

## 320 output dot-matrix display driver

Preliminary Data

### Features

- High-voltage, row/column driver IC
- 320, tri-level (high-voltage, medium voltage and ground) power outputs:
  - capable of operating at 90V, absolute max.
  - capable of sinking or sourcing 2mA
  - Hi-Z
- Logic supply range: 2.5V to 3.3V
- Slim shape die for COG, COF and TCP solutions
- Interface:
  - four dual (2-bit) input serial buses: DB<sub>A</sub>[1:2], DB<sub>B</sub>[1:2], DB<sub>C</sub>[1:2] and DB<sub>D</sub>[1:2] operating at shift clock frequency of 10MHz, max.
  - three control inputs: shift clock direction (DIR), chip select (/CS) and data latch (/DL)
  - two “all output” stage control inputs: AOC1 and AOC2
- Power supplies:
  - high-voltage for power outputs: 90V, max.
  - logic supply suitable for battery powered applications: 2.5V, min.

### Description

The STV7733 device is a low-power, controller/driver IC for dot-matrix displays. Data is encoded on two bits to select one of four possible output states: high level, medium level, ground or high impedance (Hi-Z).

Inputs AOC1 and AOC2 control the all output stages simultaneously to select one of five possible configurations: high level, medium level, ground, Hi-Z or data through.

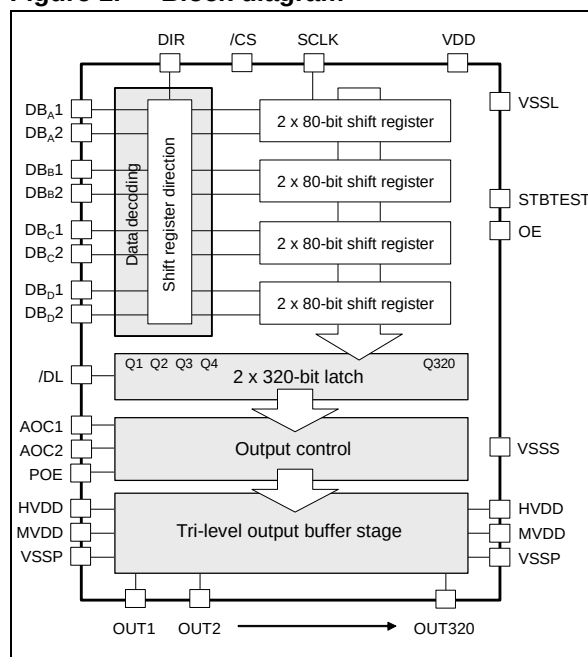
Except for the data through mode, the configuration selected by AOC1 and AOC2 is applied to all outputs at the same time.

The STV7733 communicates with the host controller through an 8-bit parallel interface. The input data bus is organized as four, 2 x 80-bit shift registers operating in parallel at a maximum clock frequency of 10MHz.

Logic inputs are LVCMOS compatible.

The STV7733 is available in bumped die form. Bumped die can be assembled in either a TCP or COG module.

**Figure 1. Block diagram**

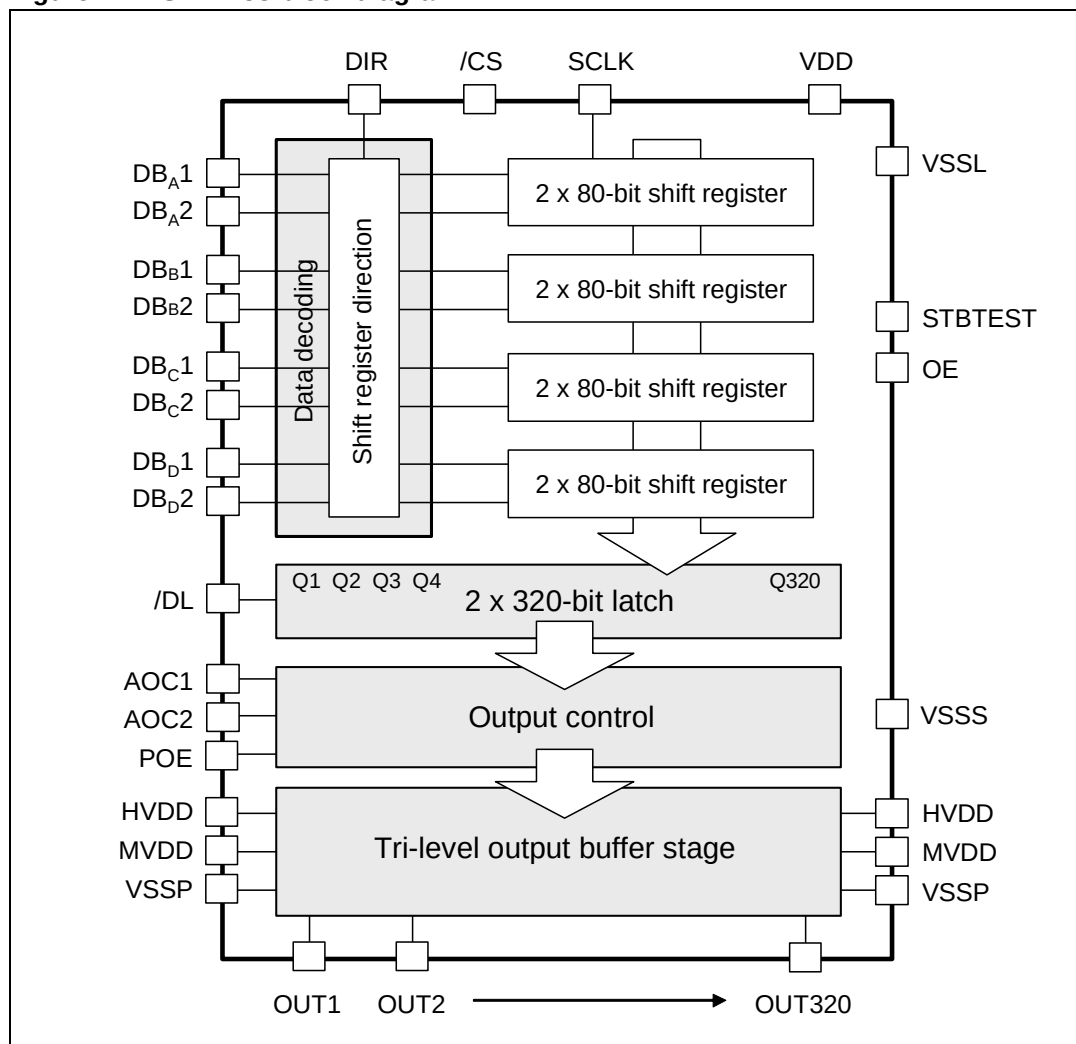


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# 1 Block diagram

Figure 2. STV7733 block diagram



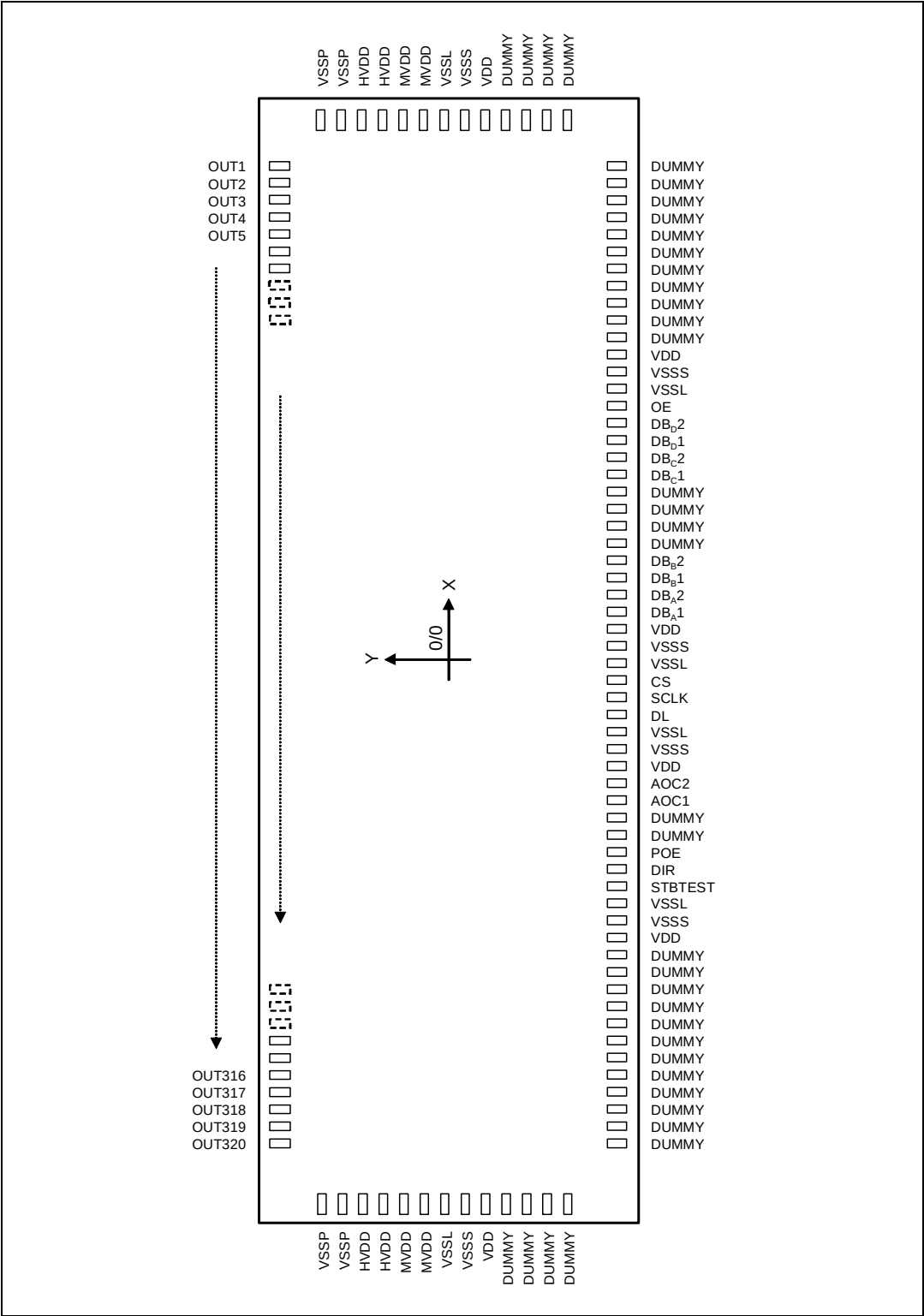
## 2 Pin description

Table 1. STV7733 pin description

| Pin name             |                       | Pin type (I/O) | Pin description                                                                                         |
|----------------------|-----------------------|----------------|---------------------------------------------------------------------------------------------------------|
| Power supplies       | HVDD                  | I              | Output buffer - high-voltage supply                                                                     |
|                      | MVDD                  | I              | Output buffer - medium voltage supply                                                                   |
|                      | VSSP                  | I              | Output buffer - ground level                                                                            |
|                      | VDD                   | I              | Logic power supply                                                                                      |
|                      | VSSL                  | I              | Logic ground                                                                                            |
|                      | VSSS                  | I              | Chip substrate level                                                                                    |
| Input logic block    | DB <sub>A</sub> [1:2] | I              | Input data bus, 2-bit serial interface                                                                  |
|                      | DB <sub>B</sub> [1:2] | I              | Input data bus, 2-bit serial interface                                                                  |
|                      | DB <sub>C</sub> [1:2] | I              | Input data bus, 2-bit serial interface                                                                  |
|                      | DB <sub>D</sub> [1:2] | I              | Input data bus, 2-bit serial interface                                                                  |
|                      | SCLK                  | I              | Data shift clock                                                                                        |
|                      | DIR                   | I              | Shift clock direction                                                                                   |
|                      | /CS                   | I              | Chip select (0 = select, 1 = un-select)                                                                 |
|                      | /DL                   | I              | Data latch. Shift register data is transferred to the driver outputs at the falling edge of this pulse. |
| Power output control | AOC1                  | I              | "All-output" control (all HVDD, all MVDD, all VSSP, data through mode) selection pin                    |
|                      | AOC2                  | I              | "All-output" control (all HVDD, all MVDD, all VSSP, data through mode) selection pin                    |
|                      | POE                   | I              | Power output enable                                                                                     |
| Power outputs        | OUT1to OUT320         | O              | High-voltage power outputs                                                                              |
| Test                 | STBTEST               | I              | Must be grounded                                                                                        |
|                      | OE                    | I              | Must be grounded                                                                                        |

3 Die pinout

Figure 3. Die pinout



## 4 Data bus configuration

Below, [Table 2](#) describes the position of the first data sampled by the first rising edge of the SCLK clock. For the first configuration described in [Table 2](#), that is, with input DIR = "H", data on the 2-bit bus DB<sub>A</sub> is sampled by the first SCLK clock pulse and appears on power output OUT1. After 80 clock pulses, data on OUT1 will be shifted to OUT317 - on the high-to-low transition of input /DL. Input /CS is the chip select.

**Table 2. Data bus configuration**

| /CS | DIR | Input                 | Position | SCLK pulse number |      |     |       |       | Comment          |
|-----|-----|-----------------------|----------|-------------------|------|-----|-------|-------|------------------|
|     |     |                       |          | OUT1              | OUT2 | ... | OUT79 | OUT80 |                  |
| L   | H   | DB <sub>A</sub> [1:2] | OUT      | 01                | 05   |     | 313   | 317   | Left/Right shift |
|     |     | DB <sub>B</sub> [1:2] | OUT      | 02                | 06   |     | 314   | 318   |                  |
|     |     | DB <sub>C</sub> [1:2] | OUT      | 03                | 07   |     | 315   | 319   |                  |
|     |     | DB <sub>D</sub> [1:2] | OUT      | 04                | 08   |     | 316   | 320   |                  |
| L   | L   | DB <sub>A</sub> [1:2] | OUT      | 320               | 316  |     | 08    | 04    | Right/Left shift |
|     |     | DB <sub>B</sub> [1:2] | OUT      | 319               | 315  |     | 07    | 03    |                  |
|     |     | DB <sub>C</sub> [1:2] | OUT      | 318               | 314  |     | 06    | 02    |                  |
|     |     | DB <sub>D</sub> [1:2] | OUT      | 317               | 313  |     | 05    | 01    |                  |

*Note:* Data is transferred from the shift register to a latch block and then on to power output stages on the falling edge of input /DL, see [Figure 2](#).

All output data is stored and held in the latch block on the rising edge of the input /DL, see [Figure 2](#).

## 5 Power output stage

The power output stage is defined by a set of three switches that can select three different output voltages ( $HV_{DD}$ ,  $MV_{DD}$  or  $V_{SSP}$ ). These switches can also be all opened to configure the output stage in a high impedance (Hi-Z) mode.

Depending on the configuration of logic inputs AOC1 and AOC2, the power output stage is configured in either a "data through" mode or a "simultaneous" mode. In the "data through" mode (for AOC1 = AOC2 = "L"), the power output stage converts the 2-bit encoded data that was loaded into the latch stage for each column into a high-voltage level that appears on the output pin. When AOC1 and AOC2 are not both "L", the power outputs can all operate simultaneously - going to  $V_{SSP}$ ,  $MV_{DD}$  or  $HV_{DD}$  depending on AOC1 and AOC2 as described below in [Table 3](#).

**Table 3. Power output truth table**

| DBn[1] | DBn[2] | POE | AOC1 | AOC2 | OUTn          | Comment |
|--------|--------|-----|------|------|---------------|---------|
| X      | X      | L   | X    | X    | All Hi-Z      | (1)     |
| L      | L      | H   | L    | L    | Hi-Z          | (2)     |
| H      | L      | H   | L    | L    | $V_{SSP}$     | (2)     |
| H      | H      | H   | L    | L    | $MV_{DD}$     | (2)     |
| L      | H      | H   | L    | L    | $HV_{DD}$     | (2)     |
| X      | X      | H   | H    | L    | All $V_{SSP}$ | (3)     |
| X      | X      | H   | L    | H    | All $MV_{DD}$ | (3)     |
| X      | X      | H   | H    | H    | All $HV_{DD}$ | (3)     |

1. With input POE = "L", all power outputs are not active, that is, they are all in Hi-Z.
2. Data through mode: each power output depends on the DBn[1:2] value at the falling edge of input /DL.
3. Output simultaneous mode: all power outputs depend on the "H"/"L" input values for AOC1 and AOC2.

## 6 Absolute maximum ratings

**Table 4. Absolute maximum ratings**

| Symbol     | Parameter                                                                   | Value           | Units |
|------------|-----------------------------------------------------------------------------|-----------------|-------|
| $V_{DD}$   | Logic supply range                                                          | -0.3, +7        | V     |
| $HV_{DD}$  | Driver supply range                                                         | -0.3, +90       | V     |
| $MV_{DD}$  | Driver supply range                                                         | -0.3, +HVdd -10 | V     |
| $V_{IN}$   | Logic input voltage range                                                   | -0.3, VDD + 0.3 | V     |
| $I_{POUT}$ | Driver output current                                                       | ±5              | mA    |
| $V_{OUT}$  | Power output voltage range                                                  | -0.3, +90       | V     |
| $V_{ESD}$  | ESD susceptibility, Human Body model<br>(100pF discharged through 1.5kohms) | 2.0             | kV    |
| $T_{jmax}$ | Maximum junction temperature                                                | 100             | °C    |
| $T_{stg}$  | Storage temperature range                                                   | -50, +150       | °C    |



## 7 Electrical characteristics

$V_{DD} = 3V$ ,  $HV_{DD} = 70V$ ,  $MV_{DD} = 35V$ ,  $V_{SSP} = 0V$ ,  $V_{SSL} = 0V$ ,  $V_{SSS} = 0V$ ,  $T_{amb} = 25^{\circ}C$ ,  $F = 10MHz$ , unless otherwise specified.

**Table 5. Electrical characteristics**

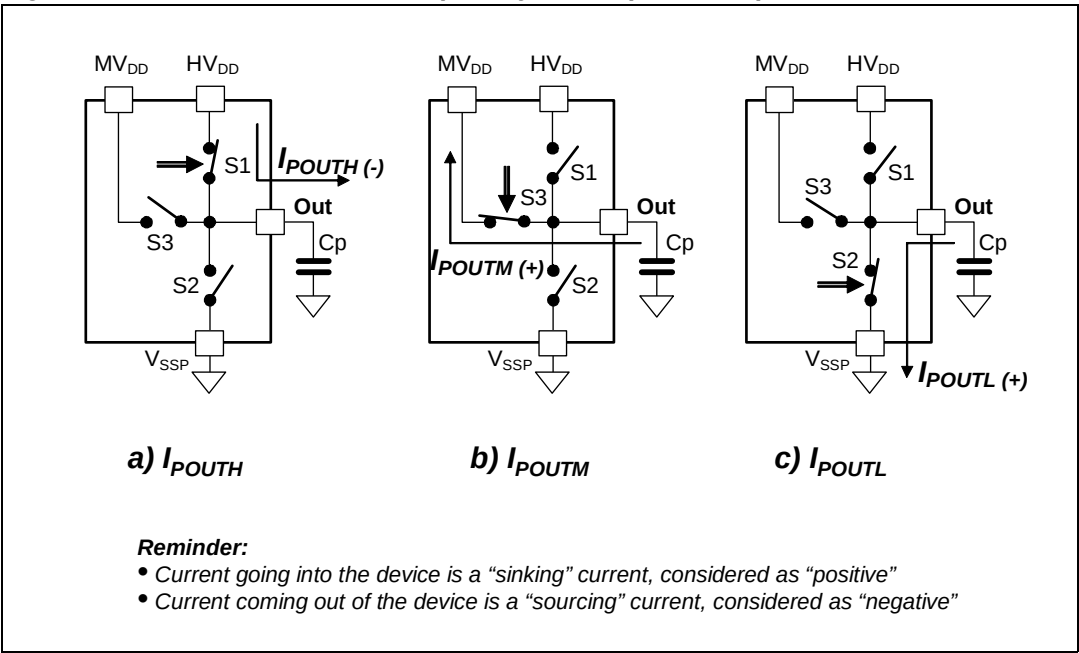
| Symbol                | Parameter                                                                                                                                                      | Min.  | Typ. | Max. | Units   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|---------|
| <b>Supply</b>         |                                                                                                                                                                |       |      |      |         |
| $V_{DD}$              | $V_{DD}$ supply voltage                                                                                                                                        | 2.5   | 3    | 3.3  | V       |
| $I_{DD}$              | $V_{DD}$ supply current with no clock, all logic inputs set to either 0V or $V_{DD}$ and all power outputs in Hi-Z                                             | -     | -    | 0.5  | $\mu A$ |
| $I_{DD1}$             | $V_{DD}$ dynamic supply current @ clock frequency = 5MHz (data frequency is 2.5MHz)                                                                            | -     | 3    | -    | mA      |
| $I_{DD2}$             | $V_{DD}$ dynamic supply current @ clock frequency = 100kHz (data frequency = 50kHz <sup>(1)</sup> )                                                            | -     | 0.1  | -    | mA      |
| $HV_{DD}$             | $HV_{DD}$ supply voltage                                                                                                                                       | 15    |      | 80   | V       |
| $MV_{DD}$             | $MV_{DD}$ supply voltage <sup>(2)</sup>                                                                                                                        | 15    |      | 70   | V       |
| $I_{PP}$              | $HV_{DD}$ supply current in steady state                                                                                                                       | -     | -    | 10   | $\mu A$ |
| <b>OUT1 to OUT320</b> |                                                                                                                                                                |       |      |      |         |
| $V_{HPOUTH}$          | Power output high level (voltage difference versus $HV_{DD}$ )<br>@ $I_{HPOUTH} = -0.5mA$ and $HV_{DD} = 80V$                                                  | -     | -    | -10  | V       |
| $V_{MPOUTH}$          | Power output medium level (voltage difference versus $MV_{DD}$ )<br>@ $I_{MPOUTH} = +0.5mA$ and $MV_{DD} = 40V$<br>@ $I_{MPOUTL} = -0.5mA$ and $MV_{DD} = 40V$ | -     | -    | +10  | V       |
|                       |                                                                                                                                                                | -     | -    | -10  | V       |
| $V_{POUTL}$           | Power output low level<br>@ $I_{POUTL} = +0.5mA$                                                                                                               | -     | -    | +10  | V       |
| $I_{POUTH}$           | Output current from $HV_{DD}$ , $MV_{DD}$ (see <a href="#">Figure 4</a> )<br>1) $HV_{DD} = 80V$ , $MV_{DD} = 40V$<br>2) $HV_{DD} = 60V$ , $MV_{DD} = 30V$      | -1.42 |      | -    | mA      |
|                       |                                                                                                                                                                | -0.7  |      |      | mA      |
| $I_{POUTM}$           | Output current from output to $MV_{DD}$ ( <a href="#">Figure 4</a> )<br>1) $HV_{DD} = 80V$ and $MV_{DD} = 40V$<br>2) $HV_{DD} = 60V$ and $MV_{DD} = 30V$       | +1.5  |      |      | mA      |
|                       |                                                                                                                                                                | +0.7  |      |      | mA      |
| $I_{POUTL}$           | Output current from output to $V_{SSP}$ @ $V_{DD}=2.5V$ ( <a href="#">Figure 4</a> )<br>1) $HV_{DD} = 80V$ and $MV_{DD} = 40V$                                 | +1.5  |      | -    | mA      |
| $I_{HiZ}$             | Output current during Hi-Z mode<br>@ $V_{DD} = 2.5V$ , $HV_{DD} = 80V$ and $MV_{DD} = 40V$                                                                     | -     |      | 10   | $\mu A$ |

**Table 5. Electrical characteristics (continued)**

| Symbol                                                   | Parameter                                               | Min. | Typ. | Max. | Units   |
|----------------------------------------------------------|---------------------------------------------------------|------|------|------|---------|
| <b>SCLK, DIR, /CS, DBn[1:2], /DL, AOC1, AOC2 and POE</b> |                                                         |      |      |      |         |
| $V_{IH}$                                                 | High level input voltage (% of $V_{DD}$ )               | 70   | -    | -    | %       |
| $V_{IL}$                                                 | Low level input voltage (% of $V_{DD}$ )                | -    | -    | 30   | %       |
| $I_{IH}$                                                 | High level input current @ $V_{IH} > 0.7 \times V_{DD}$ | -    | -    | 5    | $\mu A$ |
| $I_{IL}$                                                 | Low level input current @ $V_{IL} = 0V$                 | -    | -    | 5    | $\mu A$ |

1. This measurement is performed during device evaluation - it is not tested on all devices.
2.  $HV_{DD}$  must be greater than  $MV_{DD}$  under all conditions.

**Figure 4. Sink/source current capability test of power outputs**



## 8 AC timing requirements

$V_{DD} = 2.5V$  to  $3.3V$ ,  $T_{amb} = -20^{\circ}C$  to  $+70^{\circ}C$ ,  
input signal edge maximum rise and fall times ( $t_r$ ,  $t_f$ ) = 5ns.

**Table 6. AC timing requirements**

| Symbol       | Parameter                                                  | Min. | Typ. | Max. | Units |
|--------------|------------------------------------------------------------|------|------|------|-------|
| $t_{SCLK}$   | Data clock period                                          | 100  | -    | -    | ns    |
| $t_{WHCLK}$  | Clock pulse duration at high level                         | 40   | -    | -    | ns    |
| $t_{WLSCLK}$ | Clock pulse duration at low level                          | 40   | -    | -    | ns    |
| $t_{SDAT}$   | Input data set-up time before low-to-high clock transition | 25   | -    | -    | ns    |
| $t_{HDAT}$   | Input data hold-time after low-to-high clock transition    | 25   | -    | -    | ns    |
| $t_{SCS}$    | /CS set-up time before low-to-high clock transition        | 40   | -    | -    | ns    |
| $t_{HCS}$    | /CS hold-time after low-to-high clock transition           | 25   | -    | -    | ns    |
| $t_{HDL}$    | /DL hold-time after low-to-high transition of /CS          | 25   | -    | -    | ns    |
| $t_{DL}$     | Low level pulse duration                                   | 25   | -    | -    | ns    |
| $t_{SDL}$    | /DL set-up time before low-to-high transition of /CS       | 475  |      |      | ns    |

## 9 AC Timing characteristics

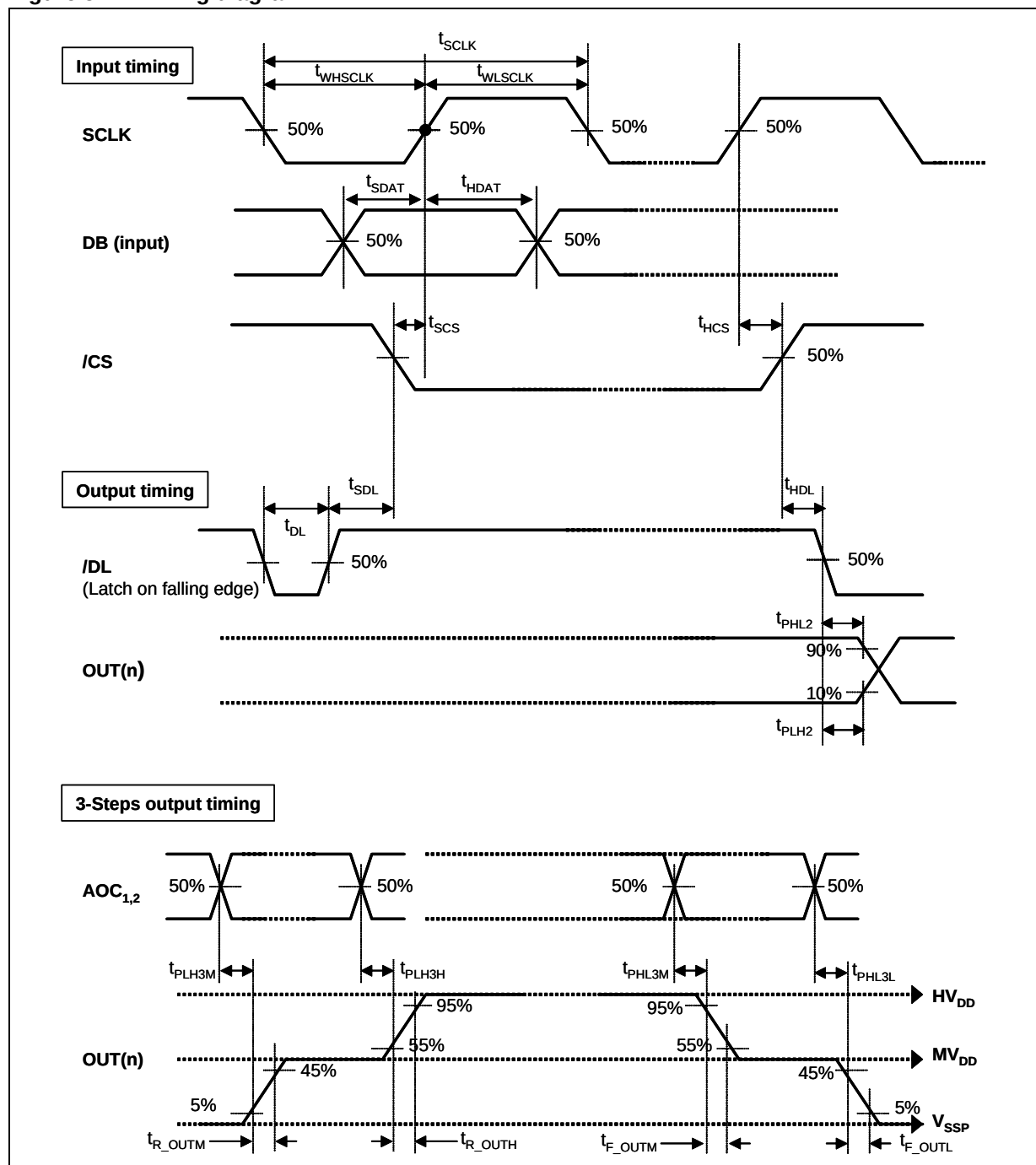
$V_{DD} = 3V$ ,  $HV_{DD} = 70V$ ,  $MV_{DD} = 35V$ ,  $V_{SSP} = 0V$ ,  $V_{SSL} = 0V$ ,  $V_{SSS} = 0V$ ,  $T_{amb} = 25^{\circ}C$ ,  
 $F = 5MHz$ ,  $C_{load} = 10pF$ , unless otherwise specified ( $V_{ILMAX} = 0.3 \times V_{DD}$ ,  $V_{IHMIN} = 0.7 \times V_{DD}$ ).

**Table 7. AC timing characteristics**

| Symbol                                                           | Parameter                                                                                                                                                                                                                                                                                                                                   | Min.             | Typ.                     | Max.       | Units                |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------|------------|----------------------|
| $t_{PHL2}$<br>$t_{PLH2}$                                         | Delay between /DL transition and change in level of power output @ $V_{DD} = 3V$ (see <a href="#">Figure 5</a> )<br>1. OUT1 and OUT320<br>2. OUT160 and OUT161                                                                                                                                                                              | -<br>-           | 150<br>500               | 250<br>850 | ns<br>ns             |
| $t_{PLH3M}$<br>$t_{PLH3H}$<br>$t_{PHL3M}$<br>$t_{PHL3L}$         | Delay between AOC <sub>1,2</sub> transitions and change in level of power output (see <a href="#">Figure 5</a> )<br>1. OUT1 and OUT320<br>2. OUT160 and OUT161                                                                                                                                                                              | -<br>-           | 150<br>500               | 250<br>850 | ns<br>ns             |
| $t_{R\_OUTM}$<br>$t_{R\_OUTH}$<br>$t_{F\_OUTM}$<br>$t_{F\_OUTL}$ | Output transition time for one single power output with $V_{DD} = 3V$ , $MV_{DD} = 35V$ and $HV_{DD} = 70V$ (see <a href="#">Figure 5</a> )<br>Output rise time from $V_{SSP}$ to $MV_{DD}$<br>Output rise time from $MV_{DD}$ to $HV_{DD}$<br>Output fall time from $HV_{DD}$ to $MV_{DD}$<br>Output fall time from $MV_{DD}$ to $V_{SSP}$ | -<br>-<br>-<br>- | 400<br>500<br>800<br>200 |            | ns<br>ns<br>ns<br>ns |

## 10 Timing

Figure 5. Timing diagram



## 11 Pad dimensions (in microns)/pad positions

The reference (x=0, y=0) is the center of the die. Bump pad pitch: 68μm, minimum (on the power output side of the die).

**Table 8. Die size**

|                                | Dimension | Units |
|--------------------------------|-----------|-------|
| <b>Die size without scribe</b> |           |       |
| X                              | 22440     | μm    |
| Y                              | 1550      | μm    |
| <b>Die size with scribe</b>    |           |       |
| X                              | 22550     | μm    |
| Y                              | 1660      | μm    |

Pad placement coordinate values correspond to the center of each bump pad center.

Number of pads: 404

**Table 9. Pad placement and bump dimensions (in microns)**

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT320        | -10845.9       | 600.6 | 51.0                           | 73.1 |
| OUT319        | -10777.9       | 600.6 | 51.0                           | 73.1 |
| OUT318        | -10709.9       | 600.6 | 51.0                           | 73.1 |
| OUT317        | -10641.9       | 600.6 | 51.0                           | 73.1 |
| OUT316        | -10573.9       | 600.6 | 51.0                           | 73.1 |
| OUT315        | -10505.9       | 600.6 | 51.0                           | 73.1 |
| OUT314        | -10437.9       | 600.6 | 51.0                           | 73.1 |
| OUT313        | -10369.9       | 600.6 | 51.0                           | 73.1 |
| OUT312        | -10301.9       | 600.6 | 51.0                           | 73.1 |
| OUT311        | -10233.9       | 600.6 | 51.0                           | 73.1 |
| OUT310        | -10165.9       | 600.6 | 51.0                           | 73.1 |
| OUT309        | -10097.9       | 600.6 | 51.0                           | 73.1 |
| OUT308        | -10029.9       | 600.6 | 51.0                           | 73.1 |
| OUT307        | -9961.9        | 600.6 | 51.0                           | 73.1 |
| OUT306        | -9893.9        | 600.6 | 51.0                           | 73.1 |
| OUT305        | -9825.9        | 600.6 | 51.0                           | 73.1 |
| OUT304        | -9757.9        | 600.6 | 51.0                           | 73.1 |
| OUT303        | -9689.9        | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT302        | -9621.9        | 600.6 | 51.0                           | 73.1 |
| OUT301        | -9553.9        | 600.6 | 51.0                           | 73.1 |
| OUT300        | -9485.9        | 600.6 | 51.0                           | 73.1 |
| OUT299        | -9417.9        | 600.6 | 51.0                           | 73.1 |
| OUT298        | -9349.9        | 600.6 | 51.0                           | 73.1 |
| OUT297        | -9281.9        | 600.6 | 51.0                           | 73.1 |
| OUT296        | -9213.9        | 600.6 | 51.0                           | 73.1 |
| OUT295        | -9145.9        | 600.6 | 51.0                           | 73.1 |
| OUT294        | -9077.9        | 600.6 | 51.0                           | 73.1 |
| OUT293        | -9009.9        | 600.6 | 51.0                           | 73.1 |
| OUT292        | -8941.9        | 600.6 | 51.0                           | 73.1 |
| OUT291        | -8873.9        | 600.6 | 51.0                           | 73.1 |
| OUT290        | -8805.9        | 600.6 | 51.0                           | 73.1 |
| OUT289        | -8737.9        | 600.6 | 51.0                           | 73.1 |
| OUT288        | -8669.9        | 600.6 | 51.0                           | 73.1 |
| OUT287        | -8601.9        | 600.6 | 51.0                           | 73.1 |
| OUT286        | -8533.9        | 600.6 | 51.0                           | 73.1 |
| OUT285        | -8465.9        | 600.6 | 51.0                           | 73.1 |
| OUT284        | -8397.9        | 600.6 | 51.0                           | 73.1 |
| OUT283        | -8329.9        | 600.6 | 51.0                           | 73.1 |
| OUT282        | -8261.9        | 600.6 | 51.0                           | 73.1 |
| OUT281        | -8193.9        | 600.6 | 51.0                           | 73.1 |
| OUT280        | -8125.9        | 600.6 | 51.0                           | 73.1 |
| OUT279        | -8057.9        | 600.6 | 51.0                           | 73.1 |
| OUT278        | -7989.9        | 600.6 | 51.0                           | 73.1 |
| OUT277        | -7921.9        | 600.6 | 51.0                           | 73.1 |
| OUT276        | -7853.9        | 600.6 | 51.0                           | 73.1 |
| OUT275        | -7785.9        | 600.6 | 51.0                           | 73.1 |
| OUT274        | -7717.9        | 600.6 | 51.0                           | 73.1 |
| OUT273        | -7649.9        | 600.6 | 51.0                           | 73.1 |
| OUT272        | -7581.9        | 600.6 | 51.0                           | 73.1 |
| OUT271        | -7513.9        | 600.6 | 51.0                           | 73.1 |
| OUT270        | -7445.9        | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT269        | -7377.9        | 600.6 | 51.0                           | 73.1 |
| OUT268        | -7309.9        | 600.6 | 51.0                           | 73.1 |
| OUT267        | -7241.9        | 600.6 | 51.0                           | 73.1 |
| OUT266        | -7173.9        | 600.6 | 51.0                           | 73.1 |
| OUT265        | -7105.9        | 600.6 | 51.0                           | 73.1 |
| OUT264        | -7037.9        | 600.6 | 51.0                           | 73.1 |
| OUT263        | -6969.9        | 600.6 | 51.0                           | 73.1 |
| OUT262        | -6901.9        | 600.6 | 51.0                           | 73.1 |
| OUT261        | -6833.9        | 600.6 | 51.0                           | 73.1 |
| OUT260        | -6765.9        | 600.6 | 51.0                           | 73.1 |
| OUT259        | -6697.9        | 600.6 | 51.0                           | 73.1 |
| OUT258        | -6629.9        | 600.6 | 51.0                           | 73.1 |
| OUT257        | -6561.9        | 600.6 | 51.0                           | 73.1 |
| OUT256        | -6493.9        | 600.6 | 51.0                           | 73.1 |
| OUT255        | -6425.9        | 600.6 | 51.0                           | 73.1 |
| OUT254        | -6357.9        | 600.6 | 51.0                           | 73.1 |
| OUT253        | -6289.9        | 600.6 | 51.0                           | 73.1 |
| OUT252        | -6221.9        | 600.6 | 51.0                           | 73.1 |
| OUT251        | -6153.9        | 600.6 | 51.0                           | 73.1 |
| OUT250        | -6085.9        | 600.6 | 51.0                           | 73.1 |
| OUT249        | -6017.9        | 600.6 | 51.0                           | 73.1 |
| OUT248        | -5949.9        | 600.6 | 51.0                           | 73.1 |
| OUT247        | -5881.9        | 600.6 | 51.0                           | 73.1 |
| OUT246        | -5813.9        | 600.6 | 51.0                           | 73.1 |
| OUT245        | -5745.9        | 600.6 | 51.0                           | 73.1 |
| OUT244        | -5677.9        | 600.6 | 51.0                           | 73.1 |
| OUT243        | -5609.9        | 600.6 | 51.0                           | 73.1 |
| OUT242        | -5541.9        | 600.6 | 51.0                           | 73.1 |
| OUT241        | -5473.9        | 600.6 | 51.0                           | 73.1 |
| OUT240        | -5405.9        | 600.6 | 51.0                           | 73.1 |
| OUT239        | -5337.9        | 600.6 | 51.0                           | 73.1 |
| OUT238        | -5269.9        | 600.6 | 51.0                           | 73.1 |
| OUT237        | -5201.9        | 600.6 | 51.0                           | 73.1 |



**Table 9. Pad placement and bump dimensions (in microns) (continued)**

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT236        | -5133.9        | 600.6 | 51.0                           | 73.1 |
| OUT235        | -5065.9        | 600.6 | 51.0                           | 73.1 |
| OUT234        | -4997.9        | 600.6 | 51.0                           | 73.1 |
| OUT233        | -4929.9        | 600.6 | 51.0                           | 73.1 |
| OUT232        | -4861.9        | 600.6 | 51.0                           | 73.1 |
| OUT231        | -4793.9        | 600.6 | 51.0                           | 73.1 |
| OUT230        | -4725.9        | 600.6 | 51.0                           | 73.1 |
| OUT229        | -4657.9        | 600.6 | 51.0                           | 73.1 |
| OUT228        | -4589.9        | 600.6 | 51.0                           | 73.1 |
| OUT227        | -4521.9        | 600.6 | 51.0                           | 73.1 |
| OUT226        | -4453.9        | 600.6 | 51.0                           | 73.1 |
| OUT225        | -4385.9        | 600.6 | 51.0                           | 73.1 |
| OUT224        | -4317.9        | 600.6 | 51.0                           | 73.1 |
| OUT223        | -4249.9        | 600.6 | 51.0                           | 73.1 |
| OUT222        | -4181.9        | 600.6 | 51.0                           | 73.1 |
| OUT221        | -4113.9        | 600.6 | 51.0                           | 73.1 |
| OUT220        | -4045.9        | 600.6 | 51.0                           | 73.1 |
| OUT219        | -3977.9        | 600.6 | 51.0                           | 73.1 |
| OUT218        | -3909.9        | 600.6 | 51.0                           | 73.1 |
| OUT217        | -3841.9        | 600.6 | 51.0                           | 73.1 |
| OUT216        | -3773.9        | 600.6 | 51.0                           | 73.1 |
| OUT215        | -3705.9        | 600.6 | 51.0                           | 73.1 |
| OUT214        | -3637.9        | 600.6 | 51.0                           | 73.1 |
| OUT213        | -3569.9        | 600.6 | 51.0                           | 73.1 |
| OUT212        | -3501.9        | 600.6 | 51.0                           | 73.1 |
| OUT211        | -3433.9        | 600.6 | 51.0                           | 73.1 |
| OUT210        | -3365.9        | 600.6 | 51.0                           | 73.1 |
| OUT209        | -3297.9        | 600.6 | 51.0                           | 73.1 |
| OUT208        | -3229.9        | 600.6 | 51.0                           | 73.1 |
| OUT207        | -3161.9        | 600.6 | 51.0                           | 73.1 |
| OUT206        | -3093.9        | 600.6 | 51.0                           | 73.1 |
| OUT205        | -3025.9        | 600.6 | 51.0                           | 73.1 |
| OUT204        | -2957.9        | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT203        | -2889.9        | 600.6 | 51.0                           | 73.1 |
| OUT202        | -2821.9        | 600.6 | 51.0                           | 73.1 |
| OUT201        | -2753.9        | 600.6 | 51.0                           | 73.1 |
| OUT200        | -2685.9        | 600.6 | 51.0                           | 73.1 |
| OUT199        | -2617.9        | 600.6 | 51.0                           | 73.1 |
| OUT198        | -2549.9        | 600.6 | 51.0                           | 73.1 |
| OUT197        | -2481.9        | 600.6 | 51.0                           | 73.1 |
| OUT196        | -2413.9        | 600.6 | 51.0                           | 73.1 |
| OUT195        | -2345.9        | 600.6 | 51.0                           | 73.1 |
| OUT194        | -2277.9        | 600.6 | 51.0                           | 73.1 |
| OUT193        | -2209.9        | 600.6 | 51.0                           | 73.1 |
| OUT192        | -2141.9        | 600.6 | 51.0                           | 73.1 |
| OUT191        | -2073.9        | 600.6 | 51.0                           | 73.1 |
| OUT190        | -2005.9        | 600.6 | 51.0                           | 73.1 |
| OUT189        | -1937.9        | 600.6 | 51.0                           | 73.1 |
| OUT188        | -1869.9        | 600.6 | 51.0                           | 73.1 |
| OUT187        | -1801.9        | 600.6 | 51.0                           | 73.1 |
| OUT186        | -1733.9        | 600.6 | 51.0                           | 73.1 |
| OUT185        | -1665.9        | 600.6 | 51.0                           | 73.1 |
| OUT184        | -1597.9        | 600.6 | 51.0                           | 73.1 |
| OUT183        | -1529.9        | 600.6 | 51.0                           | 73.1 |
| OUT182        | -1461.9        | 600.6 | 51.0                           | 73.1 |
| OUT181        | -1393.9        | 600.6 | 51.0                           | 73.1 |
| OUT180        | -1325.9        | 600.6 | 51.0                           | 73.1 |
| OUT179        | -1257.9        | 600.6 | 51.0                           | 73.1 |
| OUT178        | -1189.9        | 600.6 | 51.0                           | 73.1 |
| OUT177        | -1121.9        | 600.6 | 51.0                           | 73.1 |
| OUT176        | -1053.9        | 600.6 | 51.0                           | 73.1 |
| OUT175        | -985.9         | 600.6 | 51.0                           | 73.1 |
| OUT174        | -917.9         | 600.6 | 51.0                           | 73.1 |
| OUT173        | -849.9         | 600.6 | 51.0                           | 73.1 |
| OUT172        | -781.9         | 600.6 | 51.0                           | 73.1 |
| OUT171        | -713.9         | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT170        | -645.9         | 600.6 | 51.0                           | 73.1 |
| OUT169        | -577.9         | 600.6 | 51.0                           | 73.1 |
| OUT168        | -509.9         | 600.6 | 51.0                           | 73.1 |
| OUT167        | -441.9         | 600.6 | 51.0                           | 73.1 |
| OUT166        | -373.9         | 600.6 | 51.0                           | 73.1 |
| OUT165        | -305.9         | 600.6 | 51.0                           | 73.1 |
| OUT164        | -237.9         | 600.6 | 51.0                           | 73.1 |
| OUT163        | -169.9         | 600.6 | 51.0                           | 73.1 |
| OUT162        | -101.9         | 600.6 | 51.0                           | 73.1 |
| OUT161        | -33.9          | 600.6 | 51.0                           | 73.1 |
| OUT160        | 34.1           | 600.6 | 51.0                           | 73.1 |
| OUT159        | 102.1          | 600.6 | 51.0                           | 73.1 |
| OUT158        | 170.1          | 600.6 | 51.0                           | 73.1 |
| OUT157        | 238.1          | 600.6 | 51.0                           | 73.1 |
| OUT156        | 306.1          | 600.6 | 51.0                           | 73.1 |
| OUT155        | 374.1          | 600.6 | 51.0                           | 73.1 |
| OUT154        | 442.1          | 600.6 | 51.0                           | 73.1 |
| OUT153        | 510.1          | 600.6 | 51.0                           | 73.1 |
| OUT152        | 578.1          | 600.6 | 51.0                           | 73.1 |
| OUT151        | 646.1          | 600.6 | 51.0                           | 73.1 |
| OUT150        | 714.1          | 600.6 | 51.0                           | 73.1 |
| OUT149        | 782.1          | 600.6 | 51.0                           | 73.1 |
| OUT148        | 850.1          | 600.6 | 51.0                           | 73.1 |
| OUT147        | 918.1          | 600.6 | 51.0                           | 73.1 |
| OUT146        | 986.1          | 600.6 | 51.0                           | 73.1 |
| OUT145        | 1054.1         | 600.6 | 51.0                           | 73.1 |
| OUT144        | 1122.1         | 600.6 | 51.0                           | 73.1 |
| OUT143        | 1190.1         | 600.6 | 51.0                           | 73.1 |
| OUT142        | 1258.1         | 600.6 | 51.0                           | 73.1 |
| OUT141        | 1326.1         | 600.6 | 51.0                           | 73.1 |
| OUT140        | 1394.1         | 600.6 | 51.0                           | 73.1 |
| OUT139        | 1462.1         | 600.6 | 51.0                           | 73.1 |
| OUT138        | 1530.1         | 600.6 | 51.0                           | 73.1 |

**Table 9. Pad placement and bump dimensions (in microns) (continued)**

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT137        | 1598.1         | 600.6 | 51.0                           | 73.1 |
| OUT136        | 1666.1         | 600.6 | 51.0                           | 73.1 |
| OUT135        | 1734.1         | 600.6 | 51.0                           | 73.1 |
| OUT134        | 1802.1         | 600.6 | 51.0                           | 73.1 |
| OUT133        | 1870.1         | 600.6 | 51.0                           | 73.1 |
| OUT132        | 1938.1         | 600.6 | 51.0                           | 73.1 |
| OUT131        | 2006.1         | 600.6 | 51.0                           | 73.1 |
| OUT130        | 2074.1         | 600.6 | 51.0                           | 73.1 |
| OUT129        | 2142.1         | 600.6 | 51.0                           | 73.1 |
| OUT128        | 2210.1         | 600.6 | 51.0                           | 73.1 |
| OUT127        | 2278.1         | 600.6 | 51.0                           | 73.1 |
| OUT126        | 2346.1         | 600.6 | 51.0                           | 73.1 |
| OUT125        | 2414.1         | 600.6 | 51.0                           | 73.1 |
| OUT124        | 2482.1         | 600.6 | 51.0                           | 73.1 |
| OUT123        | 2550.1         | 600.6 | 51.0                           | 73.1 |
| OUT122        | 2618.1         | 600.6 | 51.0                           | 73.1 |
| OUT121        | 2686.1         | 600.6 | 51.0                           | 73.1 |
| OUT120        | 2754.1         | 600.6 | 51.0                           | 73.1 |
| OUT119        | 2822.1         | 600.6 | 51.0                           | 73.1 |
| OUT118        | 2890.1         | 600.6 | 51.0                           | 73.1 |
| OUT117        | 2958.1         | 600.6 | 51.0                           | 73.1 |
| OUT116        | 3026.1         | 600.6 | 51.0                           | 73.1 |
| OUT115        | 3094.1         | 600.6 | 51.0                           | 73.1 |
| OUT114        | 3162.1         | 600.6 | 51.0                           | 73.1 |
| OUT113        | 3230.1         | 600.6 | 51.0                           | 73.1 |
| OUT112        | 3298.1         | 600.6 | 51.0                           | 73.1 |
| OUT111        | 3366.1         | 600.6 | 51.0                           | 73.1 |
| OUT110        | 3434.1         | 600.6 | 51.0                           | 73.1 |
| OUT109        | 3502.1         | 600.6 | 51.0                           | 73.1 |
| OUT108        | 3570.1         | 600.6 | 51.0                           | 73.1 |
| OUT107        | 3638.1         | 600.6 | 51.0                           | 73.1 |
| OUT106        | 3706.1         | 600.6 | 51.0                           | 73.1 |
| OUT105        | 3774.1         | 600.6 | 51.0                           | 73.1 |

**Table 9. Pad placement and bump dimensions (in microns) (continued)**

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT104        | 3842.1         | 600.6 | 51.0                           | 73.1 |
| OUT103        | 3910.1         | 600.6 | 51.0                           | 73.1 |
| OUT102        | 3978.1         | 600.6 | 51.0                           | 73.1 |
| OUT101        | 4046.1         | 600.6 | 51.0                           | 73.1 |
| OUT100        | 4114.1         | 600.6 | 51.0                           | 73.1 |
| OUT99         | 4182.1         | 600.6 | 51.0                           | 73.1 |
| OUT98         | 4250.1         | 600.6 | 51.0                           | 73.1 |
| OUT97         | 4318.1         | 600.6 | 51.0                           | 73.1 |
| OUT96         | 4386.1         | 600.6 | 51.0                           | 73.1 |
| OUT95         | 4454.1         | 600.6 | 51.0                           | 73.1 |
| OUT94         | 4522.1         | 600.6 | 51.0                           | 73.1 |
| OUT93         | 4590.1         | 600.6 | 51.0                           | 73.1 |
| OUT92         | 4658.1         | 600.6 | 51.0                           | 73.1 |
| OUT91         | 4726.1         | 600.6 | 51.0                           | 73.1 |
| OUT90         | 4794.1         | 600.6 | 51.0                           | 73.1 |
| OUT89         | 4862.1         | 600.6 | 51.0                           | 73.1 |
| OUT88         | 4930.1         | 600.6 | 51.0                           | 73.1 |
| OUT87         | 4998.1         | 600.6 | 51.0                           | 73.1 |
| OUT86         | 5066.1         | 600.6 | 51.0                           | 73.1 |
| OUT85         | 5134.1         | 600.6 | 51.0                           | 73.1 |
| OUT84         | 5202.1         | 600.6 | 51.0                           | 73.1 |
| OUT83         | 5270.1         | 600.6 | 51.0                           | 73.1 |
| OUT82         | 5338.1         | 600.6 | 51.0                           | 73.1 |
| OUT81         | 5406.1         | 600.6 | 51.0                           | 73.1 |
| OUT80         | 5474.1         | 600.6 | 51.0                           | 73.1 |
| OUT79         | 5542.1         | 600.6 | 51.0                           | 73.1 |
| OUT78         | 5610.1         | 600.6 | 51.0                           | 73.1 |
| OUT77         | 5678.1         | 600.6 | 51.0                           | 73.1 |
| OUT76         | 5746.1         | 600.6 | 51.0                           | 73.1 |
| OUT75         | 5814.1         | 600.6 | 51.0                           | 73.1 |
| OUT74         | 5882.1         | 600.6 | 51.0                           | 73.1 |
| OUT73         | 5950.1         | 600.6 | 51.0                           | 73.1 |
| OUT72         | 6018.1         | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT71         | 6086.1         | 600.6 | 51.0                           | 73.1 |
| OUT70         | 6154.1         | 600.6 | 51.0                           | 73.1 |
| OUT69         | 6222.1         | 600.6 | 51.0                           | 73.1 |
| OUT68         | 6290.1         | 600.6 | 51.0                           | 73.1 |
| OUT67         | 6358.1         | 600.6 | 51.0                           | 73.1 |
| OUT66         | 6426.1         | 600.6 | 51.0                           | 73.1 |
| OUT65         | 6494.1         | 600.6 | 51.0                           | 73.1 |
| OUT64         | 6562.1         | 600.6 | 51.0                           | 73.1 |
| OUT63         | 6630.1         | 600.6 | 51.0                           | 73.1 |
| OUT62         | 6698.1         | 600.6 | 51.0                           | 73.1 |
| OUT61         | 6766.1         | 600.6 | 51.0                           | 73.1 |
| OUT60         | 6834.1         | 600.6 | 51.0                           | 73.1 |
| OUT59         | 6902.1         | 600.6 | 51.0                           | 73.1 |
| OUT58         | 6970.1         | 600.6 | 51.0                           | 73.1 |
| OUT57         | 7038.1         | 600.6 | 51.0                           | 73.1 |
| OUT56         | 7106.1         | 600.6 | 51.0                           | 73.1 |
| OUT55         | 7174.1         | 600.6 | 51.0                           | 73.1 |
| OUT54         | 7242.1         | 600.6 | 51.0                           | 73.1 |
| OUT53         | 7310.1         | 600.6 | 51.0                           | 73.1 |
| OUT52         | 7378.1         | 600.6 | 51.0                           | 73.1 |
| OUT51         | 7446.1         | 600.6 | 51.0                           | 73.1 |
| OUT50         | 7514.1         | 600.6 | 51.0                           | 73.1 |
| OUT49         | 7582.1         | 600.6 | 51.0                           | 73.1 |
| OUT48         | 7650.1         | 600.6 | 51.0                           | 73.1 |
| OUT47         | 7718.1         | 600.6 | 51.0                           | 73.1 |
| OUT46         | 7786.1         | 600.6 | 51.0                           | 73.1 |
| OUT45         | 7854.1         | 600.6 | 51.0                           | 73.1 |
| OUT44         | 7922.1         | 600.6 | 51.0                           | 73.1 |
| OUT43         | 7990.1         | 600.6 | 51.0                           | 73.1 |
| OUT42         | 8058.1         | 600.6 | 51.0                           | 73.1 |
| OUT41         | 8126.1         | 600.6 | 51.0                           | 73.1 |
| OUT40         | 8194.1         | 600.6 | 51.0                           | 73.1 |
| OUT39         | 8262.1         | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |       | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|-------|--------------------------------|------|
|               | X              | Y     | X                              | Y    |
| OUT38         | 8330.1         | 600.6 | 51.0                           | 73.1 |
| OUT37         | 8398.1         | 600.6 | 51.0                           | 73.1 |
| OUT36         | 8466.1         | 600.6 | 51.0                           | 73.1 |
| OUT35         | 8534.1         | 600.6 | 51.0                           | 73.1 |
| OUT34         | 8602.1         | 600.6 | 51.0                           | 73.1 |
| OUT33         | 8670.1         | 600.6 | 51.0                           | 73.1 |
| OUT32         | 8738.1         | 600.6 | 51.0                           | 73.1 |
| OUT31         | 8806.1         | 600.6 | 51.0                           | 73.1 |
| OUT30         | 8874.1         | 600.6 | 51.0                           | 73.1 |
| OUT29         | 8942.1         | 600.6 | 51.0                           | 73.1 |
| OUT28         | 9010.1         | 600.6 | 51.0                           | 73.1 |
| OUT27         | 9078.1         | 600.6 | 51.0                           | 73.1 |
| OUT26         | 9146.1         | 600.6 | 51.0                           | 73.1 |
| OUT25         | 9214.1         | 600.6 | 51.0                           | 73.1 |
| OUT24         | 9282.1         | 600.6 | 51.0                           | 73.1 |
| OUT23         | 9350.1         | 600.6 | 51.0                           | 73.1 |
| OUT22         | 9418.1         | 600.6 | 51.0                           | 73.1 |
| OUT21         | 9486.1         | 600.6 | 51.0                           | 73.1 |
| OUT20         | 9554.1         | 600.6 | 51.0                           | 73.1 |
| OUT19         | 9622.1         | 600.6 | 51.0                           | 73.1 |
| OUT18         | 9690.1         | 600.6 | 51.0                           | 73.1 |
| OUT17         | 9758.1         | 600.6 | 51.0                           | 73.1 |
| OUT16         | 9826.1         | 600.6 | 51.0                           | 73.1 |
| OUT15         | 9894.1         | 600.6 | 51.0                           | 73.1 |
| OUT14         | 9962.1         | 600.6 | 51.0                           | 73.1 |
| OUT13         | 10030.1        | 600.6 | 51.0                           | 73.1 |
| OUT12         | 10098.1        | 600.6 | 51.0                           | 73.1 |
| OUT11         | 10166.1        | 600.6 | 51.0                           | 73.1 |
| OUT10         | 10234.1        | 600.6 | 51.0                           | 73.1 |
| OUT9          | 10302.1        | 600.6 | 51.0                           | 73.1 |
| OUT8          | 10370.1        | 600.6 | 51.0                           | 73.1 |
| OUT7          | 10438.1        | 600.6 | 51.0                           | 73.1 |
| OUT6          | 10506.1        | 600.6 | 51.0                           | 73.1 |

Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |        | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|--------|--------------------------------|------|
|               | X              | Y      | X                              | Y    |
| OUT5          | 10574.1        | 600.6  | 51.0                           | 73.1 |
| OUT4          | 10642.1        | 600.6  | 51.0                           | 73.1 |
| OUT3          | 10710.1        | 600.6  | 51.0                           | 73.1 |
| OUT2          | 10778.1        | 600.6  | 51.0                           | 73.1 |
| OUT1          | 10846.1        | 600.6  | 51.0                           | 73.1 |
| VSSP          | 11142.5        | 675.5  | 73.1                           | 51.0 |
| VSSP          | 11142.5        | 607.5  | 73.1                           | 51.0 |
| HVDD          | 11142.5        | 505.5  | 73.1                           | 51.0 |
| HVDD          | 11142.5        | 437.5  | 73.1                           | 51.0 |
| MVDD          | 11142.5        | 335.5  | 73.1                           | 51.0 |
| MVDD          | 11142.5        | 267.5  | 73.1                           | 51.0 |
| VSSL          | 11142.5        | 164.7  | 73.1                           | 51.0 |
| VSSS          | 11142.5        | -107.5 | 73.1                           | 51.0 |
| VDD           | 11142.5        | -328.9 | 73.1                           | 51.0 |
| VDD_DUMMY31   | 11142.5        | -428.9 | 73.1                           | 51.0 |
| VDD_DUMMY30   | 11142.5        | -496.9 | 73.1                           | 51.0 |
| VDD_DUMMY29   | 11142.5        | -598.9 | 73.1                           | 51.0 |
| VDD_DUMMY28   | 11142.5        | -666.9 | 73.1                           | 51.0 |
| VDD_DUMMY27   | 10273.7        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY26   | 10001.7        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY25   | 9729.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY24   | 9457.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY23   | 9185.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY22   | 8913.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY21   | 8641.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY20   | 8369.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY19   | 8097.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY18   | 7825.7         | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY17   | 7276.9         | -700.9 | 51.0                           | 73.1 |
| VDD           | 6383.4         | -700.9 | 51.0                           | 73.1 |
| VSSS          | 6169.1         | -700.9 | 51.0                           | 73.1 |
| VSSL          | 5897.0         | -700.9 | 51.0                           | 73.1 |
| OE            | 5527.6         | -700.9 | 51.0                           | 73.1 |



Table 9. Pad placement and bump dimensions (in microns) (continued)

| Lead pad name | Pad placements |        | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|--------|--------------------------------|------|
|               | X              | Y      | X                              | Y    |
| DBD2          | 5157.7         | -700.9 | 51.0                           | 73.1 |
| DBD1          | 4787.7         | -700.9 | 51.0                           | 73.1 |
| DBC2          | 4417.8         | -700.9 | 51.0                           | 73.1 |
| DBC1          | 4047.9         | -700.9 | 51.0                           | 73.1 |
| DBC1_DUMMY2   | 3684.5         | -700.9 | 51.0                           | 73.1 |
| DBC1_DUMMY1   | 2873.6         | -700.9 | 51.0                           | 73.1 |
| DBB2_DUMMY2   | 2049.7         | -700.9 | 51.0                           | 73.1 |
| DBB2_DUMMY1   | 1298.3         | -700.9 | 51.0                           | 73.1 |
| DBB2          | 380.7          | -700.9 | 51.0                           | 73.1 |
| DBB1          | 12.6           | -700.9 | 51.0                           | 73.1 |
| DBA2          | -355.4         | -700.9 | 51.0                           | 73.1 |
| DBA1          | -732.9         | -700.9 | 51.0                           | 73.1 |
| VDD           | -801.0         | -700.9 | 51.0                           | 73.1 |
| VSSS          | -1015.3        | -700.9 | 51.0                           | 73.1 |
| VSSL          | -1287.4        | -700.9 | 51.0                           | 73.1 |
| /CS           | -2180.9        | -700.9 | 51.0                           | 73.1 |
| SCLK          | -2473.8        | -700.9 | 51.0                           | 73.1 |
| /DL           | -2766.7        | -700.9 | 51.0                           | 73.1 |
| VSSL          | -2834.8        | -700.9 | 51.0                           | 73.1 |
| VSSS          | -3106.9        | -700.9 | 51.0                           | 73.1 |
| VDD           | -3321.2        | -700.9 | 51.0                           | 73.1 |
| AOC2          | -3389.2        | -700.9 | 51.0                           | 73.1 |
| AOC1          | -3682.1        | -700.9 | 51.0                           | 73.1 |
| AOC1_DUMMY1   | -4378.2        | -700.9 | 51.0                           | 73.1 |
| POE_DUMMY1    | -5131.9        | -700.9 | 51.0                           | 73.1 |
| POE           | -5989.1        | -700.9 | 51.0                           | 73.1 |
| DIR           | -6282.0        | -700.9 | 51.0                           | 73.1 |
| STBTEST       | -6574.9        | -700.9 | 51.0                           | 73.1 |
| VSSL          | -6643.0        | -700.9 | 51.0                           | 73.1 |
| VSSS          | -6915.1        | -700.9 | 51.0                           | 73.1 |
| VDD           | -7129.4        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY16   | -7406.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY15   | -7678.3        | -700.9 | 51.0                           | 73.1 |

**Table 9. Pad placement and bump dimensions (in microns) (continued)**

| Lead pad name | Pad placements |        | Bump dimensions <sup>(1)</sup> |      |
|---------------|----------------|--------|--------------------------------|------|
|               | X              | Y      | X                              | Y    |
| VDD_DUMMY14   | -7950.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY13   | -8222.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY12   | -8494.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY11   | -8766.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY10   | -9038.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY9    | -9310.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY8    | -9582.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY7    | -9854.3        | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY6    | -10398.2       | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY5    | -10942.2       | -700.9 | 51.0                           | 73.1 |
| VDD_DUMMY4    | -11142.6       | -666.9 | 73.1                           | 51.0 |
| VDD_DUMMY3    | -11142.6       | -598.9 | 73.1                           | 51.0 |
| VDD_DUMMY2    | -11142.6       | -496.9 | 73.1                           | 51.0 |
| VDD_DUMMY1    | -11142.6       | -428.9 | 73.1                           | 51.0 |
| VDD           | -11142.6       | -328.9 | 73.1                           | 51.0 |
| VSSS          | -11142.6       | -107.5 | 73.1                           | 51.0 |
| VSSL          | -11142.6       | 164.7  | 73.1                           | 51.0 |
| MVDD          | -11142.6       | 267.5  | 73.1                           | 51.0 |
| MVDD          | -11142.6       | 335.5  | 73.1                           | 51.0 |
| HVDD          | -11142.6       | 437.5  | 73.1                           | 51.0 |
| HVDD          | -11142.6       | 505.5  | 73.1                           | 51.0 |
| VSSP          | -11142.6       | 607.5  | 73.1                           | 51.0 |
| VSSP          | -11142.6       | 675.5  | 73.1                           | 51.0 |

1. Tolerance: +/- 3µm

## 12 Ordering information

**Table 10. Order codes**

| Part numbers | Description                           |
|--------------|---------------------------------------|
| STV7733/BMP  | Tested and usawn bump wafer (u = die) |
| STV7733/WPB3 | Gold bumped dice                      |

## 13 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 29-May-2007 | 1        | Initial release |

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