

**1200-Output Channel  
TFT LCD Source Driver with TCON**

**Specification**  
**Preliminary**

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## 1. Introduction

The ILI6128B is a 1200-channel output source driver with TTL interface timing controller (TCON). The ILI6128B supports dual-gate mode to extend the source channel and expand the available options of resolution applications.

The interface uses a digital 24-bit parallel RGB input format. The TCON generates the 800x480 and 800x600 resolutions that provide horizontal and vertical control timing to the source driver and gate driver. It uses the dithering technique applied the source driver with 6-bit DAC to support 8-bit resolution and 256 gray scales. Operating parameters can be set via pin control for all features. The output circuit of this source driver incorporates an operational amplifier with low power dissipation, and supports a wide voltage supply range and small output deviation.

The ILI6128B can be configured using dual-gate operation mode for reducing the amount of FPC and lowering cost. A wide range of supply voltages and numerous pin control features makes dual-gate mode suitable for various applications.

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## 2. Features

### ◆ TCON

- Supports display resolutions: 800x480 and 800x600
- Supports digital 24-bit parallel RGB input mode
- Supports configuration of CABC block with 3-line SPI
- Supports hardware pins control CABC function mode
- Source output with 8-bit resolution for 256 gray scales ( 2-bit dithering )
- Supports Dual-gate mode
- Supports Dual Gate Z scan inversion
- Maximum Operation frequency: 50 MHz
- Built-in internal 10/14 set gamma
- Supports stand-by mode for reduced power consumption
- Logic operation voltage level 2.7V to 3.6V
- Supports LED backlight enable control signal with CABC function ( CABC\_PWM )
- Normally white/black LCD selection ( Controlled by REV pin )
- Dual-gate 1+2Dot with inversion
- Supports BIST and Mute function
- Supports stripe color filter type

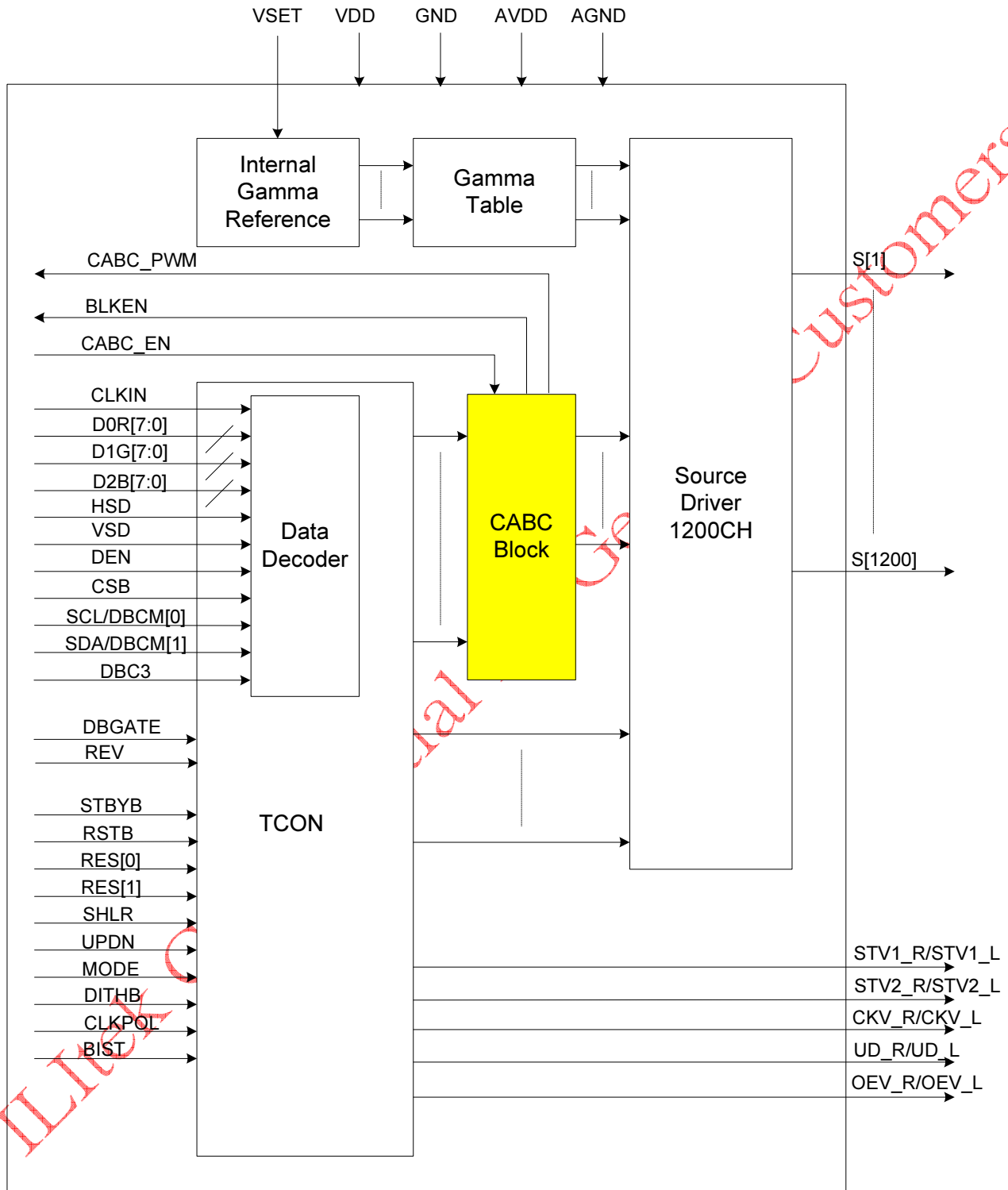
### ◆ Source Driver

- 1200 channels output source driver for TFT LCD panel
- Output dynamic range: 0.1V ~ AVDD-0.1V
- Voltage deviation of outputs:  $\pm 20\text{mV}$
- Power for source driver voltage ( AVDD ): 8.0V ~ 13.5V

### ◆ Others

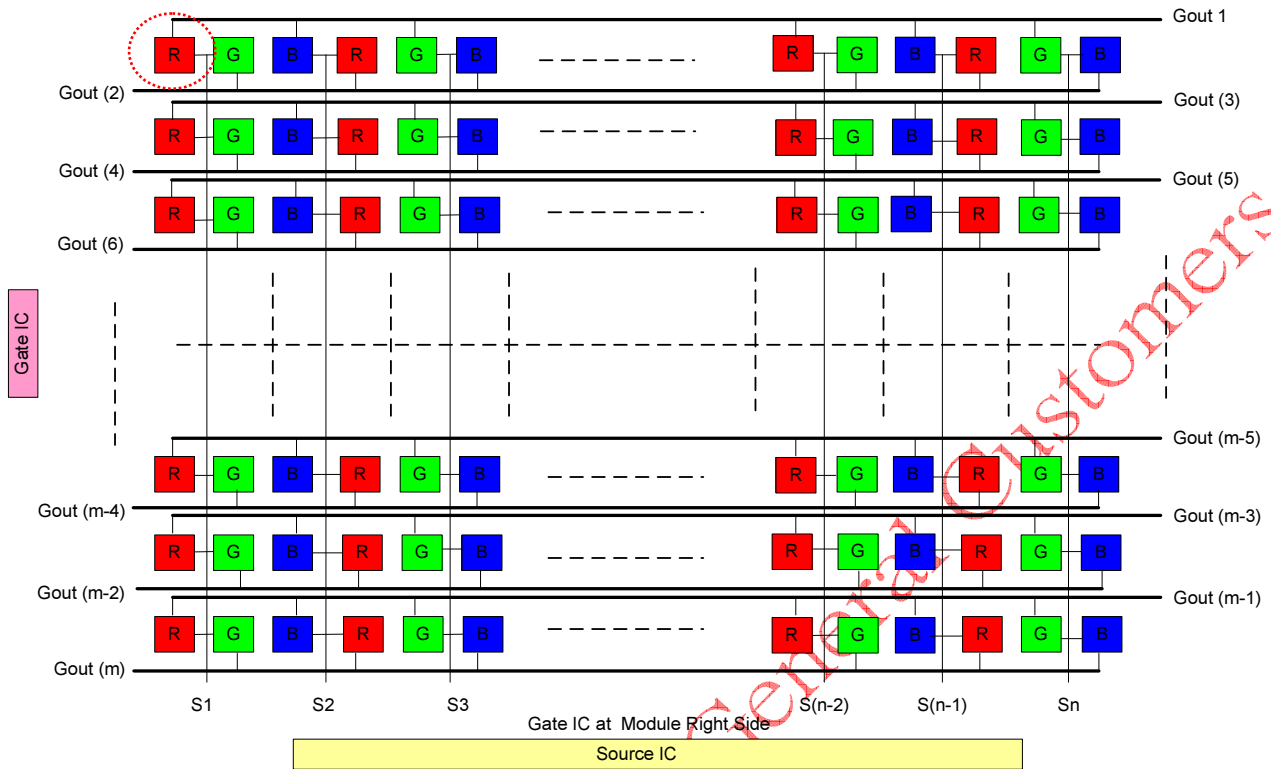
- COG package
- Supports CABC ( Content Adaptive Brightness Control ) function

### 3. Block Diagram



## 4. Application Diagram

### Case1: Gate IC at Panel Left Side

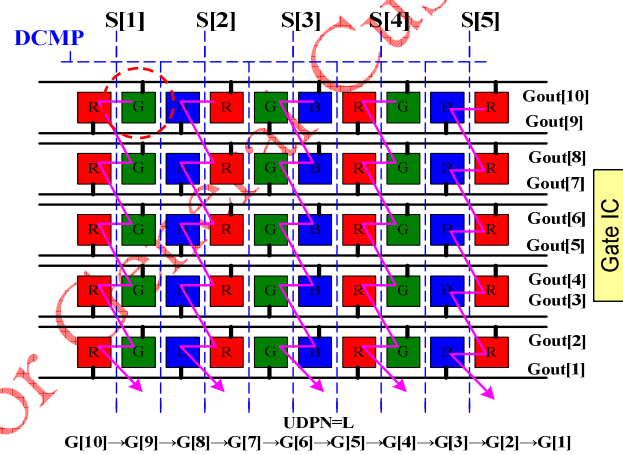
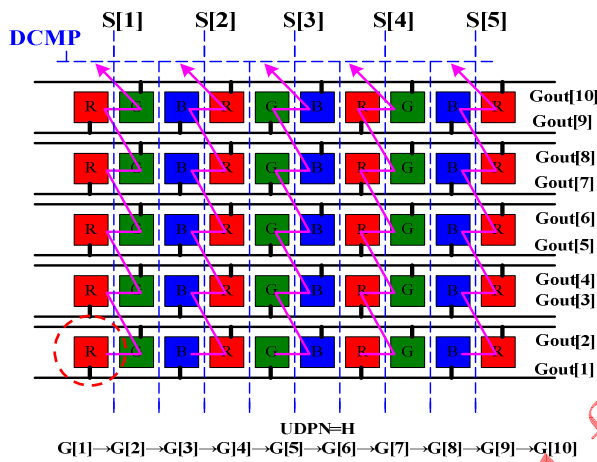
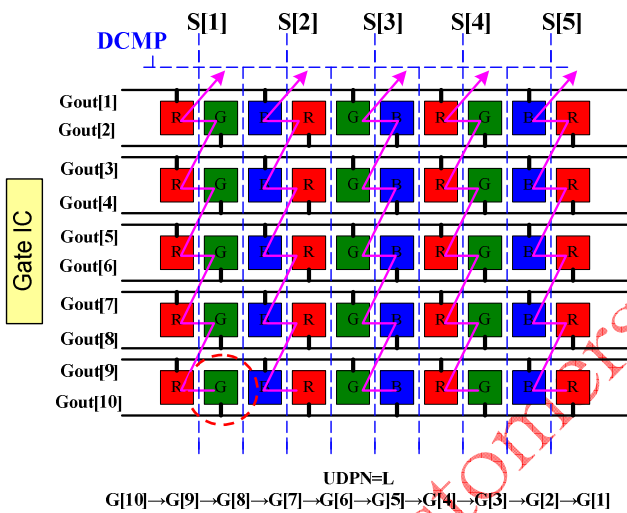
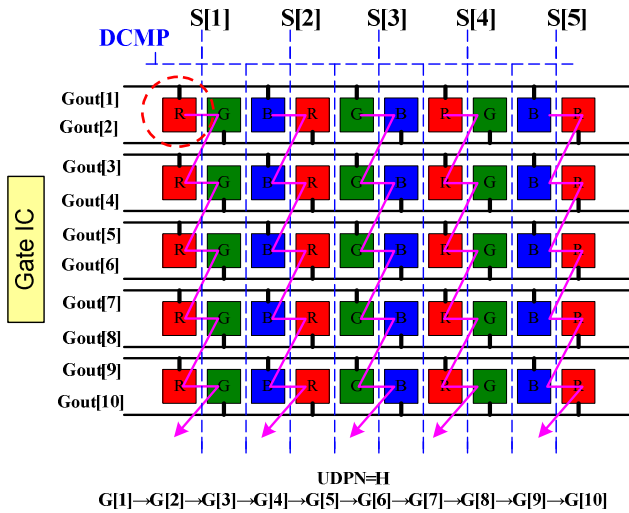


### Case2: Gate IC at Panel Right Side

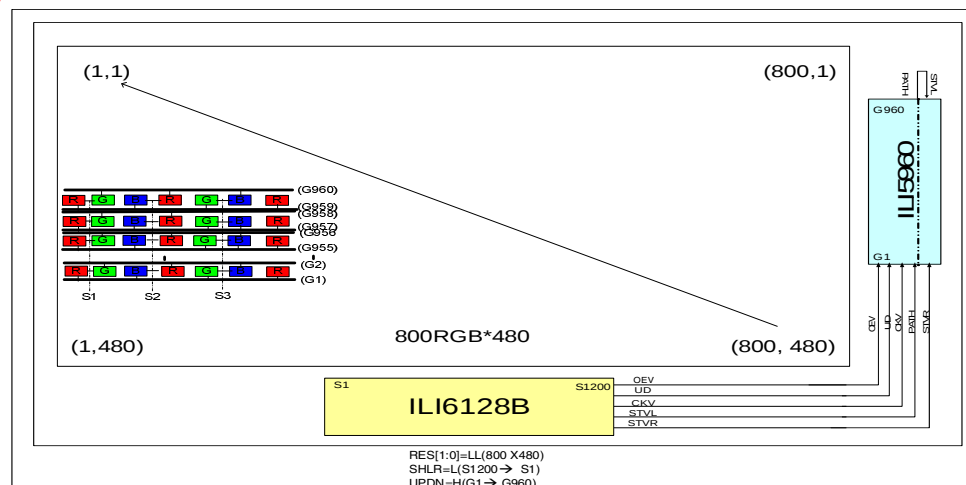
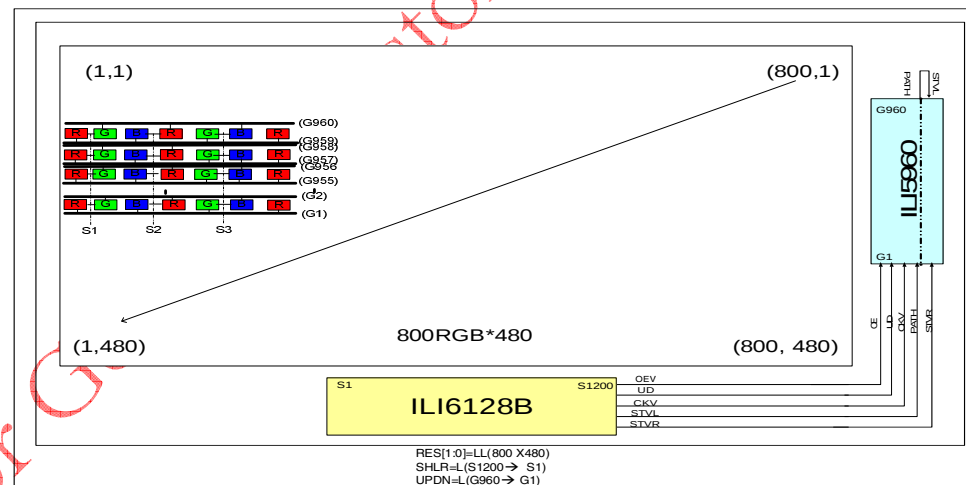


Note:

1. Gout1~Gount m → Gate IC out channel
2. S1~Sn → Source IC out channel

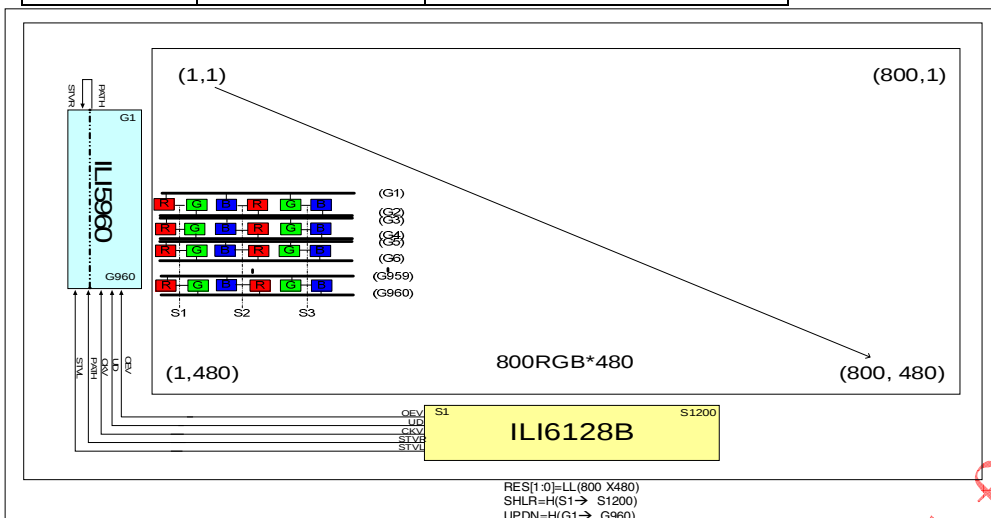


| UPDN | Scan Direction | Color Filter Mapping |
|------|----------------|----------------------|
| L    | G960→G001      | G960→ <b>G</b>       |
| H    | G001→G960      | G001→ <b>R</b>       |

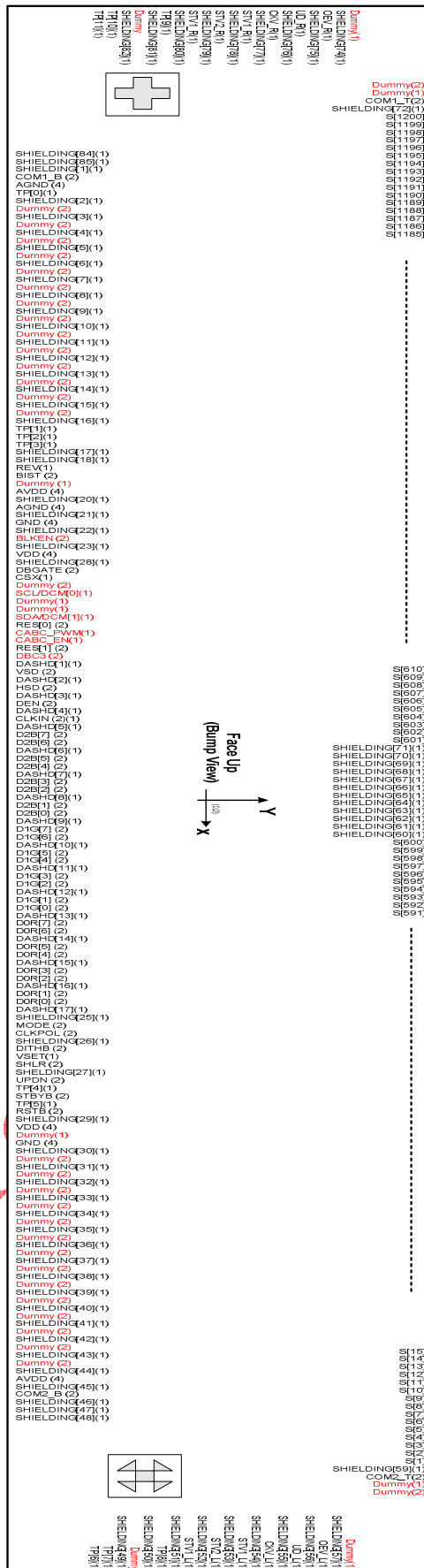


800(RGB) x 480 (Gate driver on left side)

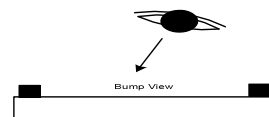
| UPDN | Scan Direction | Color Filter Mapping |
|------|----------------|----------------------|
| H    | G001→G960      | G001→ <b>R</b>       |
| L    | G960→G001      | G960→ <b>G</b>       |



## 5. Pad Sequence (Bump Side)



General Customers



## 6. Pin Descriptions

| Pin Name                         | I/O | Descriptions                                                                                                                                                                                                                                  |
|----------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLKIN                            | I   | Clock for input data. Data latched at rising or falling edge of this signal. Default is falling edge.<br><b>Note: Normal pull low</b>                                                                                                         |
| D0R[7:0]<br>D1G[7:0]<br>D2B[7:0] | I   | Digital data input. Dx0 is LSB and Dx7 is MSB.<br>D0[7:0] = R[7:0] data; D1[7:0] = G[7:0] data; D2[7:0]=B[7:0] data<br>When 18-bit RGB interface (disable dithering function), please use Dx[7:2] as 6-bit input and connect Dx[1:0] to DGND. |
| HSD                              | I   | Horizontal sync input in digital parallel RGB. Default signal is negative polarity.<br><b>Note: Normal pull high</b>                                                                                                                          |
| VSD                              | I   | Vertical sync input in digital parallel RGB. Default signal is negative polarity.<br><b>Note: Normal pull high</b>                                                                                                                            |
| DEN                              | I   | Input data enable control. When DE mode, active High to enable data input.<br><b>Note: Normal pull low</b>                                                                                                                                    |
| MODE                             | I   | DE or SYNC mode select:<br>MODE="L": For SYNC timing mode<br>MODE="H": For DE timing mode<br><b>Note: Normal pull high</b>                                                                                                                    |
| VSET                             | I   | Gamma Voltage input selection:<br>VSET="L": For 10-set gamma voltage<br>VSET="H": For 14 set gamma voltage<br><b>Note: Normal pull low</b>                                                                                                    |
| CSB                              | I   | SPI function chip select signal:<br>CSB="L": Enable SPI function<br>CSB="H": Disable SPI function<br><b>Fix to the VDD level when not in use.</b><br><b>Note: Normal pull high</b>                                                            |
| SCL/DBCM[0]                      | I   | Multi-Function Selection:<br>DBC3="H": For SPI "SCL" function<br>DBC3="L": For CABC hardware pin control DBCM[0] function<br><b>Note: Normal pull high and fix to the VDD level when not in use.</b>                                          |
| SDA/DBCM[1]                      | I/O | Multi-Function Selection:<br>DBC3="H": For SPI "SDA" function<br>DBC3="L": For CABC hardware pin control DBCM[1] function<br><b>Note: Normal pull high and fix to the VDD level when not in use.</b>                                          |
| DBC3                             | I   | DBC3-wire selection pin:<br>DBC3="L": CABC function control by hardware<br>DBC3="H": CABC function control by SPI interface<br><b>Note: Normal pull high</b>                                                                                  |
| RSTB                             | I   | Hardware global reset and low active:<br>RSTB="L": Enter Reset mode<br>RSTB="H": Normal operation<br><br><b>Note: Normal pull high</b>                     |
| DITHB                            | I   | Dithering function enable control:<br>DITHB="L": Enable internal dithering function<br>DITHB="H": Disable internal dithering function<br><b>Note: Normal pull high</b>                                                                        |

| Pin Name         | I/O        | Descriptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
|------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------|-----|--|--|--|--|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|
| CLKPOL           | I          | Input clock edge selection:<br>CLKPOL="L": Latch data at CLKIN falling edge<br>CLKPOL="H": Latch data at CLKIN rising edge<br><b>Note: Normal pull low</b>                                                                                                                                                                                                                                                                                                                                         |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| RES[1:0]         | I          | Display resolution selection.<br>RES[1:0]="00", for 800(RGB)x480 display resolution.<br>RES[1:0]="01", for 800(RGB)x600 display resolution.<br><b>Note: Normal pull "LL"</b>                                                                                                                                                                                                                                                                                                                       |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| DBGATE           | I          | Dual gate function enables control:<br>DBGATE="L": Disable dual gate function<br>DBGATE="H": Enable dual gate function<br><b>Note: Normal pull low</b>                                                                                                                                                                                                                                                                                                                                             |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| STBYB            | I          | Standby mode control:<br>STBYB="L": Enter standby mode for power saving<br>Timing controller and source driver will turn off and all outputs are Hi-Z.<br>STBYB="H": Normal operation.<br><b>Note: Normal pull high</b>                                                                                                                                                                                                                                                                            |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| SHLR             | I          | Source shift direction control.<br>SHLR="L": Shift direction is "S[1200] → S[1199] → S[1198] → ... S[3] → S[2] → S[1]"<br>SHLR="H": Shift direction is "S[1] → S[2] → S[3] → ... → S[1198] → S[1199] → S[1200]"<br><b>Note: Normal pull high</b>                                                                                                                                                                                                                                                   |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| UPDN             | I          | Gate scan direction control:<br>UPDN="L": STV2 outputs the vertical start pulse and UD pin outputs "L" to Gate driver<br>UPDN="H": STV1 outputs the vertical start pulse and UD pin outputs "H" to Gate driver<br><b>Note: Normal pull low</b>                                                                                                                                                                                                                                                     |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| BIST             | I          | Normal operation and BIST pattern select:<br>BIST="L": Normal operation<br>BIST="H": BIST function disable (DCLK input is not needed)<br>CABC_PWM & BLKEN signal keep at "H" VDD level.<br><b>Note: Normal pull low</b>                                                                                                                                                                                                                                                                            |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| CABC_EN          | I          | CABC Function Enable Control:<br>CABC_EN="L": CABC_PWM pin is used to control external backlight controller<br>The CABC_PWM signal is the same as BLKEN pin.<br>CABC_EN="H": CABC_PWM pin signal will refer to gray scale content of display image to output a pulse to driver backlight controller.<br><b>Note: Normal pull low</b>                                                                                                                                                               |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| CABC_PWM         | O          | Dimming brightness output for external backlight controller:<br>CABC_PWM="L": Turn off external backlight controller<br>CABC_PWM="H": Turn on external backlight controller                                                                                                                                                                                                                                                                                                                        |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| BLKEN            | O          | The backlight control signal for external backlight controller:<br>BLKEN="L": Turn off the external backlight controller<br>BLKEN="H": Turn on the external backlight controller<br><b>Note: Keep Open when not in use.</b>                                                                                                                                                                                                                                                                        |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| REV              | I          | Data invert or not control:<br>REV="L": keep input data ( For normally white LCD cell )<br>REV="H": Invert input data ( For normally black LCD cell ) <table><tr><th>REV</th><th colspan="5">Input Data</th></tr><tr><th></th><th>00H</th><th>10H</th><th>20H</th><th>30H</th><th>3FH</th></tr><tr><td>H</td><td>3FH</td><td>2FH</td><td>1FH</td><td>0FH</td><td>00H</td></tr><tr><td>L</td><td>00H</td><td>10H</td><td>20H</td><td>30H</td><td>3FH</td></tr></table> <b>Note: Normal pull low</b> | REV | Input Data |     |  |  |  |  | 00H | 10H | 20H | 30H | 3FH | H | 3FH | 2FH | 1FH | 0FH | 00H | L | 00H | 10H | 20H | 30H | 3FH |
| REV              | Input Data |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
|                  | 00H        | 10H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20H | 30H        | 3FH |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| H                | 3FH        | 2FH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1FH | 0FH        | 00H |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| L                | 00H        | 10H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20H | 30H        | 3FH |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| AVDD             | P          | Power supply for analog block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| AGND             | P          | Ground level for analog block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| VDD              | P          | Power supply for digital block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| GND              | P          | Ground level for digital block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| S[1] ~ S[1200]   | O          | Source driver output signals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| COM1_B<br>COM2_B | S          | Internal link together between input side and out side                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| COM1_T           | S          | Internal link together between input side and out side                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |            |     |  |  |  |  |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |

| Pin Name          | I/O | Descriptions                                                               |
|-------------------|-----|----------------------------------------------------------------------------|
| COM2_T            |     |                                                                            |
| CKV_L/<br>CKV_R   | O   | Gate Driver output control                                                 |
| STV1_L/<br>STV1_R | O   | Gate Driver output control                                                 |
| STV2_L/<br>STV2_R | O   | Gate Driver output control                                                 |
| OEV_L/<br>OEV_R   | O   | Gate Driver output control                                                 |
| UD_L/<br>UD_R     | O   | Gate Driver output control                                                 |
| STBN_L/<br>STBN_R | O   | Gate Driver output control                                                 |
| TP[0] ~ TP[11]    | T   | Test pin for ILITEK only Float these pins for normal operation.            |
| SHIELDING[1]~[85] | --  | IC shielding pads. These pins are internally connected to AGND level.      |
| DASHD             | --  | Data bus shielding pad. These pins are internally connected to DGND level. |
| Dummy             | --  | Floating pins                                                              |

Note:

I: Input, O: Output, P: Power, D: Dummy, S: Shorted line, M: Mark, PI: Power input, PO: Power output,  
 T: Testing, SH: Shielding, I / O: Input / Output, PS: Power Setting,

COM1 Pass Line Description:

| Pass Line No: | Pad Name |        |
|---------------|----------|--------|
| 1             | COM1_B   | COM1_T |
| 2             | COM2_B   | COM2_T |

T: Testing, SH: Shielding, I / O: Input / Output, PS: Power Setting, C: Capacitor pin.

**Value of Wiring Resistance to Each Pin:**

The recommended wiring resistance values are shown below. The wiring resistance values affect the current capacity of the power supply, so be sure to design using values that do not exceed those recommended.

| Pin Name | Wiring resistance value( $\Omega$ ) | Pin Name        | Wiring resistance value( $\Omega$ ) |
|----------|-------------------------------------|-----------------|-------------------------------------|
| VDD      | <25                                 | RSTB            | <1K                                 |
| AVDD     | <5                                  | BIST            | <1K                                 |
| GND      | <25                                 | REV             | <1K                                 |
| AGND     | <5                                  | CSB             | <200                                |
| D0R[7:0] | <200                                | SCL/DBCM[0]     | <200                                |
| D1G[7:0] | <200                                | SDA/DBCM[1]     | <200                                |
| D2B[7:0] | <200                                | STBYB           | <1K                                 |
| DEN      | <200                                | CKV_L / CKV_R   | < 200 & 20 pf                       |
| CLKIN    | <50                                 | STV1_L / STV1_R | < 200 & 20 pf                       |
| HSD      | <200                                | STV2_L / STV2_R | < 200 & 20 pf                       |
| VSD      | <200                                | OEVL / OEVR     | < 200 & 20 pf                       |
| MODE     | <1K                                 | UD_L / UD_R     | < 200 & 20 pf                       |
| RES[1:0] | <1K                                 | STBN_L / STBN_R | < 200 & 20 pf                       |
| DITHB    | <1K                                 | CABC_EN         | <1K                                 |
| CLKPOL   | <1K                                 | UPDN            | <1K                                 |
| CABC_PWM | <1K                                 | DBGATE          | <1K                                 |
| VSET     | <1K                                 | DBC3            | <1K                                 |
| SHLR     | <1K                                 | BLKEN           | <1K                                 |

**Source Output Status With RES[1:0] Pin Selection:**

| RES[1:0] | Resolution | Enable Channel | Disable Channel |
|----------|------------|----------------|-----------------|
| L L      | 800X480    | S[1]~S[1200]   | --              |
| L H      | 800X600    | S[1]~S[1200]   | --              |

## 7. Relationship between input data and output channels

### 1. DBGATE="H": Dual Gate Enable and Color Filter with Stripe Type. (Gate Driver IC on Panel Left Side)

(1) SHLR="H" & UPDN="H", right shift

| Output |        | S[1]          | S[2]          | S[3]          | --- | S[1198]       | S[1199]       | S[1200]       |
|--------|--------|---------------|---------------|---------------|-----|---------------|---------------|---------------|
| Order  |        | First data    |               |               | →   | Last data     |               |               |
| First  | Gout 1 | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |
| ↓      | Gout 2 | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |
|        | Gout 3 | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |
| Last   | Gout 4 | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |

(2) SHLR="L" & UPDN="H", Left shift

| Output |        | S[1]          | S[2]          | S[3]          | --- | S[1198]       | S[1199]       | S[1200]       |
|--------|--------|---------------|---------------|---------------|-----|---------------|---------------|---------------|
| Order  |        | Last data     |               |               | ←   | First data    |               |               |
| First  | Gout 1 | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |
| ↓      | Gout 2 | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |
|        | Gout 3 | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |
| Last   | Gout 4 | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |

(3) SHLR="H" & UPDN="L", right shift

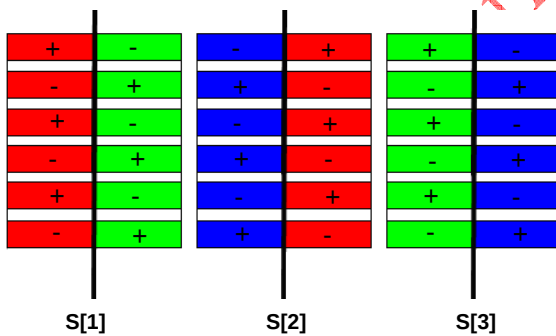
| Output |           | S[1]          | S[2]          | S[3]          | --- | S[1198]       | S[1199]       | S[1200]       |
|--------|-----------|---------------|---------------|---------------|-----|---------------|---------------|---------------|
| Order  |           | First data    |               |               | →   | Last data     |               |               |
| First  | Gout m    | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |
| ↓      | Gout(m-1) | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |
|        | Gout(m-2) | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] |
| Last   | Gout(m-3) | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] |

(4) SHLR="L" & UPDN="L", Left shift

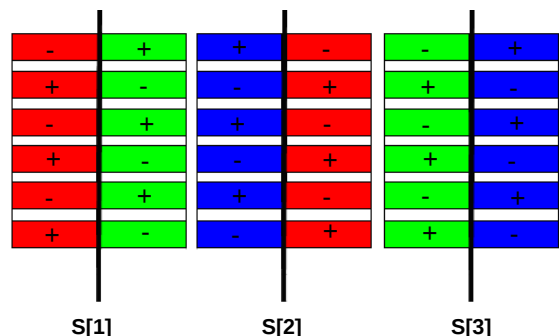
| Output |           | S[1]          | S[2]          | S[3]          | --- | S[1198]       | S[1199]       | S[1200]       |
|--------|-----------|---------------|---------------|---------------|-----|---------------|---------------|---------------|
| Order  |           | Last data     |               |               | ←   | First data    |               |               |
| First  | Gout m    | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D1G[7]~D1G[0] |
| ↓      | Gout(m-1) | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D2B[7]~D2B[0] |
|        | Gout(m-2) | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D2B[7]~D2B[0] | --- | D1G[7]~D1G[0] | D0R[7]~D0R[0] | D1G[7]~D1G[0] |
| Last   | Gout(m-3) | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D1G[7]~D1G[0] | --- | D0R[7]~D0R[0] | D2B[7]~D2B[0] | D2B[7]~D2B[0] |

#### Dot Polarity Inversion:

BGATE="H" at ual-Gate Mode with 1+2-Dot Inversion:



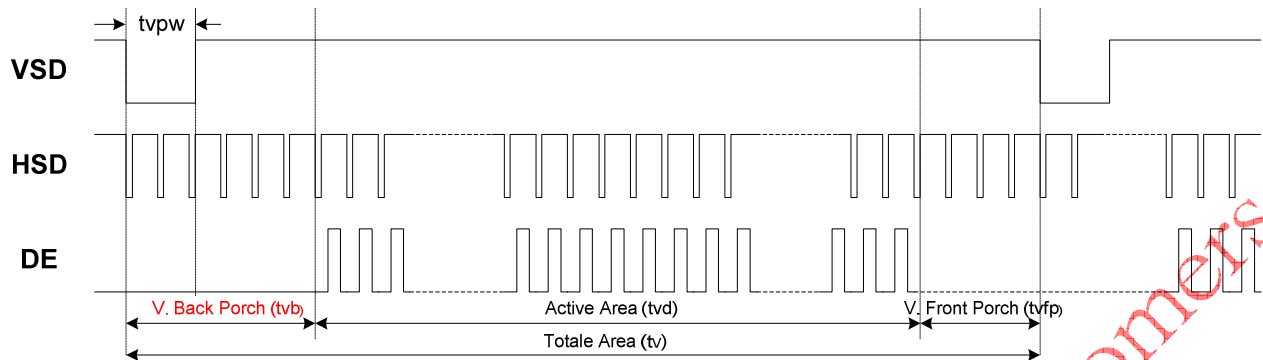
Frame N



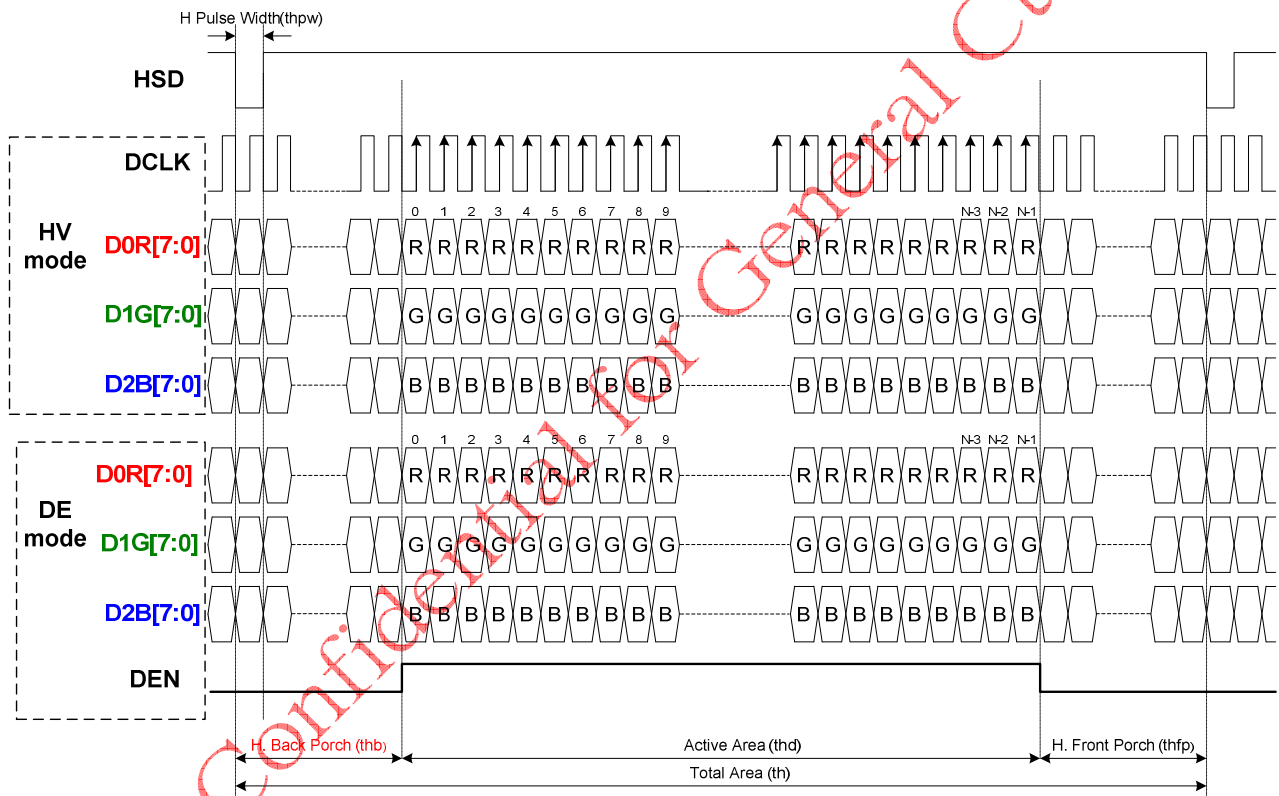
Frame N+1

## 8. Display Data Input Timing

### 8.1. Vertical Input Timing



### 8.2. Horizontal Input Timing



### 8.3. Timing Characteristic

#### A. Resolution 800X480

##### ● Horizontal timing

| Parameter                 | Symbol | Spec |      |      | Unit |
|---------------------------|--------|------|------|------|------|
|                           |        | Min. | Typ. | Max. |      |
| H-Display Area            | thd    | 800  |      |      | DCLK |
| DCLK Frequency            | fclk   | --   | 30   | 50   | MHz  |
| One Horization Period     | th     | 862  | 1056 | 1200 | DCLK |
| HS Pulse Width            | thpw   | 1    | --   | 40   | DCLK |
| HS Back Porch ( Blanking) | thb    | 46   |      |      | DCLK |
| HS Front Porch            | thfp   | 16   | 210  | 354  | DCLK |
| DE Mode Blanking          | th-thd | 85   | 256  | 400  | DCLK |

##### ● Vertical timing

| Parameter                 | Symbol | Spec |      |      | Unit |
|---------------------------|--------|------|------|------|------|
|                           |        | Min. | Typ. | Max. |      |
| V-Display Area            | tvd    | 480  |      |      | th   |
| VS period Time            | Tv     | 513  | 525  | 650  | th   |
| VS pulse width            | tvpw   | 3    | --   | 20   | th   |
| VS Back Porch ( Blanking) | tvb    | 23   |      |      | th   |
| VS Front Porch            | tvfp   | 7    | 22   | 147  | th   |
| DE Mode Blanking          | tv-tvd | 30   | 45   | 170  | th   |

#### B. Resolution 800X600

##### ● Horizontal timing

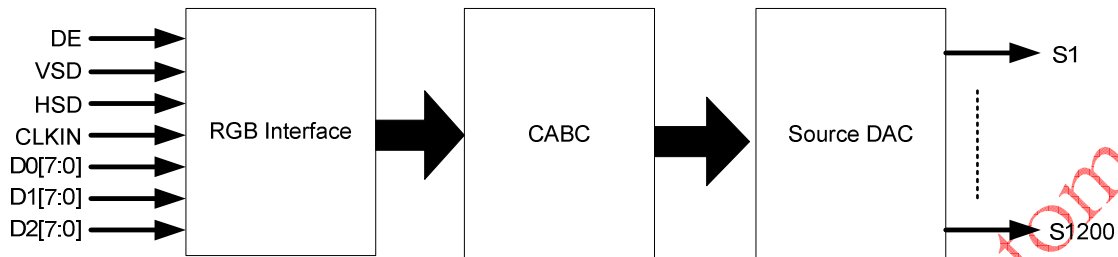
| Parameter                 | Symbol | Spec |      |      | Unit |
|---------------------------|--------|------|------|------|------|
|                           |        | Min. | Typ. | Max. |      |
| H-Display Area            | thd    | 800  |      |      | DCLK |
| DCLK Frequency            | fclk   | --   | 40   | 50   | MHz  |
| One Horization Period     | th     | 862  | 1056 | 1200 | DCLK |
| HS Pulse Width            | thpw   | 1    | --   | 40   | DCLK |
| HS Back Porch ( Blanking) | thb    | 46   |      |      | DCLK |
| HS Front Porch            | thfp   | 16   | 210  | 354  | DCLK |
| DE Mode Blanking          | th-thd | 62   | 256  | 400  | DCLK |

##### ● Vertical timing

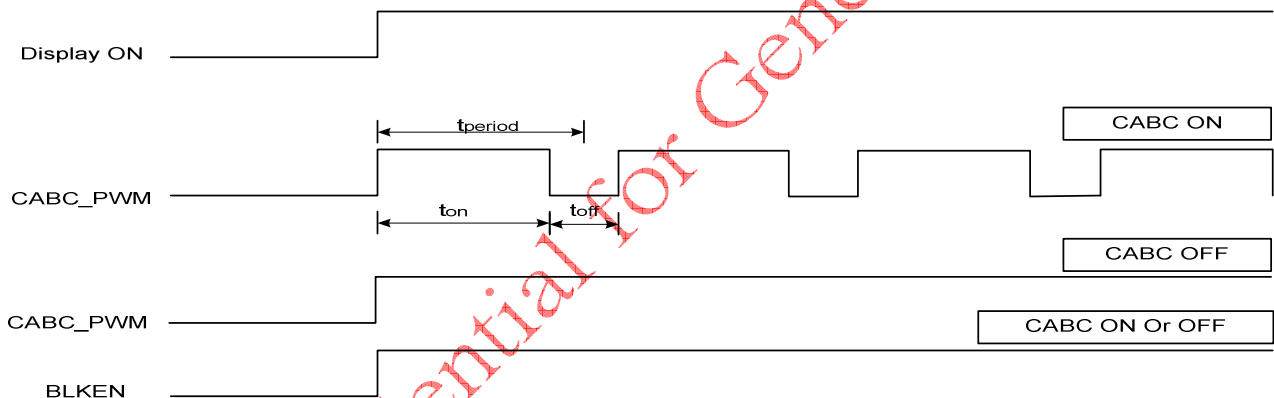
| Parameter                 | Symbol | Spec |      |      | Unit |
|---------------------------|--------|------|------|------|------|
|                           |        | Min. | Typ. | Max. |      |
| V-Display Area            | tvd    | 600  |      |      | th   |
| VS period Time            | Tv     | 624  | 635  | 700  | th   |
| VS pulse width            | tvpw   | 1    | --   | 20   | th   |
| VS Back Porch ( Blanking) | tvb    | 23   |      |      | th   |
| VS Front Porch            | tvfp   | 1    | 12   | 77   | th   |
| DE Mode Blanking          | tv-tvd | 24   | 35   | 100  | th   |

## 9. CABC (Content Adaptive Brightness Control)

ILI6128B provides a dynamic backlight control function as CABC (Content adaptive brightness control) to reduce the power consumption of the luminance source. ILI6128B will refer the gray scale content of display image to output a PWM waveform to LED driver for backlight brightness control. Content adaptation means that the content of gray sale can be increased while simultaneously lowering brightness of the backlight to achieve the same perceived brightness. The adjusted gray level scale and thus the power consumption reduction depend on the content of the image.



The CABC function can be turned ON/OFF via external pin as CABC\_EN and also can be configured by software commands via SPI mode for performance optimization. ILI6128B can calculate the backlight brightness level and send a PWM pulse to LED driver via CABC\_EN pin for backlight brightness control purpose. The figure in the following is the basic timing diagram which is applied ILI6128B to control LED driver.



### 9.1. CABC Hardware Control

| BIST | CABC_EN | DBC3 | SDA/DBC[1] | SCL/DBC[0] | Function                             |
|------|---------|------|------------|------------|--------------------------------------|
| L    | L       | X    | X          | X          | CABC Disable                         |
| L    | H       | L    | L          | H          | CABC Disable                         |
| L    | H       | L    | L          | L          | UI Mode ( User Interface Image )     |
| L    | H       | L    | H          | L          | Moving Mode ( Moving Picture Image ) |
| L    | H       | L    | H          | H          | Still Mode ( Still Picture Image )   |
| L    | H       | H    | X          | X          | CABC fucntion control by SPI         |
| H    | X       | X    | X          | X          | BIST Enable ; CABC OFF               |

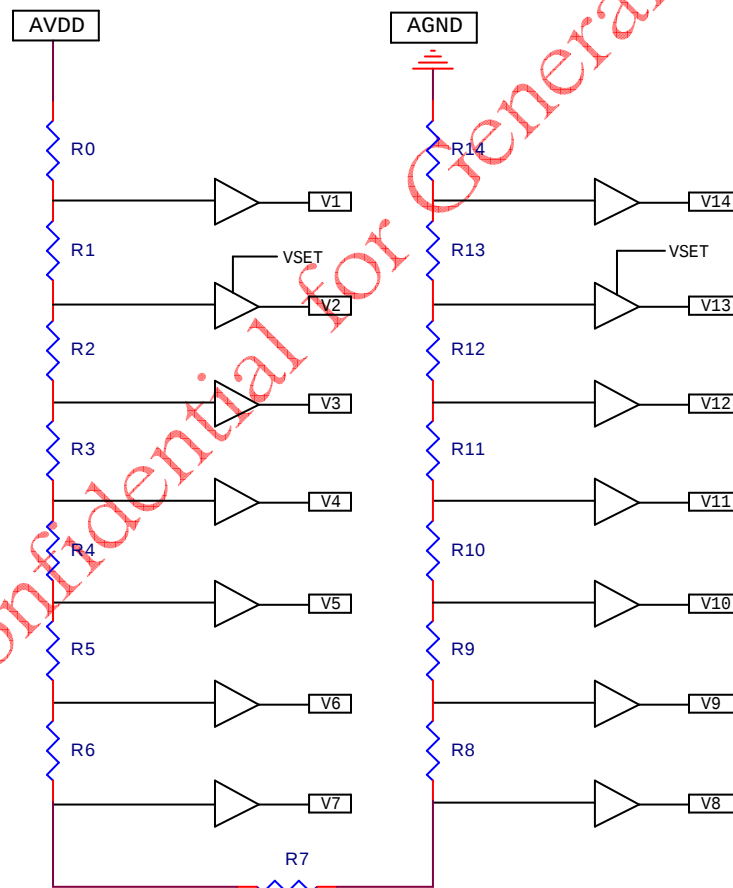
ILitek Confidential for General Customers

## 10. Relationship between gamma correction and output voltage

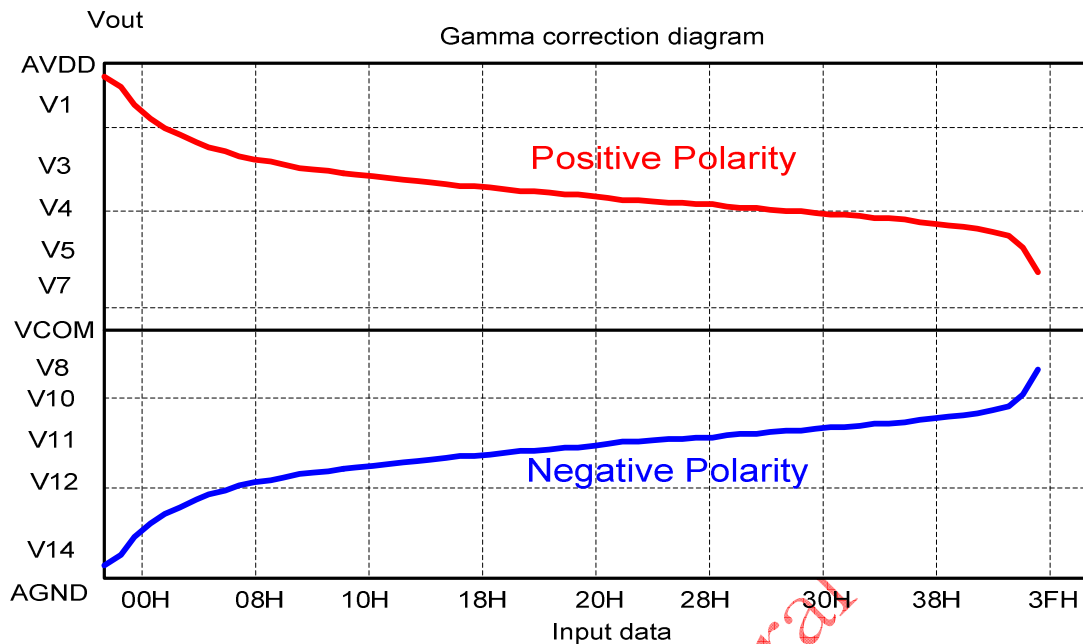
The output voltage is determined by the 6-bit digital input data, and the V1 ~ V14 gamma correction reference voltage inputs. Figure below shows the relationship between the input data and the output voltage. Refer the next page for the relative values and voltage calculation method. ILI6128B supports internal gamma reference voltage generator circuit for V1~V14 gamma correction reference voltage.

Input Data and Output Voltage Reference Table:

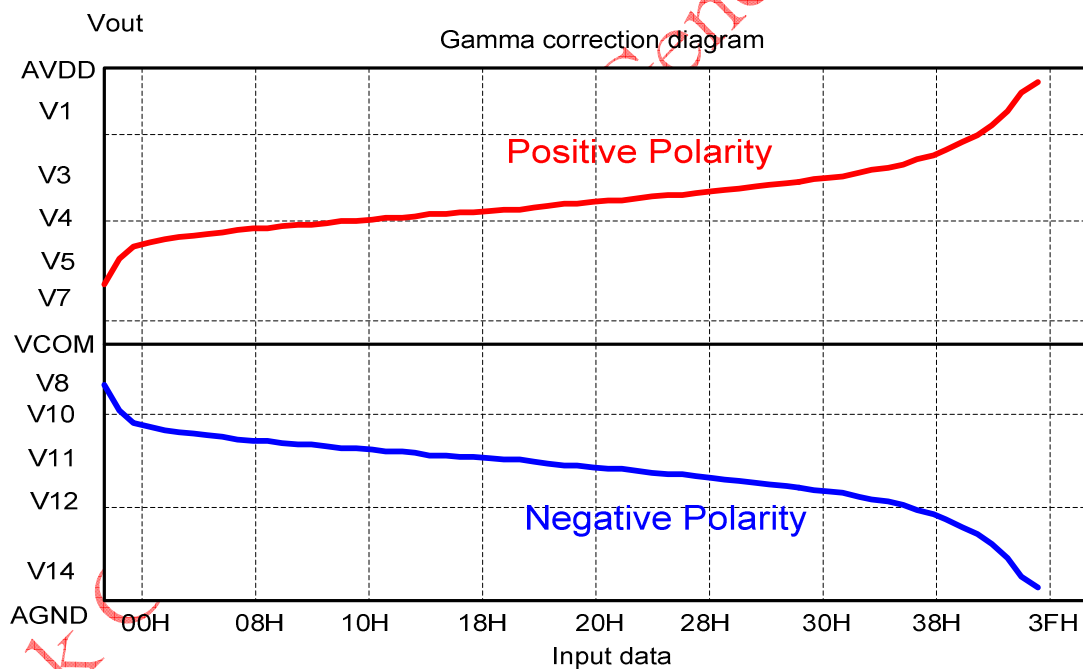
| AVDD=10.3V GAMMA SET=14 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| GAMMA                   | V1    | V2    | V3    | V4    | V5    | V6    | V7    | V8    | V9    | V10   | V11   | V12   | V13   | V14   |
| AVDD Ratio              | 0.815 | 0.808 | 0.662 | 0.621 | 0.588 | 0.535 | 0.464 | 0.407 | 0.336 | 0.284 | 0.252 | 0.211 | 0.065 | 0.059 |
| Voltae (V)              | 8.390 | 8.323 | 6.816 | 6.393 | 6.054 | 5.512 | 4.784 | 4.192 | 3.463 | 2.922 | 2.600 | 2.177 | 0.670 | 0.602 |
| AVDD=10.3V GAMMA SET=10 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| GAMMA                   | V1    | N.A   | V3    | V4    | V5    | N.A   | V7    | V8    | N.A   | V10   | V11   | V12   | N.A   | V14   |
| AVDD Ratio              | 0.815 | --    | 0.662 | 0.621 | 0.588 | --    | 0.464 | 0.407 | --    | 0.284 | 0.252 | 0.211 | --    | 0.059 |
| Voltae (V)              | 8.390 | --    | 6.816 | 6.393 | 6.054 | --    | 4.784 | 4.192 | --    | 2.922 | 2.600 | 2.177 | --    | 0.602 |



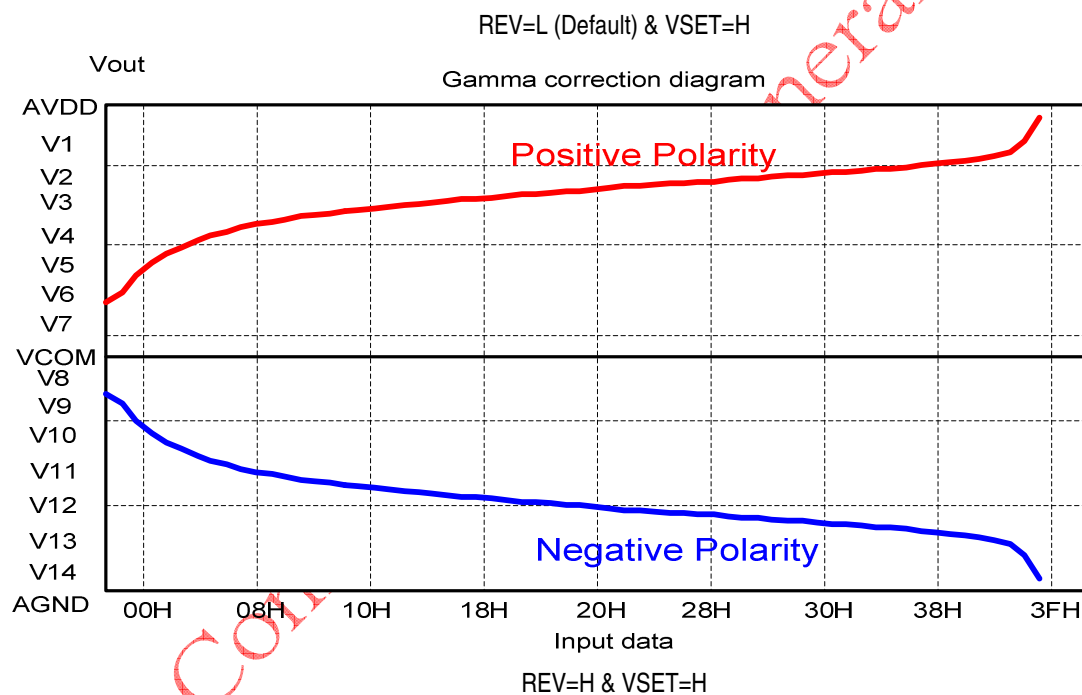
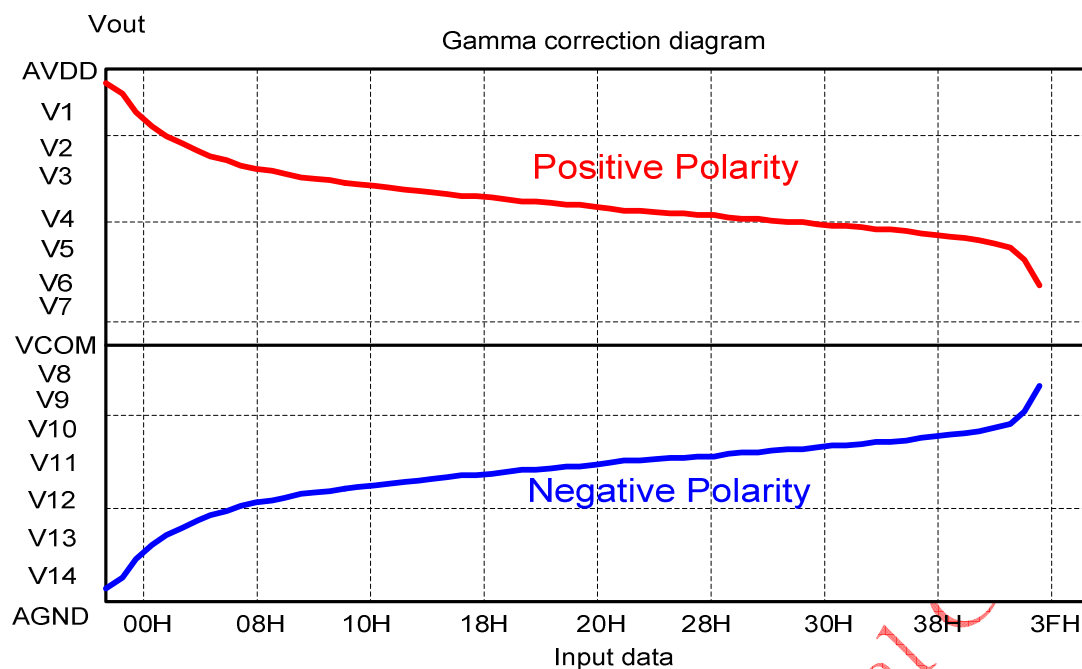
**Gamma Correction Characteristic Curve:**



REV=L (Default) & VSET=L (Default)



REV=H & VSET=L (Default)

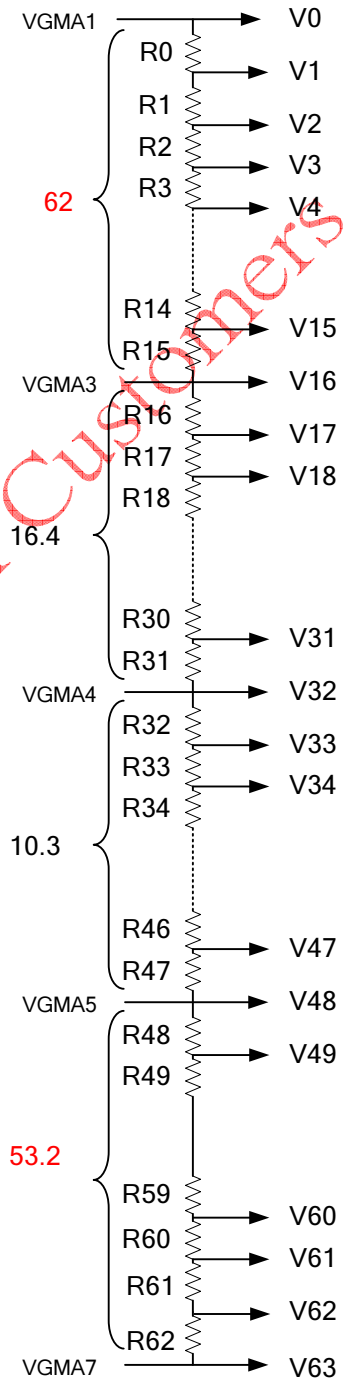


### 10.1. Gamma correction resistor ratio

Case1: VSET=L --> 10 Set Gamma

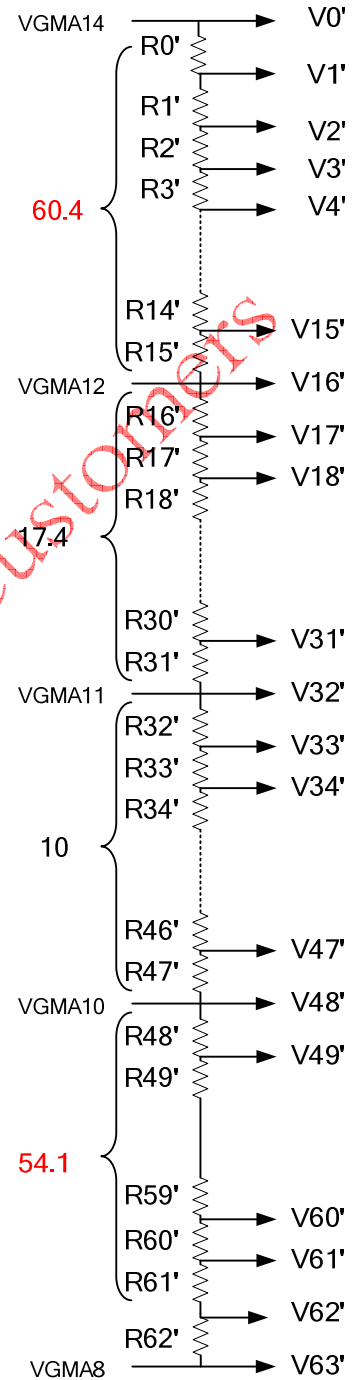
Relationship between input data and output voltage for **positive polarity**:

| Data | Output Voltage | Rn    | Ω_Ratio |
|------|----------------|-------|---------|
| 00H  | V0             | R0    | 9.6     |
| 01H  | V1             | R1    | 8.4     |
| 02H  | V2             | R2    | 7.6     |
| 03H  | V3             | R3    | 6.4     |
| 04H  | V4             | R4    | 5.2     |
| 05H  | V5             | R5    | 4.4     |
| 06H  | V6             | R6    | 3.6     |
| 07H  | V7             | R7    | 2.4     |
| 08H  | V8             | R8    | 2       |
| 09H  | V9             | R9    | 2       |
| 0AH  | V10            | R10   | 2       |
| 0BH  | V11            | R11   | 1.8     |
| 0CH  | V12            | R12   | 1.8     |
| 0DH  | V13            | R13   | 1.6     |
| 0EH  | V14            | R14   | 1.6     |
| 0FH  | V15            | R15   | 1.6     |
| 10H  | V16            | R16   | 1.6     |
| 11H  | V17            | R17   | 1.4     |
| 12H  | V18            | R18   | 1.4     |
| 13H  | V19            | R19   | 1.4     |
| 14H  | V20            | R20   | 1.2     |
| 15H  | V21            | R21   | 1.2     |
| 16H  | V22            | R22   | 1.2     |
| 17H  | V23            | R23   | 1       |
| 18H  | V24            | R24   | 1       |
| 19H  | V25            | R25   | 0.8     |
| 1AH  | V26            | R26   | 0.8     |
| 1BH  | V27            | R27   | 0.8     |
| 1CH  | V28            | R28   | 0.8     |
| 1DH  | V29            | R29   | 0.6     |
| 1EH  | V30            | R30   | 0.6     |
| 1FH  | V31            | R31   | 0.6     |
| 20H  | V32            | R32   | 0.6     |
| 21H  | V33            | R33   | 0.6     |
| 22H  | V34            | R34   | 0.6     |
| 23H  | V35            | R35   | 0.6     |
| 24H  | V36            | R36   | 0.5     |
| 25H  | V37            | R37   | 0.5     |
| 26H  | V38            | R38   | 0.5     |
| 27H  | V39            | R39   | 0.5     |
| 28H  | V40            | R40   | 0.6     |
| 29H  | V41            | R41   | 0.6     |
| 2AH  | V42            | R42   | 0.6     |
| 2BH  | V43            | R43   | 0.8     |
| 2CH  | V44            | R44   | 0.8     |
| 2DH  | V45            | R45   | 0.8     |
| 2EH  | V46            | R46   | 0.8     |
| 2FH  | V47            | R47   | 0.9     |
| 30H  | V48            | R48   | 0.9     |
| 31H  | V49            | R49   | 0.9     |
| 32H  | V50            | R50   | 0.9     |
| 33H  | V51            | R51   | 1       |
| 34H  | V52            | R52   | 1       |
| 35H  | V53            | R53   | 1       |
| 36H  | V54            | R54   | 1       |
| 37H  | V55            | R55   | 1.1     |
| 38H  | V56            | R56   | 1.2     |
| 39H  | V57            | R57   | 1.4     |
| 3AH  | V58            | R58   | 1.6     |
| 3BH  | V59            | R59   | 2       |
| 3CH  | V60            | R60   | 2.4     |
| 3DH  | V61            | R61   | 4       |
| 3EH  | V62            | R62   | 32.8    |
| 3FH  | V63            | Total | 141.9   |



Relationship between input data and output voltage for **negative polarity**:

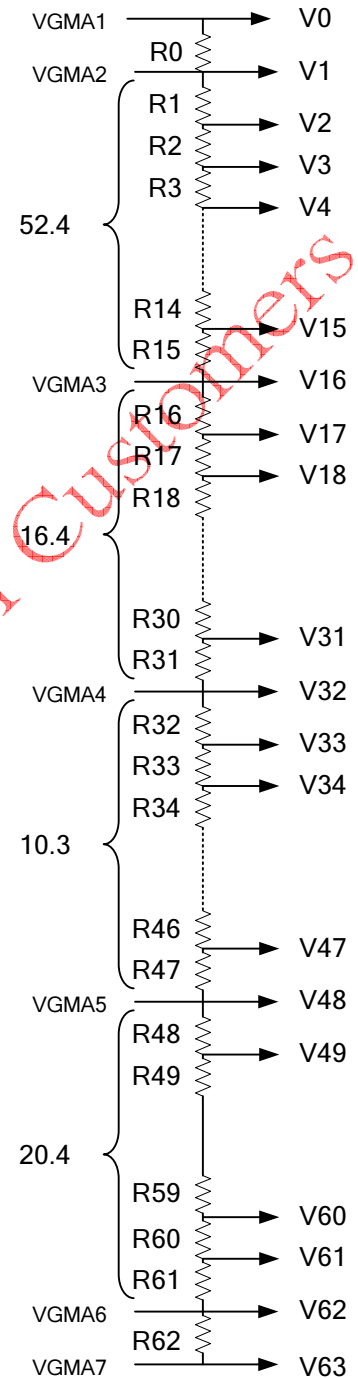
| Data |      | Output Voltage                             | Rn     | Ω_Ratio |
|------|------|--------------------------------------------|--------|---------|
| 00H  | V0'  | <b>VGMA14</b>                              | R0'    | 9.6     |
| 01H  | V1'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.6063$ | R1'    | 8.4     |
| 02H  | V2'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.6802$ | R2'    | 7.6     |
| 03H  | V3'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.7246$ | R3'    | 6.4     |
| 04H  | V4'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.7616$ | R4'    | 5.2     |
| 05H  | V5'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.7911$ | R5'    | 4.4     |
| 06H  | V6'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.8170$ | R6'    | 3.6     |
| 07H  | V7'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.8392$ | R7'    | 2.4     |
| 08H  | V8'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.8595$ | R8'    | 2       |
| 09H  | V9'  | $VGMA14 + (VGMA12 - VGMA14) \times 0.8780$ | R9'    | 2       |
| 0AH  | V10' | $VGMA14 + (VGMA12 - VGMA14) \times 0.8965$ | R10'   | 2       |
| 0BH  | V11' | $VGMA14 + (VGMA12 - VGMA14) \times 0.9150$ | R11'   | 1.8     |
| 0CH  | V12' | $VGMA14 + (VGMA12 - VGMA14) \times 0.9335$ | R12'   | 1.8     |
| 0DH  | V13' | $VGMA14 + (VGMA12 - VGMA14) \times 0.9501$ | R13'   | 1.6     |
| 0EH  | V14' | $VGMA14 + (VGMA12 - VGMA14) \times 0.9667$ | R14'   | 1.6     |
| 0FH  | V15' | $VGMA14 + (VGMA12 - VGMA14) \times 0.9834$ | R15'   | 1.6     |
| 10H  | V16' | <b>VGMA12</b>                              | R16'   | 1.6     |
| 11H  | V17' | $VGMA12 + (VGMA11 - VGMA12) \times 0.0800$ | R17'   | 1.4     |
| 12H  | V18' | $VGMA12 + (VGMA11 - VGMA12) \times 0.1600$ | R18'   | 1.4     |
| 13H  | V19' | $VGMA12 + (VGMA11 - VGMA12) \times 0.2400$ | R19'   | 1.4     |
| 14H  | V20' | $VGMA12 + (VGMA11 - VGMA12) \times 0.3200$ | R20'   | 1.2     |
| 15H  | V21' | $VGMA12 + (VGMA11 - VGMA12) \times 0.3800$ | R21'   | 1.2     |
| 16H  | V22' | $VGMA12 + (VGMA11 - VGMA12) \times 0.4400$ | R22'   | 1.2     |
| 17H  | V23' | $VGMA12 + (VGMA11 - VGMA12) \times 0.5000$ | R23'   | 1       |
| 18H  | V24' | $VGMA12 + (VGMA11 - VGMA12) \times 0.5500$ | R24'   | 1       |
| 19H  | V25' | $VGMA12 + (VGMA11 - VGMA12) \times 0.6000$ | R25'   | 0.8     |
| 1AH  | V26' | $VGMA12 + (VGMA11 - VGMA12) \times 0.6500$ | R26'   | 0.8     |
| 1BH  | V27' | $VGMA12 + (VGMA11 - VGMA12) \times 0.7000$ | R27'   | 0.8     |
| 1CH  | V28' | $VGMA12 + (VGMA11 - VGMA12) \times 0.7600$ | R28'   | 0.8     |
| 1DH  | V29' | $VGMA12 + (VGMA11 - VGMA12) \times 0.8200$ | R29'   | 0.6     |
| 1EH  | V30' | $VGMA12 + (VGMA11 - VGMA12) \times 0.8800$ | R30'   | 0.6     |
| 1FH  | V31' | $VGMA12 + (VGMA11 - VGMA12) \times 0.9400$ | R31'   | 0.6     |
| 20H  | V32' | <b>VGMA11</b>                              | R32'   | 0.6     |
| 21H  | V33' | $VGMA11 + (VGMA10 - VGMA11) \times 0.0345$ | R33'   | 0.6     |
| 22H  | V34' | $VGMA11 + (VGMA10 - VGMA11) \times 0.0690$ | R34'   | 0.6     |
| 23H  | V35' | $VGMA11 + (VGMA10 - VGMA11) \times 0.1149$ | R35'   | 0.6     |
| 24H  | V36' | $VGMA11 + (VGMA10 - VGMA11) \times 0.1609$ | R36'   | 0.5     |
| 25H  | V37' | $VGMA11 + (VGMA10 - VGMA11) \times 0.2069$ | R37'   | 0.5     |
| 26H  | V38' | $VGMA11 + (VGMA10 - VGMA11) \times 0.2529$ | R38'   | 0.5     |
| 27H  | V39' | $VGMA11 + (VGMA10 - VGMA11) \times 0.3103$ | R39'   | 0.5     |
| 28H  | V40' | $VGMA11 + (VGMA10 - VGMA11) \times 0.3678$ | R40'   | 0.6     |
| 29H  | V41' | $VGMA11 + (VGMA10 - VGMA11) \times 0.4368$ | R41'   | 0.6     |
| 2AH  | V42' | $VGMA11 + (VGMA10 - VGMA11) \times 0.5057$ | R42'   | 0.6     |
| 2BH  | V43' | $VGMA11 + (VGMA10 - VGMA11) \times 0.5747$ | R43'   | 0.8     |
| 2CH  | V44' | $VGMA11 + (VGMA10 - VGMA11) \times 0.6552$ | R44'   | 0.8     |
| 2DH  | V45' | $VGMA11 + (VGMA10 - VGMA11) \times 0.7356$ | R45'   | 0.8     |
| 2EH  | V46' | $VGMA11 + (VGMA10 - VGMA11) \times 0.8161$ | R46'   | 0.8     |
| 2FH  | V47' | $VGMA11 + (VGMA10 - VGMA11) \times 0.9080$ | R47'   | 0.9     |
| 30H  | V48' | <b>VGMA10</b>                              | R48'   | 0.9     |
| 31H  | V49' | $VGMA10 + (VGMA8 - VGMA10) \times 0.0265$  | R49'   | 0.9     |
| 32H  | V50' | $VGMA10 + (VGMA8 - VGMA10) \times 0.0530$  | R50'   | 0.9     |
| 33H  | V51' | $VGMA10 + (VGMA8 - VGMA10) \times 0.0828$  | R51'   | 1       |
| 34H  | V52' | $VGMA10 + (VGMA8 - VGMA10) \times 0.1126$  | R52'   | 1       |
| 35H  | V53' | $VGMA10 + (VGMA8 - VGMA10) \times 0.1457$  | R53'   | 1       |
| 36H  | V54' | $VGMA10 + (VGMA8 - VGMA10) \times 0.1788$  | R54'   | 1       |
| 37H  | V55' | $VGMA10 + (VGMA8 - VGMA10) \times 0.2119$  | R55'   | 1.1     |
| 38H  | V56' | $VGMA10 + (VGMA8 - VGMA10) \times 0.2517$  | R56'   | 1.2     |
| 39H  | V57' | $VGMA10 + (VGMA8 - VGMA10) \times 0.3113$  | R57'   | 1.4     |
| 3AH  | V58' | $VGMA10 + (VGMA8 - VGMA10) \times 0.3841$  | R58'   | 1.6     |
| 3BH  | V59' | $VGMA10 + (VGMA8 - VGMA10) \times 0.4702$  | R59'   | 2       |
| 3CH  | V60' | $VGMA10 + (VGMA8 - VGMA10) \times 0.5762$  | R60'   | 2.4     |
| 3DH  | V61' | $VGMA10 + (VGMA8 - VGMA10) \times 0.7020$  | R61'   | 4       |
| 3EH  | V62' | $VGMA10 + (VGMA8 - VGMA10) \times 0.8411$  | R62'   | 32.8    |
| 3FH  | V63' | <b>VGMA8</b>                               | Total' | 141.9   |



Case2: VSET=H --> 14 Set Gamma

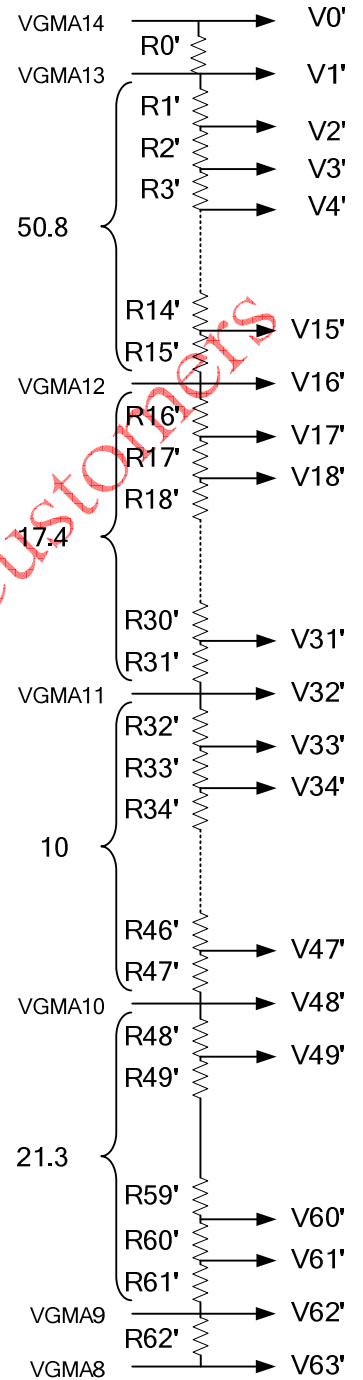
Relationship between input data and output voltage for **positive polarity**:

| Data | Output Voltage | Rn    | Ω_Ratio |
|------|----------------|-------|---------|
| 00H  | V0             | R0    | 9.6     |
| 01H  | V1             | R1    | 8.4     |
| 02H  | V2             | R2    | 7.6     |
| 03H  | V3             | R3    | 6.4     |
| 04H  | V4             | R4    | 5.2     |
| 05H  | V5             | R5    | 4.4     |
| 06H  | V6             | R6    | 3.6     |
| 07H  | V7             | R7    | 2.4     |
| 08H  | V8             | R8    | 2       |
| 09H  | V9             | R9    | 2       |
| 0AH  | V10            | R10   | 2       |
| 0BH  | V11            | R11   | 1.8     |
| 0CH  | V12            | R12   | 1.8     |
| 0DH  | V13            | R13   | 1.6     |
| 0EH  | V14            | R14   | 1.6     |
| 0FH  | V15            | R15   | 1.6     |
| 10H  | V16            | R16   | 1.6     |
| 11H  | V17            | R17   | 1.4     |
| 12H  | V18            | R18   | 1.4     |
| 13H  | V19            | R19   | 1.4     |
| 14H  | V20            | R20   | 1.2     |
| 15H  | V21            | R21   | 1.2     |
| 16H  | V22            | R22   | 1.2     |
| 17H  | V23            | R23   | 1       |
| 18H  | V24            | R24   | 1       |
| 19H  | V25            | R25   | 0.8     |
| 1AH  | V26            | R26   | 0.8     |
| 1BH  | V27            | R27   | 0.8     |
| 1CH  | V28            | R28   | 0.8     |
| 1DH  | V29            | R29   | 0.6     |
| 1EH  | V30            | R30   | 0.6     |
| 1FH  | V31            | R31   | 0.6     |
| 20H  | V32            | R32   | 0.6     |
| 21H  | V33            | R33   | 0.6     |
| 22H  | V34            | R34   | 0.6     |
| 23H  | V35            | R35   | 0.6     |
| 24H  | V36            | R36   | 0.5     |
| 25H  | V37            | R37   | 0.5     |
| 26H  | V38            | R38   | 0.5     |
| 27H  | V39            | R39   | 0.5     |
| 28H  | V40            | R40   | 0.6     |
| 29H  | V41            | R41   | 0.6     |
| 2AH  | V42            | R42   | 0.6     |
| 2BH  | V43            | R43   | 0.8     |
| 2CH  | V44            | R44   | 0.8     |
| 2DH  | V45            | R45   | 0.8     |
| 2EH  | V46            | R46   | 0.8     |
| 2FH  | V47            | R47   | 0.9     |
| 30H  | V48            | R48   | 0.9     |
| 31H  | V49            | R49   | 0.9     |
| 32H  | V50            | R50   | 0.9     |
| 33H  | V51            | R51   | 1       |
| 34H  | V52            | R52   | 1       |
| 35H  | V53            | R53   | 1       |
| 36H  | V54            | R54   | 1       |
| 37H  | V55            | R55   | 1.1     |
| 38H  | V56            | R56   | 1.2     |
| 39H  | V57            | R57   | 1.4     |
| 3AH  | V58            | R58   | 1.6     |
| 3BH  | V59            | R59   | 2       |
| 3CH  | V60            | R60   | 2.4     |
| 3DH  | V61            | R61   | 4       |
| 3EH  | V62            | R62   | 32.8    |
| 3FH  | V63            | Total | 141.9   |



Relationship between input data and output voltage for **negative polarity**:

| Data | Output Voltage                                  | Rn     | Ω_Ratio |
|------|-------------------------------------------------|--------|---------|
| 00H  | V0' <b>VGMA14</b>                               | R0'    | 9.6     |
| 01H  | V1' <b>VGMA13</b>                               | R1'    | 8.4     |
| 02H  | V2' $VGMA13 + (VGMA12 - VGMA13) \times 0.1878$  | R2'    | 7.6     |
| 03H  | V3' $VGMA13 + (VGMA12 - VGMA13) \times 0.3005$  | R3'    | 6.4     |
| 04H  | V4' $VGMA13 + (VGMA12 - VGMA13) \times 0.3944$  | R4'    | 5.2     |
| 05H  | V5' $VGMA13 + (VGMA12 - VGMA13) \times 0.4695$  | R5'    | 4.4     |
| 06H  | V6' $VGMA13 + (VGMA12 - VGMA13) \times 0.5352$  | R6'    | 3.6     |
| 07H  | V7' $VGMA13 + (VGMA12 - VGMA13) \times 0.5915$  | R7'    | 2.4     |
| 08H  | V8' $VGMA13 + (VGMA12 - VGMA13) \times 0.6432$  | R8'    | 2       |
| 09H  | V9' $VGMA13 + (VGMA12 - VGMA13) \times 0.6901$  | R9'    | 2       |
| 0AH  | V10' $VGMA13 + (VGMA12 - VGMA13) \times 0.7371$ | R10'   | 2       |
| 0BH  | V11' $VGMA13 + (VGMA12 - VGMA13) \times 0.7840$ | R11'   | 1.8     |
| 0CH  | V12' $VGMA13 + (VGMA12 - VGMA13) \times 0.8310$ | R12'   | 1.8     |
| 0DH  | V13' $VGMA13 + (VGMA12 - VGMA13) \times 0.8732$ | R13'   | 1.6     |
| 0EH  | V14' $VGMA13 + (VGMA12 - VGMA13) \times 0.9155$ | R14'   | 1.6     |
| 0FH  | V15' $VGMA13 + (VGMA12 - VGMA13) \times 0.9577$ | R15'   | 1.6     |
| 10H  | V16' <b>VGMA12</b>                              | R16'   | 1.6     |
| 11H  | V17' $VGMA12 + (VGMA11 - VGMA12) \times 0.0800$ | R17'   | 1.4     |
| 12H  | V18' $VGMA12 + (VGMA11 - VGMA12) \times 0.1600$ | R18'   | 1.4     |
| 13H  | V19' $VGMA12 + (VGMA11 - VGMA12) \times 0.2400$ | R19'   | 1.4     |
| 14H  | V20' $VGMA12 + (VGMA11 - VGMA12) \times 0.3200$ | R20'   | 1.2     |
| 15H  | V21' $VGMA12 + (VGMA11 - VGMA12) \times 0.3800$ | R21'   | 1.2     |
| 16H  | V22' $VGMA12 + (VGMA11 - VGMA12) \times 0.4400$ | R22'   | 1.2     |
| 17H  | V23' $VGMA12 + (VGMA11 - VGMA12) \times 0.5000$ | R23'   | 1       |
| 18H  | V24' $VGMA12 + (VGMA11 - VGMA12) \times 0.5500$ | R24'   | 1       |
| 19H  | V25' $VGMA12 + (VGMA11 - VGMA12) \times 0.6000$ | R25'   | 0.8     |
| 1AH  | V26' $VGMA12 + (VGMA11 - VGMA12) \times 0.6500$ | R26'   | 0.8     |
| 1BH  | V27' $VGMA12 + (VGMA11 - VGMA12) \times 0.7000$ | R27'   | 0.8     |
| 1CH  | V28' $VGMA12 + (VGMA11 - VGMA12) \times 0.7600$ | R28'   | 0.8     |
| 1DH  | V29' $VGMA12 + (VGMA11 - VGMA12) \times 0.8200$ | R29'   | 0.6     |
| 1EH  | V30' $VGMA12 + (VGMA11 - VGMA12) \times 0.8800$ | R30'   | 0.6     |
| 1FH  | V31' $VGMA12 + (VGMA11 - VGMA12) \times 0.9400$ | R31'   | 0.6     |
| 20H  | V32' <b>VGMA11</b>                              | R32'   | 0.6     |
| 21H  | V33' $VGMA11 + (VGMA10 - VGMA11) \times 0.0345$ | R33'   | 0.6     |
| 22H  | V34' $VGMA11 + (VGMA10 - VGMA11) \times 0.0690$ | R34'   | 0.6     |
| 23H  | V35' $VGMA11 + (VGMA10 - VGMA11) \times 0.1149$ | R35'   | 0.6     |
| 24H  | V36' $VGMA11 + (VGMA10 - VGMA11) \times 0.1609$ | R36'   | 0.5     |
| 25H  | V37' $VGMA11 + (VGMA10 - VGMA11) \times 0.2069$ | R37'   | 0.5     |
| 26H  | V38' $VGMA11 + (VGMA10 - VGMA11) \times 0.2529$ | R38'   | 0.5     |
| 27H  | V39' $VGMA11 + (VGMA10 - VGMA11) \times 0.3103$ | R39'   | 0.5     |
| 28H  | V40' $VGMA11 + (VGMA10 - VGMA11) \times 0.3678$ | R40'   | 0.6     |
| 29H  | V41' $VGMA11 + (VGMA10 - VGMA11) \times 0.4368$ | R41'   | 0.6     |
| 2AH  | V42' $VGMA11 + (VGMA10 - VGMA11) \times 0.5057$ | R42'   | 0.6     |
| 2BH  | V43' $VGMA11 + (VGMA10 - VGMA11) \times 0.5747$ | R43'   | 0.8     |
| 2CH  | V44' $VGMA11 + (VGMA10 - VGMA11) \times 0.6552$ | R44'   | 0.8     |
| 2DH  | V45' $VGMA11 + (VGMA10 - VGMA11) \times 0.7356$ | R45'   | 0.8     |
| 2EH  | V46' $VGMA11 + (VGMA10 - VGMA11) \times 0.8161$ | R46'   | 0.8     |
| 2FH  | V47' $VGMA11 + (VGMA10 - VGMA11) \times 0.9080$ | R47'   | 0.9     |
| 30H  | V48' <b>VGMA10</b>                              | R48'   | 0.9     |
| 31H  | V49' $VGMA10 + (VGMA9 - VGMA10) \times 0.0315$  | R49'   | 0.9     |
| 32H  | V50' $VGMA10 + (VGMA9 - VGMA10) \times 0.0630$  | R50'   | 0.9     |
| 33H  | V51' $VGMA10 + (VGMA9 - VGMA10) \times 0.0984$  | R51'   | 1       |
| 34H  | V52' $VGMA10 + (VGMA9 - VGMA10) \times 0.1339$  | R52'   | 1       |
| 35H  | V53' $VGMA10 + (VGMA9 - VGMA10) \times 0.1732$  | R53'   | 1       |
| 36H  | V54' $VGMA10 + (VGMA9 - VGMA10) \times 0.2126$  | R54'   | 1       |
| 37H  | V55' $VGMA10 + (VGMA9 - VGMA10) \times 0.2520$  | R55'   | 1.1     |
| 38H  | V56' $VGMA10 + (VGMA9 - VGMA10) \times 0.2992$  | R56'   | 1.2     |
| 39H  | V57' $VGMA10 + (VGMA9 - VGMA10) \times 0.3701$  | R57'   | 1.4     |
| 3AH  | V58' $VGMA10 + (VGMA9 - VGMA10) \times 0.4567$  | R58'   | 1.6     |
| 3BH  | V59' $VGMA10 + (VGMA9 - VGMA10) \times 0.5591$  | R59'   | 2       |
| 3CH  | V60' $VGMA10 + (VGMA9 - VGMA10) \times 0.6850$  | R60'   | 2.4     |
| 3DH  | V61' $VGMA10 + (VGMA9 - VGMA10) \times 0.8346$  | R61'   | 4       |
| 3EH  | V62' <b>VGMA9</b>                               | R62'   | 32.8    |
| 3FH  | V63' <b>VGMA8</b>                               | Total' | 141.9   |



## 11. Power ON/OFF Sequence

### 11.1. Normal mode power on/ off

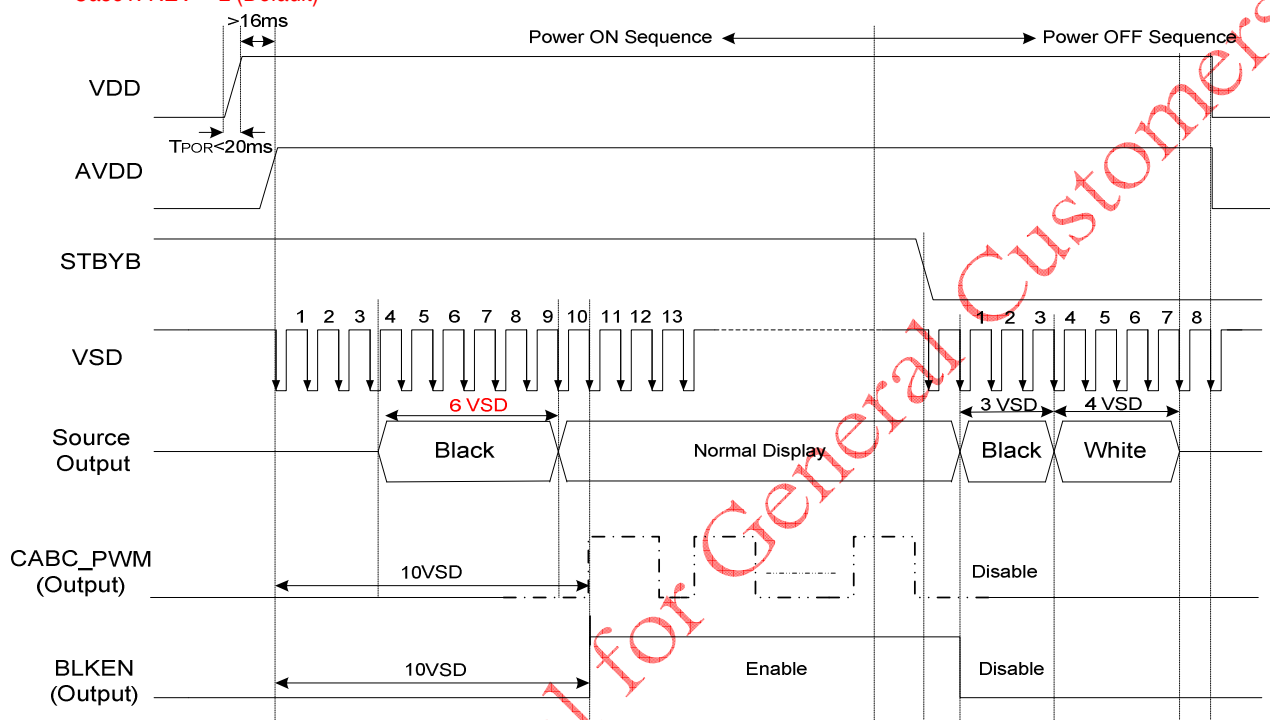
To prevent device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VDD, DGND → AVDD, AGND

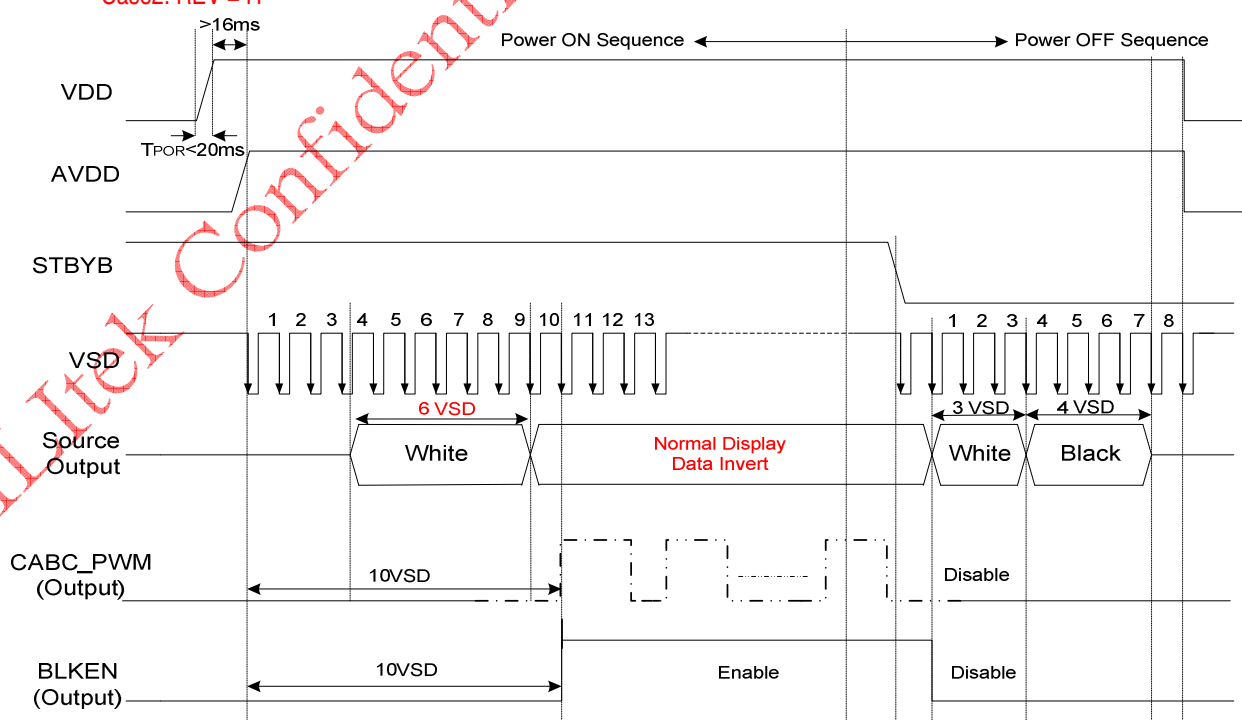
Power OFF: AVDD, AGND → VDD, DGND

In order to prevent the ILI6128B from a power ON reset fail, the rising time ( $t_{POR}$ ) of the digital power supply VDD should be maintained within given specifications. The power ON/OFF timing sequence is illustrated below:

Case1: REV = L (Default)



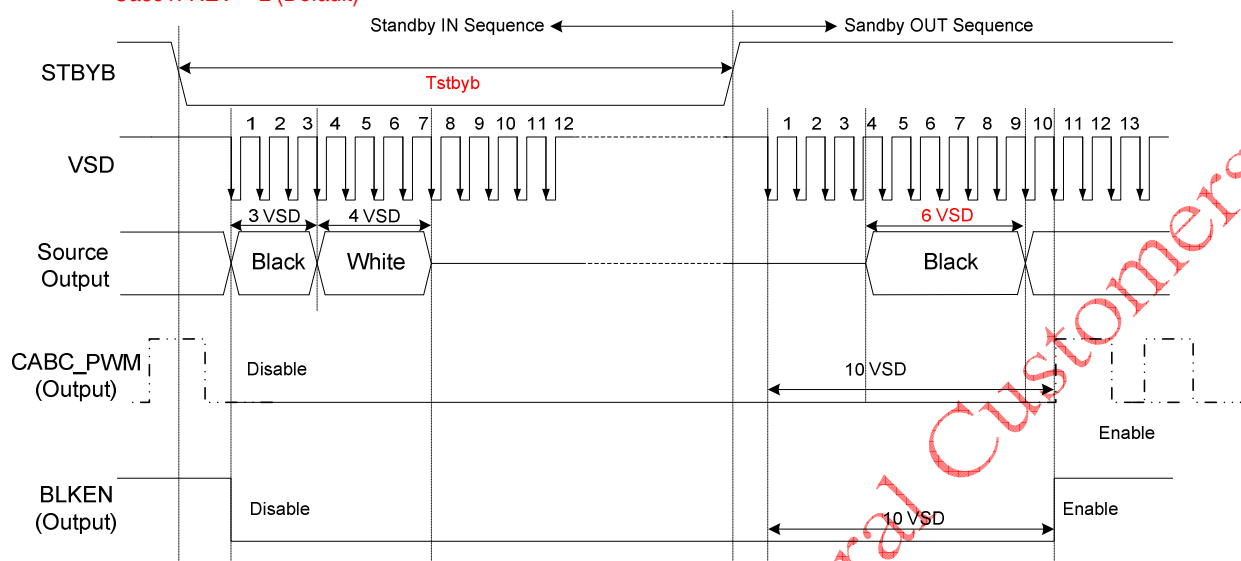
Case2: REV = H



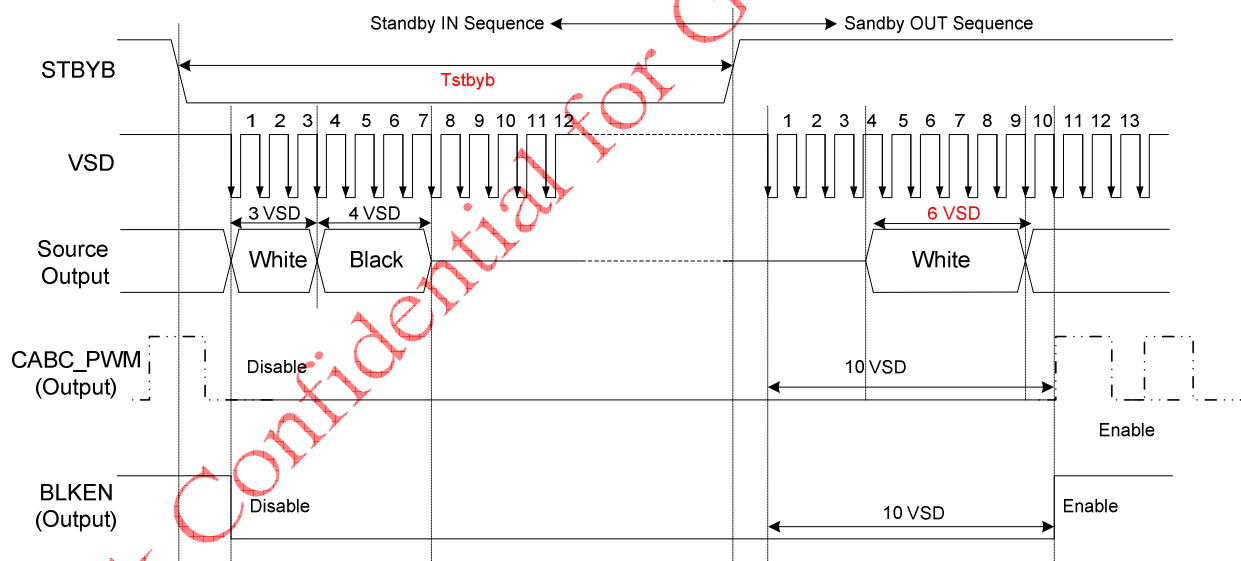
## 11.2. Standby ON/OFF Control

The ILI6128B supports Standby mode to save power consumption, the source driver will turn off and all source output channels will be Hi-Z state when the chip is in Standby mode. Standby mode is controlled via STBYB pin and the Standby ON/FF timing sequence as illustrated below:

**Case1: REV = L (Default)**

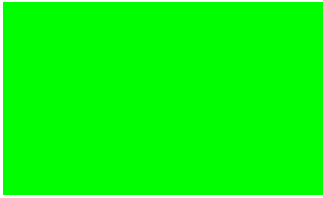
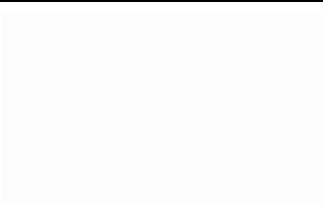
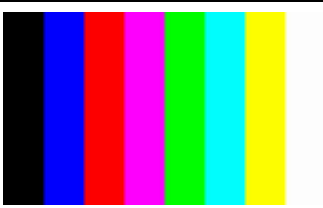
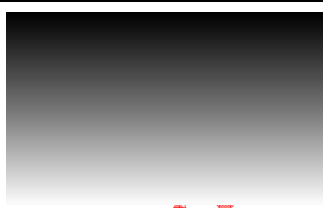
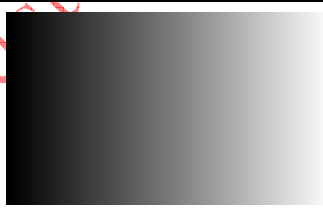


**Case2: REV = H**



## 12. The BIST Patterns for Aging Mode Test

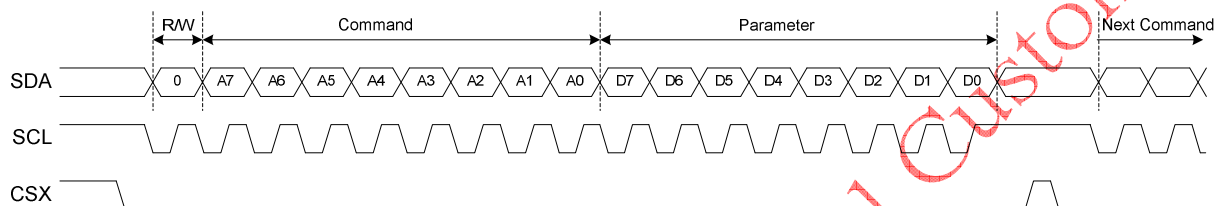
The ILI6128B supports a function to generate BIST patterns for aging mode test automatically. When the external BIST pin goes "H" level, then the ILI6128B will leave Normal operation mode and starts to generate the BIST patterns to LCD panel without an external clock signal. The BIST patterns are illustrated below:

|                                                                                     |                                                                                     |                                                                                      |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1                                                                                   | 2                                                                                   | 3                                                                                    | 4                                                                                     |
| Red                                                                                 | Green                                                                               | Blue                                                                                 | Black                                                                                 |
|    |    |    |    |
| 5                                                                                   | 6                                                                                   | 7                                                                                    | 8                                                                                     |
| White                                                                               | Vertical 8-color stripe                                                             | Horizontal 64-gray scale                                                             | Vertical 64-gray scale                                                                |
|    |    |    |    |
| 9                                                                                   | 10                                                                                  | 11                                                                                   | 12                                                                                    |
| Gray with black block                                                               | Gray with black dot                                                                 | Gray with black line                                                                 | Black with white frame                                                                |
|  |  |  |  |

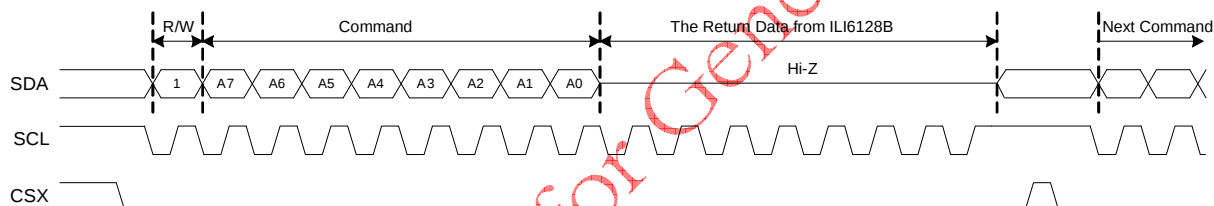
### 13. The Command Format for 3-line Serial Interface

The ILI6128B uses the 3-line serial port as the communication interface for all the commands and parameters of the CABC function. This 3-line serial communication is bi-directional controlled by the “R/W” bit in address field. Under read mode, the 3-line engine in the ILI6128B will return the data during the “Data phase”. The returned data should be latched at the rising edge of SCL by an external controller. Data in the “Hi-Z phase” is ignored by 3-line engine during write operation, and should be ignored during read operation also. During read operation, the external controller should float the SDA pin under “Hi-Z phase” and “Data phase”. Each Read/Write operation should be exactly 17 bits. To prevent incorrect setting of the internal register any write operation with more or less than 17 bits of data during a CSB Low period will be ignored by the 3-line engine. The timing diagram of read/write operation is illustrated below:

#### Write Operation



#### Read Operation



### 13.1. BIST & Mute Function

DE Mode:

| Mode        | BIST | Clock  | DE     | Function         |
|-------------|------|--------|--------|------------------|
| H<br>( DE ) | H    | Enable | Enable | BIST Function    |
|             | H    | OFF    | XXX    | BIST Function    |
|             | H    | XXX    | OFF    | BIST Function    |
|             | L    | Enable | Enable | Normal Operation |
|             | L    | OFF    | XXX    | Mute Function    |
|             | L    | XXX    | OFF    | N.A              |

SYNC Mode:

| Mode          | BIST | Clock  | VS     | HS     | Function         |
|---------------|------|--------|--------|--------|------------------|
| L<br>( SYNC ) | H    | Enable | Enable | Enable | BIST Function    |
|               | H    | OFF    | XXX    | XXX    | BIST Function    |
|               | H    | XXX    | OFF    | XXX    | BIST Function    |
|               | H    | XXX    | XXX    | OFF    | BIST Function    |
|               | L    | Enable | Enable | Enable | Normal Operation |
|               | L    | OFF    | XXX    | XXX    | Mute Function    |
|               | L    | XXX    | OFF    | XXX    | N.A              |
|               | L    | XXX    | XXX    | OFF    | N.A              |

Note:

A. XXX: Don't Care Input Signal Setting of Enable or Disable Status

B. OFF: Signal Open

### 13.2. Absolute Maximum Rating

| Parameter                    | Symbol | Spec |      |      | Unit |
|------------------------------|--------|------|------|------|------|
|                              |        | Min. | Typ. | Max. |      |
| Digital supply voltage       | VDD    | -0.5 | --   | +5.0 | V    |
| Analog supply voltage,V1~V14 | AVDD   | -0.5 | --   | +15  | V    |
| Operation temperature        | TOPR   | -20  | --   | +85  | °C   |
| Storage temperature          | TSTG   | -55  | --   | +125 | °C   |

#### \*Comments

Stresses above those listed under “Absolute Maximum Ratings” can cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposed to absolute maximum rating conditions for extended periods can affect device reliability.

### 13.3. DC Electrical Characteristics

Note: VDD=2.7 ~ 3.6V, AVDD=6.5~13.5V, GND=AGND=0V, Ta=-20~+85 °C

| Parameter                           | Symbol | Min.    | Typ.   | Max.     | Unit | Conditions                                                        |
|-------------------------------------|--------|---------|--------|----------|------|-------------------------------------------------------------------|
| Low level input voltage             | Vil    | 0       | -      | 0.3XVDD  | V    | For the digital circuit                                           |
| High level input voltage            | Vih    | 0.7XVDD | -      | VDD      | V    | For the digital circuit                                           |
| Input leakage current               | Ii     | -       | -      | ±1       | uA   | For the digital circuit                                           |
| High level output voltage           | Voh    | VDD-0.4 | -      | -        | V    | Ioh= -400mA                                                       |
| Low level output voltage            | Vol    | -       | -      | GND+0.4  | V    | Iol= +400mA                                                       |
| Pull low/high resistor              | Ri     | 50K     | 100K   | 200K     | ohm  | For the digital input pin @ VDD=3.3V                              |
| Digital Operation current           | Idd    | -       | 4      | -        | mA   | Fclk=30 MHz, , FLD=32.65KHz , VDD=2.7V                            |
| Digital Stand-by current            | Ist1   | -       | 70     | -        | ua   | Clock & all functions are stopped                                 |
| Analog Operating Current            | Idda   | -       | 6      | -        | mA   | No load, Fclk=30MHz, FLD=32.65KHz @ AVDD=13.5V,V1=12.5V, V14=0.1V |
| Analog Stand-by current             | Ist2   | -       | 150    | -        | ua   | No load, clock and all functions are stopped                      |
| Output Voltage deviation            | Vod1   | -       | ± 20   | ± 35     | mV   | Vo = AGND+0.1V ~ AGND+0.5V & Vo = AVDD-0.5V ~ AVDD-0.1V           |
| Output Voltage deviation            | Vod2   | -       | ± 15   | ± 20     | mV   | Vo = AGND+0.5V ~ AVDD-0.5V                                        |
| Output Voltage offset between Chips | Voc    | -       | -      | ± 20     | mV   | Vo = AGND+0.5V ~ AVDD-0.5V                                        |
| Dynamic Range of Output             | Vdr    | 0.1     | -      | AVDD-0.1 | V    | S1 ~ S1200                                                        |
| Sinking Current of Outputs          | IOLy   | 80      | -      | -        | uA   | S1 ~ S1200; Vo=0.1V v.s 1.0V , AVDD=13.5V                         |
| Driving Current of Outputs          | IOHy   | 80      | -      | -        | uA   | S1 ~ S1200; Vo=13.4V v.s 12.5V , AVDD=13.5V                       |
| Resistance of Gamma Table           | Rg     | 0.7*Rn  | 1.0*Rn | 1.3*Rn   | ohm  | Rn: Internal gamma resistor                                       |

### 13.4. AC Electrical Characteristics

Note: VDD=2.7V ~ 3.6V, AVDD=6.5V~13.5V, GND=AGND=0V, Ta=-20~+85 °C

| Parameter              | Symbol | Min. | Typ. | Max. | Unit | Conditions                                     |
|------------------------|--------|------|------|------|------|------------------------------------------------|
| VDD Power On Slew rate | TPOR   | -    | -    | 20   | ms   | From 0V to 90% VDD                             |
| RSTB pulse width       | Trst   | 10   | -    | -    | us   | CLKIN = 45MHz                                  |
| STBYB pulse width      | Tstbyb | 8    | -    | -    | VS   |                                                |
| CLKIN cycle time       | Tcph   | 20   | -    | -    | ns   |                                                |
| CLKIN pulse duty       | Tcwh   | 40   | 50   | 60   | %    |                                                |
| VSD setup time         | Tvst   | 8    | -    | -    | ns   |                                                |
| VSD hold time          | Tvhd   | 8    | -    | -    | ns   |                                                |
| HSD setup time         | Thst   | 8    | -    | -    | ns   |                                                |
| HSD hold time          | Thhd   | 8    | -    | -    | ns   |                                                |
| Data set-up time       | Tdsu   | 8    | -    | -    | ns   | D0R[7:0], D1G[7:0], D2B[7:0] to CLKIN          |
| Data hold time         | Tdhd   | 8    | -    | -    | ns   | D0R[7:0], D1G[7:0], D2B[7:0] to CLKIN          |
| DE setup time          | Tesu   | 8    | -    | -    | ns   |                                                |
| DE hold time           | Tehd   | 8    | -    | -    | ns   |                                                |
| Output stable time     | Tsst   | -    | -    | 6    | us   | 10% to 90% target voltage. CL=120pF, R=10K ohm |

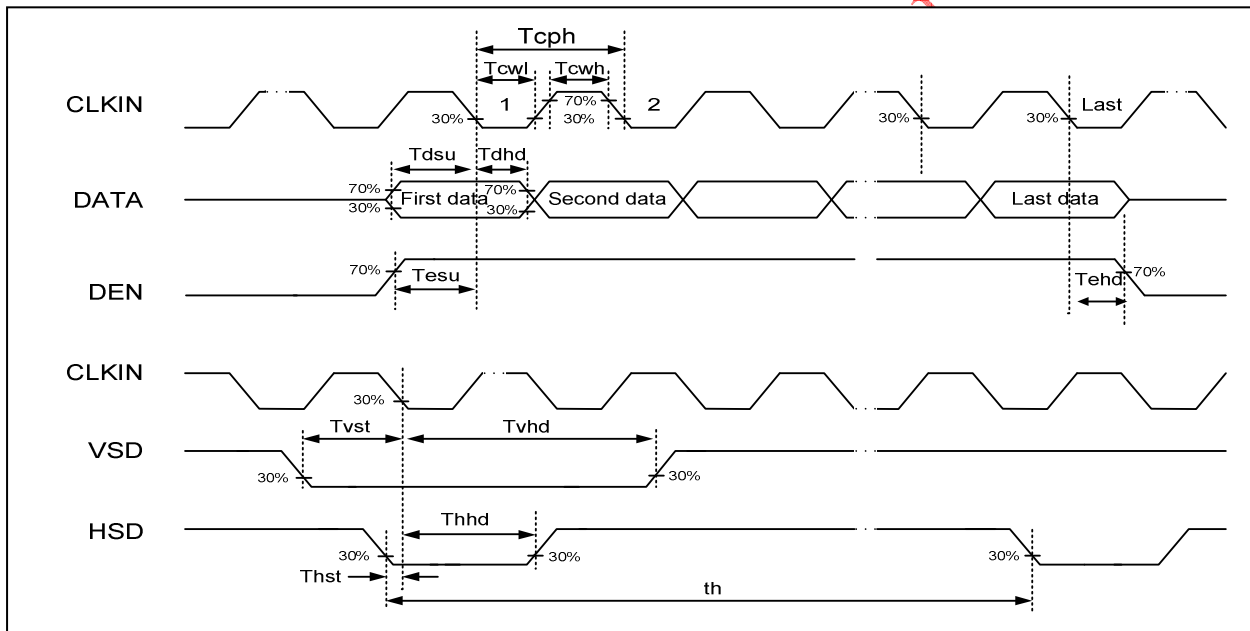
## 14. Timing

### 14.1. Parallel 24-bit RGB Mode

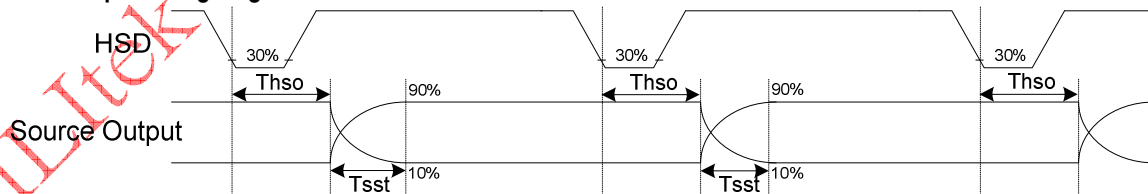
( Note:VDD=2.7V ~ 3.6V, AVDD=6.5V~13.5V, GND=AGND=0V, Ta=-20~+85°C )

| Parameter                      | Symbol | Min. | Typ. | Max. | Unit  | Conditions       |
|--------------------------------|--------|------|------|------|-------|------------------|
| CLKIN Frequency                | Fclk   | -    | 33   | 50   | MHz   | VDD = 2.7V ~3.6V |
| CLKIN Cycle Time               | Tclk   | 20   | 30   | -    | ns    |                  |
| CLKIN Pulse Duty               | Tcwh   | 40   | 50   | 60   | %     | Tclk             |
| Time from HSD to Source Output | Thso   | -    | 37   | -    | CLKIN |                  |
| Time from HSD to LD            | Thld   | -    | 20   | -    | CLKIN |                  |
| Time from HSD to STV           | Thstv  | -    | 2    | -    | CLKIN |                  |
| Time from HSD to CKV           | Thckv  | -    | 20   | -    | CLKIN |                  |
| Time from HSD to OEV           | Thoev  | -    | 4    | -    | CLKIN |                  |
| LD Pulse Width                 | Twld   | -    | 16   | -    | CLKIN |                  |
| CKV Pulse Width                | Twckv  | -    | 66   | -    | CLKIN |                  |
| OEV Pulse Width                | Twoev  | -    | 74   | -    | CLKIN |                  |

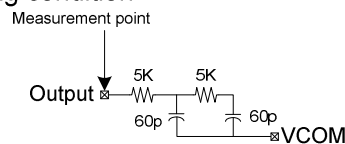
### 14.2. Input Clock and Data Timing Diagram



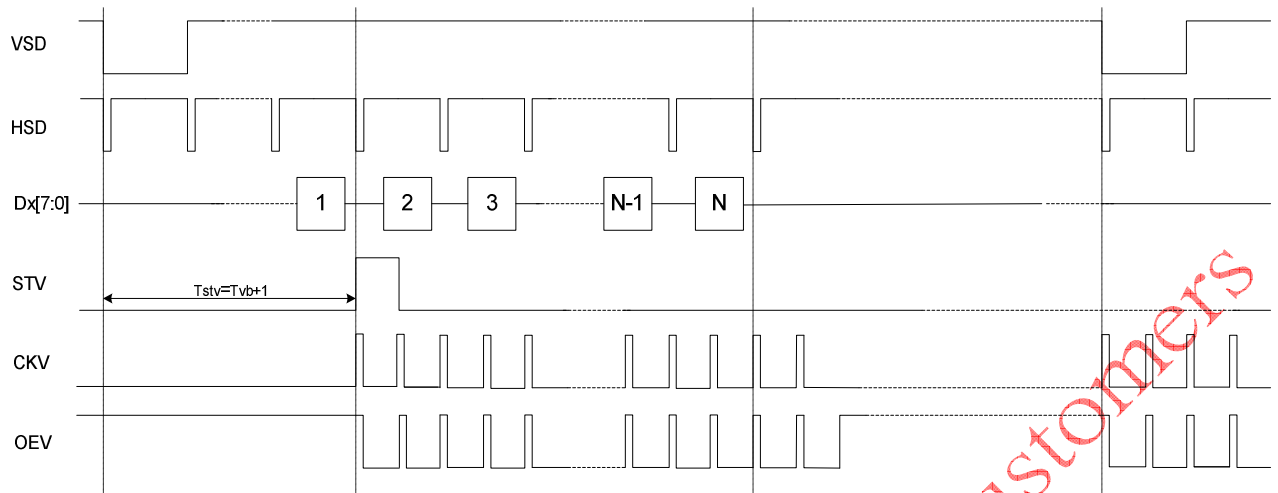
### Source output timing diagram



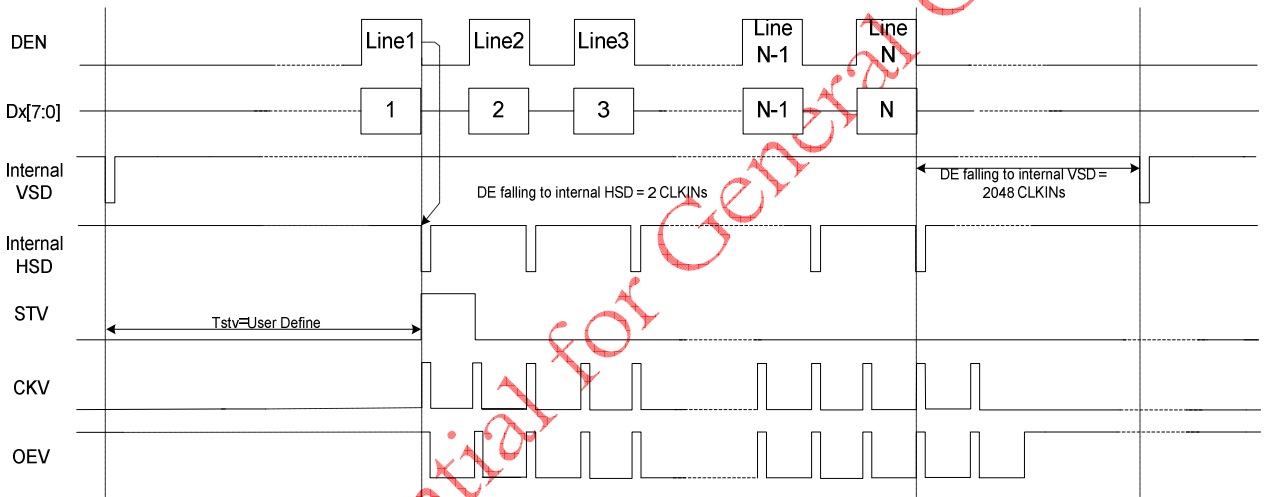
### Output Loading condition



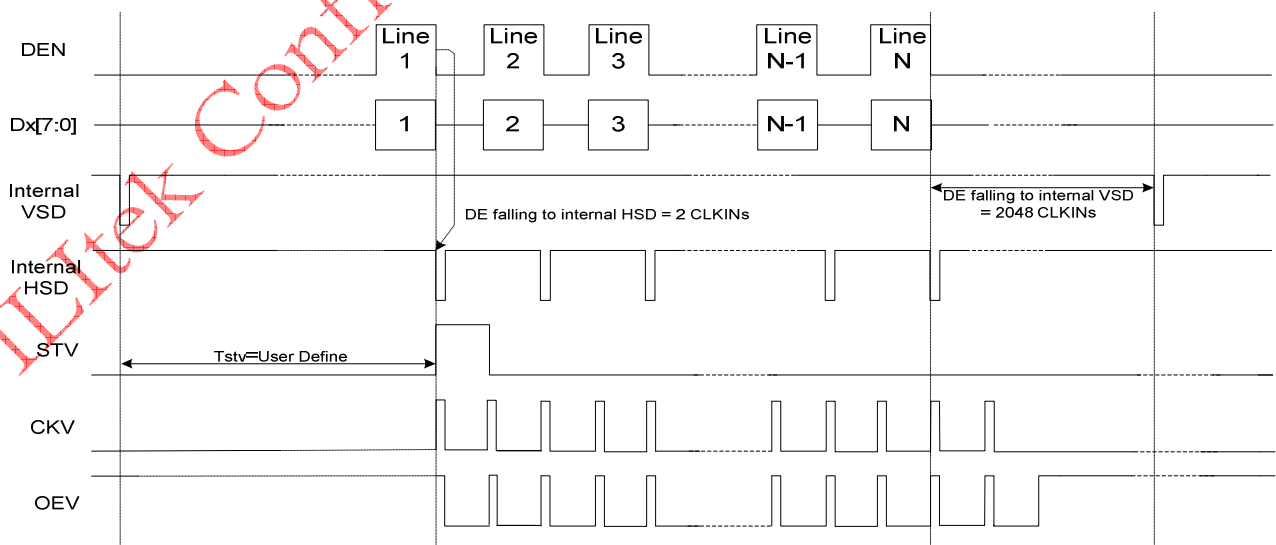
Vertical Timing Diagram of HV Mode (Dual Gate)



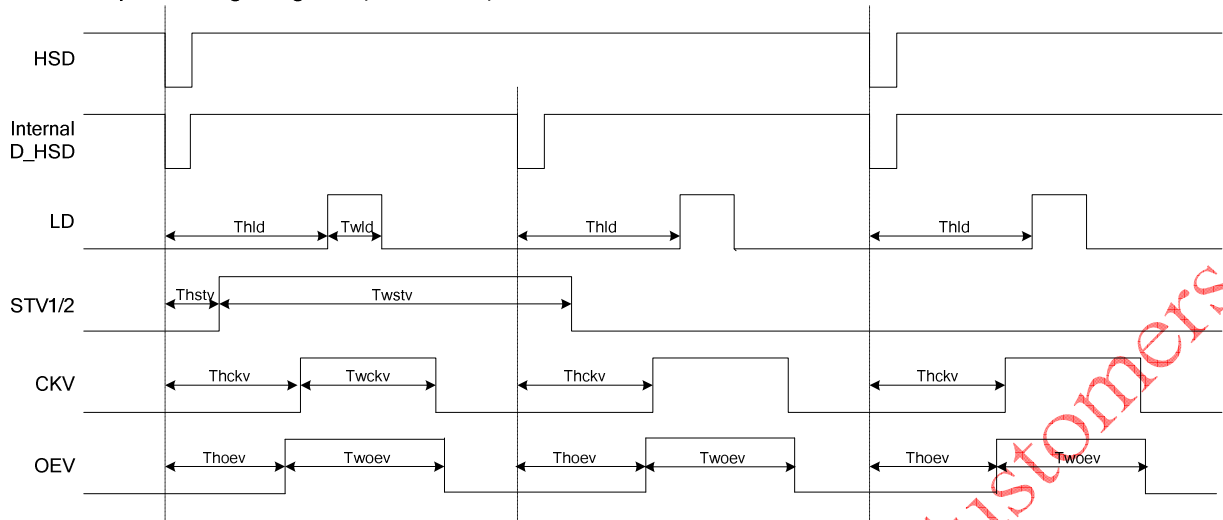
Vertical Timing Diagram of DE Mode (Dual Gate)



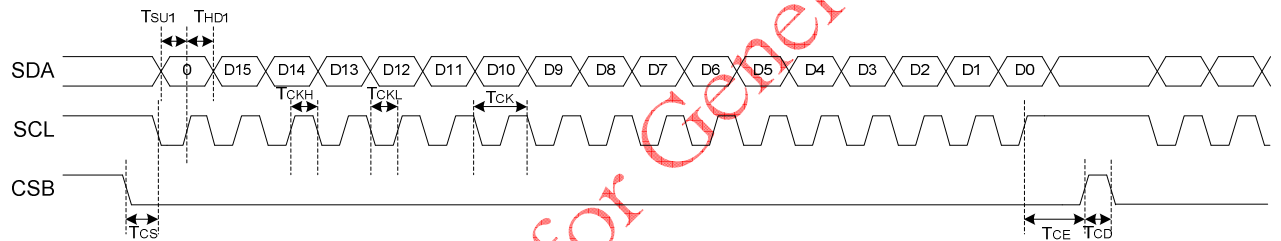
Vertical Timing Diagram of DE Mode (Dual Gate)



Gate Output Timing Diagram (Dual Gate)

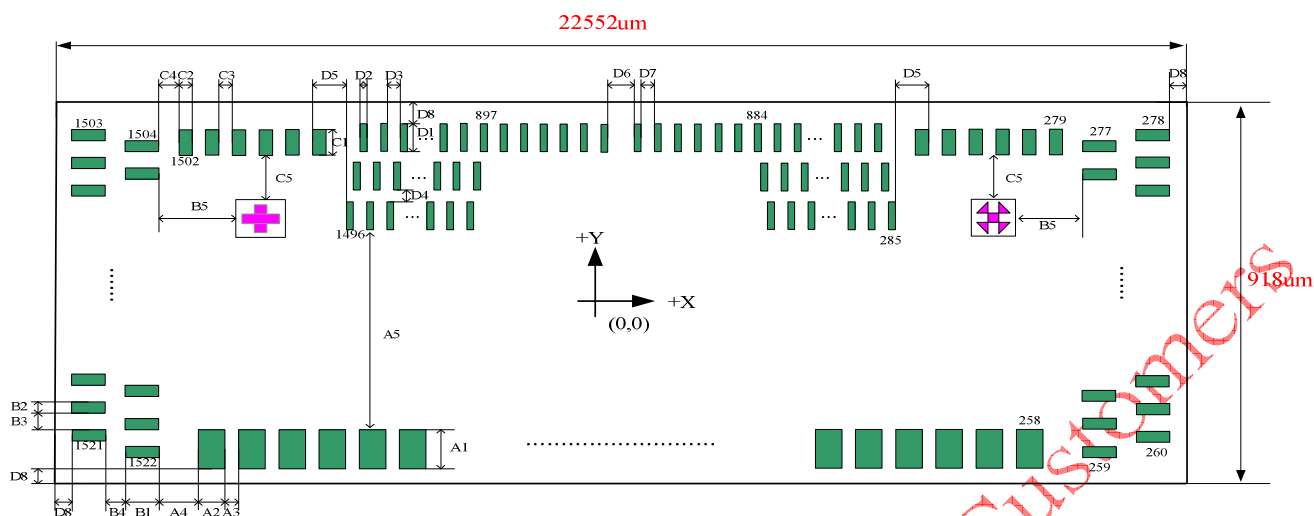


**SPI Timing**



| Parameter             | Symbol    | Spec |      |      | Unit | Conditions |
|-----------------------|-----------|------|------|------|------|------------|
|                       |           | Min. | Typ. | Max. |      |            |
| SCL period            | $T_{CK}$  | 60   | --   | --   | ns   |            |
| SCL high width        | $T_{CKH}$ | 30   | --   | --   | ns   |            |
| SCL low width         | $T_{CKL}$ | 30   | --   | --   | ns   |            |
| Data setup time       | $T_{SU1}$ | 12   | --   | --   | ns   |            |
| Data hold time        | $T_{HD1}$ | 12   | --   | --   | ns   |            |
| CSB to SCL setup time | $T_{CS}$  | 20   | --   | --   | ns   |            |
| CSB to SDA hold time  | $T_{CE}$  | 20   | --   | --   | ns   |            |
| CSB high pulse width  | $T_{CD}$  | 50   | --   | --   | ns   |            |

## 15. Pad Arrangement and Coordination



| Symbol | A1    | A2  | A3      | A4 | A5  | B1  | B2  |
|--------|-------|-----|---------|----|-----|-----|-----|
| Size   | 110   | 65  | 20      | 44 | 324 | 100 | 30  |
| Symbol | B3    | B4  | B5      | C1 | C2  | C3  | C4  |
| Size   | 50    | 30  | 168.5   | 70 | 30  | 20  | 70  |
| Symbol | C5    | D1  | D2      | D3 | D4  | D5  | D6  |
| Size   | 191.5 | 110 | 17      | 34 | 30  | 50  | 450 |
| Symbol | D7    | D8  | Unit:um |    |     |     |     |
| Size   | 17    | 47  |         |    |     |     |     |

Note: Chip Size Include Scribe Line

| number | pad name      | x        | y    | number | pad name      | x       | y    | number | pad name      | x      | y    |
|--------|---------------|----------|------|--------|---------------|---------|------|--------|---------------|--------|------|
| 1      | SHIELDING[84] | -10922.5 | -357 | 61     | BIST          | -5822.5 | -357 | 121    | D2B[5]        | -722.5 | -357 |
| 2      | SHIELDING[85] | -10837.5 | -357 | 62     | Dummy         | -5737.5 | -357 | 122    | D2B[5]        | -637.5 | -357 |
| 3      | SHIELDING[1]  | -10752.5 | -357 | 63     | AVDD          | -5652.5 | -357 | 123    | D2B[4]        | -552.5 | -357 |
| 4      | COM1_B        | -10667.5 | -357 | 64     | AVDD          | -5567.5 | -357 | 124    | D2B[4]        | -467.5 | -357 |
| 5      | COM1_B        | -10582.5 | -357 | 65     | AVDD          | -5482.5 | -357 | 125    | DASHD[7]      | -382.5 | -357 |
| 6      | AGND          | -10497.5 | -357 | 66     | AVDD          | -5397.5 | -357 | 126    | D2B[3]        | -297.5 | -357 |
| 7      | AGND          | -10412.5 | -357 | 67     | SHIELDING[20] | -5312.5 | -357 | 127    | D2B[3]        | -212.5 | -357 |
| 8      | AGND          | -10327.5 | -357 | 68     | AGND          | -5227.5 | -357 | 128    | D2B[2]        | -127.5 | -357 |
| 9      | AGND          | -10242.5 | -357 | 69     | AGND          | -5142.5 | -357 | 129    | D2B[2]        | -42.5  | -357 |
| 10     | TP[0]         | -10157.5 | -357 | 70     | AGND          | -5057.5 | -357 | 130    | DASHD[8]      | 42.5   | -357 |
| 11     | SHIELDING[2]  | -10072.5 | -357 | 71     | AGND          | -4972.5 | -357 | 131    | D2B[1]        | 127.5  | -357 |
| 12     | Dummy         | -9987.5  | -357 | 72     | SHIELDING[21] | -4887.5 | -357 | 132    | D2B[1]        | 212.5  | -357 |
| 13     | Dummy         | -9902.5  | -357 | 73     | GND           | -4802.5 | -357 | 133    | D2B[0]        | 297.5  | -357 |
| 14     | SHIELDING[3]  | -9817.5  | -357 | 74     | GND           | -4717.5 | -357 | 134    | D2B[0]        | 382.5  | -357 |
| 15     | Dummy         | -9732.5  | -357 | 75     | GND           | -4632.5 | -357 | 135    | DASHD[9]      | 467.5  | -357 |
| 16     | Dummy         | -9647.5  | -357 | 76     | GND           | -4547.5 | -357 | 136    | D1G[7]        | 552.5  | -357 |
| 17     | SHIELDING[4]  | -9562.5  | -357 | 77     | SHIELDING[22] | -4462.5 | -357 | 137    | D1G[7]        | 637.5  | -357 |
| 18     | Dummy         | -9477.5  | -357 | 78     | BLKEN         | -4377.5 | -357 | 138    | D1G[6]        | 722.5  | -357 |
| 19     | Dummy         | -9392.5  | -357 | 79     | BLKEN         | -4292.5 | -357 | 139    | D1G[6]        | 807.5  | -357 |
| 20     | SHIELDING[5]  | -9307.5  | -357 | 80     | SHIELDING[23] | -4207.5 | -357 | 140    | DASHD[10]     | 892.5  | -357 |
| 21     | Dummy         | -9222.5  | -357 | 81     | VDD           | -4122.5 | -357 | 141    | D1G[5]        | 977.5  | -357 |
| 22     | Dummy         | -9137.5  | -357 | 82     | VDD           | -4037.5 | -357 | 142    | D1G[5]        | 1062.5 | -357 |
| 23     | SHIELDING[6]  | -9052.5  | -357 | 83     | VDD           | -3952.5 | -357 | 143    | D1G[4]        | 1147.5 | -357 |
| 24     | Dummy         | -8967.5  | -357 | 84     | VDD           | -3867.5 | -357 | 144    | D1G[4]        | 1232.5 | -357 |
| 25     | Dummy         | -8882.5  | -357 | 85     | SHIELDING[28] | -3782.5 | -357 | 145    | DASHD[11]     | 1317.5 | -357 |
| 26     | SHIELDING[7]  | -8797.5  | -357 | 86     | DBGATE        | -3697.5 | -357 | 146    | D1G[3]        | 1402.5 | -357 |
| 27     | Dummy         | -8712.5  | -357 | 87     | DBGATE        | -3612.5 | -357 | 147    | D1G[3]        | 1487.5 | -357 |
| 28     | Dummy         | -8627.5  | -357 | 88     | CSX           | -3527.5 | -357 | 148    | D1G[2]        | 1572.5 | -357 |
| 29     | SHIELDING[8]  | -8542.5  | -357 | 89     | Dummy         | -3442.5 | -357 | 149    | D1G[2]        | 1657.5 | -357 |
| 30     | Dummy         | -8457.5  | -357 | 90     | Dummy         | -3357.5 | -357 | 150    | DASHD[12]     | 1742.5 | -357 |
| 31     | Dummy         | -8372.5  | -357 | 91     | SCL/DCM[0]    | -3272.5 | -357 | 151    | D1G[1]        | 1827.5 | -357 |
| 32     | SHIELDING[9]  | -8287.5  | -357 | 92     | Dummy         | -3187.5 | -357 | 152    | D1G[1]        | 1912.5 | -357 |
| 33     | Dummy         | -8202.5  | -357 | 93     | Dummy         | -3102.5 | -357 | 153    | D1G[0]        | 1997.5 | -357 |
| 34     | Dummy         | -8117.5  | -357 | 94     | SDA/DCM[1]    | -3017.5 | -357 | 154    | D1G[0]        | 2082.5 | -357 |
| 35     | SHIELDING[10] | -8032.5  | -357 | 95     | RES[0]        | -2932.5 | -357 | 155    | DASHD[13]     | 2167.5 | -357 |
| 36     | Dummy         | -7947.5  | -357 | 96     | RES[0]        | -2847.5 | -357 | 156    | D0R[7]        | 2252.5 | -357 |
| 37     | Dummy         | -7862.5  | -357 | 97     | CAB_PWM       | -2762.5 | -357 | 157    | D0R[7]        | 2337.5 | -357 |
| 38     | SHIELDING[11] | -7777.5  | -357 | 98     | CABC_EN       | -2677.5 | -357 | 158    | D0R[6]        | 2422.5 | -357 |
| 39     | Dummy         | -7692.5  | -357 | 99     | RES[1]        | -2592.5 | -357 | 159    | D0R[6]        | 2507.5 | -357 |
| 40     | Dummy         | -7607.5  | -357 | 100    | RES[1]        | -2507.5 | -357 | 160    | DASHD[14]     | 2592.5 | -357 |
| 41     | SHIELDING[12] | -7522.5  | -357 | 101    | DBC3          | -2422.5 | -357 | 161    | D0R[5]        | 2677.5 | -357 |
| 42     | Dummy         | -7437.5  | -357 | 102    | DBC3          | -2337.5 | -357 | 162    | D0R[5]        | 2762.5 | -357 |
| 43     | Dummy         | -7352.5  | -357 | 103    | DASHD[1]      | -2252.5 | -357 | 163    | D0R[4]        | 2847.5 | -357 |
| 44     | SHIELDING[13] | -7267.5  | -357 | 104    | VSD           | -2167.5 | -357 | 164    | D0R[4]        | 2932.5 | -357 |
| 45     | Dummy         | -7182.5  | -357 | 105    | VSD           | -2082.5 | -357 | 165    | DASHD[15]     | 3017.5 | -357 |
| 46     | Dummy         | -7097.5  | -357 | 106    | DASHD[2]      | -1997.5 | -357 | 166    | D0R[3]        | 3102.5 | -357 |
| 47     | SHIELDING[14] | -7012.5  | -357 | 107    | HSD           | -1912.5 | -357 | 167    | D0R[3]        | 3187.5 | -357 |
| 48     | Dummy         | -6927.5  | -357 | 108    | HSD           | -1827.5 | -357 | 168    | D0R[2]        | 3272.5 | -357 |
| 49     | Dummy         | -6842.5  | -357 | 109    | DASHD[3]      | -1742.5 | -357 | 169    | D0R[2]        | 3357.5 | -357 |
| 50     | SHIELDING[15] | -6757.5  | -357 | 110    | DEN           | -1657.5 | -357 | 170    | DASHD[16]     | 3442.5 | -357 |
| 51     | Dummy         | -6672.5  | -357 | 111    | DEN           | -1572.5 | -357 | 171    | D0R[1]        | 3527.5 | -357 |
| 52     | Dummy         | -6587.5  | -357 | 112    | DASHD[4]      | -1487.5 | -357 | 172    | D0R[1]        | 3612.5 | -357 |
| 53     | SHIELDING[16] | -6502.5  | -357 | 113    | CLKIN         | -1402.5 | -357 | 173    | D0R[0]        | 3697.5 | -357 |
| 54     | TP[1]         | -6417.5  | -357 | 114    | CLKIN         | -1317.5 | -357 | 174    | D0R[0]        | 3782.5 | -357 |
| 55     | TP[2]         | -6332.5  | -357 | 115    | DASHD[5]      | -1232.5 | -357 | 175    | DASHD[17]     | 3867.5 | -357 |
| 56     | TP[3]         | -6247.5  | -357 | 116    | D2B[7]        | -1147.5 | -357 | 176    | SHIELDING[25] | 3952.5 | -357 |
| 57     | SHIELDING[17] | -6162.5  | -357 | 117    | D2B[7]        | -1062.5 | -357 | 177    | MODE          | 4037.5 | -357 |
| 58     | SHIELDING[18] | -6077.5  | -357 | 118    | D2B[6]        | -977.5  | -357 | 178    | MODE          | 4122.5 | -357 |
| 59     | REV           | -5992.5  | -357 | 119    | D2B[6]        | -892.5  | -357 | 179    | CLKPOL        | 4207.5 | -357 |
| 60     | BIST          | -5907.5  | -357 | 120    | DASHD[6]      | -807.5  | -357 | 180    | CLKPOL        | 4292.5 | -357 |

| number | pad name      | x      | y    | number | Pad name      | X       | y    | number | Pad name | x       | y   |
|--------|---------------|--------|------|--------|---------------|---------|------|--------|----------|---------|-----|
| 181    | SHIELDING[26] | 4377.5 | -357 | 241    | Dummy         | 9477.5  | -357 | 301    | S[17]    | 10348.5 | 217 |
| 182    | DITHB         | 4462.5 | -357 | 242    | SHIELDING[42] | 9562.5  | -357 | 302    | S[18]    | 10331.5 | 357 |
| 183    | DITHB         | 4547.5 | -357 | 243    | Dummy         | 9647.5  | -357 | 303    | S[19]    | 10314.5 | 77  |
| 184    | VSET          | 4632.5 | -357 | 244    | Dummy         | 9732.5  | -357 | 304    | S[20]    | 10297.5 | 217 |
| 185    | SHLR          | 4717.5 | -357 | 245    | SHIELDING[43] | 9817.5  | -357 | 305    | S[21]    | 10280.5 | 357 |
| 186    | SHLR          | 4802.5 | -357 | 246    | Dummy         | 9902.5  | -357 | 306    | S[22]    | 10263.5 | 77  |
| 187    | SHIELDING[27] | 4887.5 | -357 | 247    | Dummy         | 9987.5  | -357 | 307    | S[23]    | 10246.5 | 217 |
| 188    | UPDN          | 4972.5 | -357 | 248    | SHIELDING[44] | 10072.5 | -357 | 308    | S[24]    | 10229.5 | 357 |
| 189    | UPDN          | 5057.5 | -357 | 249    | AVDD          | 10157.5 | -357 | 309    | S[25]    | 10212.5 | 77  |
| 190    | TP[4]         | 5142.5 | -357 | 250    | AVDD          | 10242.5 | -357 | 310    | S[26]    | 10195.5 | 217 |
| 191    | STBYB         | 5227.5 | -357 | 251    | AVDD          | 10327.5 | -357 | 311    | S[27]    | 10178.5 | 357 |
| 192    | STBYB         | 5312.5 | -357 | 252    | AVDD          | 10412.5 | -357 | 312    | S[28]    | 10161.5 | 77  |
| 193    | TP[5]         | 5397.5 | -357 | 253    | SHIELDING[45] | 10497.5 | -357 | 313    | S[29]    | 10144.5 | 217 |
| 194    | RSTB          | 5482.5 | -357 | 254    | COM2_B        | 10582.5 | -357 | 314    | S[30]    | 10127.5 | 357 |
| 195    | RSTB          | 5567.5 | -357 | 255    | COM2_B        | 10667.5 | -357 | 315    | S[31]    | 10110.5 | 77  |
| 196    | SHIELDING[29] | 5652.5 | -357 | 256    | SHIELDING[46] | 10752.5 | -357 | 316    | S[32]    | 10093.5 | 217 |
| 197    | VDD           | 5737.5 | -357 | 257    | SHIELDING[47] | 10837.5 | -357 | 317    | S[33]    | 10076.5 | 357 |
| 198    | VDD           | 5822.5 | -357 | 258    | SHIELDING[48] | 10922.5 | -357 | 318    | S[34]    | 10059.5 | 77  |
| 199    | VDD           | 5907.5 | -357 | 259    | TP[6]         | 11009   | -363 | 319    | S[35]    | 10042.5 | 217 |
| 200    | VDD           | 5992.5 | -357 | 260    | TP[7]         | 11179   | -323 | 320    | S[36]    | 10025.5 | 357 |
| 201    | Dummy         | 6077.5 | -357 | 261    | SHIELDING[49] | 11049   | -283 | 321    | S[37]    | 10008.5 | 77  |
| 202    | GND           | 6162.5 | -357 | 262    | Dummy         | 11179   | -243 | 322    | S[38]    | 9991.5  | 217 |
| 203    | GND           | 6247.5 | -357 | 263    | SHIELDING[50] | 11049   | -203 | 323    | S[39]    | 9974.5  | 357 |
| 204    | GND           | 6332.5 | -357 | 264    | TP[8]         | 11179   | -163 | 324    | S[40]    | 9957.5  | 77  |
| 205    | GND           | 6417.5 | -357 | 265    | SHIELDING[51] | 11049   | -123 | 325    | S[41]    | 9940.5  | 217 |
| 206    | SHIELDING[30] | 6502.5 | -357 | 266    | STV1_L        | 11179   | -83  | 326    | S[42]    | 9923.5  | 357 |
| 207    | Dummy         | 6587.5 | -357 | 267    | SHIELDING[52] | 11049   | -43  | 327    | S[43]    | 9906.5  | 77  |
| 208    | Dummy         | 6672.5 | -357 | 268    | STV2_L        | 11179   | -3   | 328    | S[44]    | 9889.5  | 217 |
| 209    | SHIELDING[31] | 6757.5 | -357 | 269    | SHIELDING[53] | 11049   | 37   | 329    | S[45]    | 9872.5  | 357 |
| 210    | Dummy         | 6842.5 | -357 | 270    | STV1_L        | 11179   | 77   | 330    | S[46]    | 9855.5  | 77  |
| 211    | Dummy         | 6927.5 | -357 | 271    | SHIELDING[54] | 11049   | 117  | 331    | S[47]    | 9838.5  | 217 |
| 212    | SHIELDING[32] | 7012.5 | -357 | 272    | CKV_L         | 11179   | 157  | 332    | S[48]    | 9821.5  | 357 |
| 213    | Dummy         | 7097.5 | -357 | 273    | SHIELDING[55] | 11049   | 197  | 333    | S[49]    | 9804.5  | 77  |
| 214    | Dummy         | 7182.5 | -357 | 274    | UD_L          | 11179   | 237  | 334    | S[50]    | 9787.5  | 217 |
| 215    | SHIELDING[33] | 7267.5 | -357 | 275    | SHIELDING[56] | 11049   | 277  | 335    | S[51]    | 9770.5  | 357 |
| 216    | Dummy         | 7352.5 | -357 | 276    | OEVL          | 11179   | 317  | 336    | S[52]    | 9753.5  | 77  |
| 217    | Dummy         | 7437.5 | -357 | 277    | SHIELDING[57] | 11049   | 357  | 337    | S[53]    | 9736.5  | 217 |
| 218    | SHIELDING[34] | 7522.5 | -357 | 278    | Dummy         | 11179   | 397  | 338    | S[54]    | 9719.5  | 357 |
| 219    | Dummy         | 7607.5 | -357 | 279    | Dummy         | 10914   | 377  | 339    | S[55]    | 9702.5  | 77  |
| 220    | Dummy         | 7692.5 | -357 | 280    | Dummy         | 10864   | 377  | 340    | S[56]    | 9685.5  | 217 |
| 221    | SHIELDING[35] | 7777.5 | -357 | 281    | Dummy         | 10814   | 377  | 341    | S[57]    | 9668.5  | 357 |
| 222    | Dummy         | 7862.5 | -357 | 282    | COM2_T        | 10764   | 377  | 342    | S[58]    | 9651.5  | 77  |
| 223    | Dummy         | 7947.5 | -357 | 283    | COM2_T        | 10714   | 377  | 343    | S[59]    | 9634.5  | 217 |
| 224    | SHIELDING[36] | 8032.5 | -357 | 284    | SHIELDING[59] | 10664   | 377  | 344    | S[60]    | 9617.5  | 357 |
| 225    | Dummy         | 8117.5 | -357 | 285    | S[1]          | 10620.5 | 77   | 345    | S[61]    | 9600.5  | 77  |
| 226    | Dummy         | 8202.5 | -357 | 286    | S[2]          | 10603.5 | 217  | 346    | S[62]    | 9583.5  | 217 |
| 227    | SHIELDING[37] | 8287.5 | -357 | 287    | S[3]          | 10586.5 | 357  | 347    | S[63]    | 9566.5  | 357 |
| 228    | Dummy         | 8372.5 | -357 | 288    | S[4]          | 10569.5 | 77   | 348    | S[64]    | 9549.5  | 77  |
| 229    | Dummy         | 8457.5 | -357 | 289    | S[5]          | 10552.5 | 217  | 349    | S[65]    | 9532.5  | 217 |
| 230    | SHIELDING[38] | 8542.5 | -357 | 290    | S[6]          | 10535.5 | 357  | 350    | S[66]    | 9515.5  | 357 |
| 231    | Dummy         | 8627.5 | -357 | 291    | S[7]          | 10518.5 | 77   | 351    | S[67]    | 9498.5  | 77  |
| 232    | Dummy         | 8712.5 | -357 | 292    | S[8]          | 10501.5 | 217  | 352    | S[68]    | 9481.5  | 217 |
| 233    | SHIELDING[39] | 8797.5 | -357 | 293    | S[9]          | 10484.5 | 357  | 353    | S[69]    | 9464.5  | 357 |
| 234    | Dummy         | 8882.5 | -357 | 294    | S[10]         | 10467.5 | 77   | 354    | S[70]    | 9447.5  | 77  |
| 235    | Dummy         | 8967.5 | -357 | 295    | S[11]         | 10450.5 | 217  | 355    | S[71]    | 9430.5  | 217 |
| 236    | SHIELDING[40] | 9052.5 | -357 | 296    | S[12]         | 10433.5 | 357  | 356    | S[72]    | 9413.5  | 357 |
| 237    | Dummy         | 9137.5 | -357 | 297    | S[13]         | 10416.5 | 77   | 357    | S[73]    | 9396.5  | 77  |
| 238    | Dummy         | 9222.5 | -357 | 298    | S[14]         | 10399.5 | 217  | 358    | S[74]    | 9379.5  | 217 |
| 239    | SHIELDING[41] | 9307.5 | -357 | 299    | S[15]         | 10382.5 | 357  | 359    | S[75]    | 9362.5  | 357 |
| 240    | Dummy         | 9392.5 | -357 | 300    | S[16]         | 10365.5 | 77   | 360    | S[76]    | 9345.5  | 77  |

| number | pad name | x      | y   | number | pad name | x      | y   | number | pad name | x      | y   |
|--------|----------|--------|-----|--------|----------|--------|-----|--------|----------|--------|-----|
| 361    | S[77]    | 9328.5 | 217 | 421    | S[137]   | 8308.5 | 217 | 481    | S[197]   | 7288.5 | 217 |
| 362    | S[78]    | 9311.5 | 357 | 422    | S[138]   | 8291.5 | 357 | 482    | S[198]   | 7271.5 | 357 |
| 363    | S[79]    | 9294.5 | 77  | 423    | S[139]   | 8274.5 | 77  | 483    | S[199]   | 7254.5 | 77  |
| 364    | S[80]    | 9277.5 | 217 | 424    | S[140]   | 8257.5 | 217 | 484    | S[200]   | 7237.5 | 217 |
| 365    | S[81]    | 9260.5 | 357 | 425    | S[141]   | 8240.5 | 357 | 485    | S[201]   | 7220.5 | 357 |
| 366    | S[82]    | 9243.5 | 77  | 426    | S[142]   | 8223.5 | 77  | 486    | S[202]   | 7203.5 | 77  |
| 367    | S[83]    | 9226.5 | 217 | 427    | S[143]   | 8206.5 | 217 | 487    | S[203]   | 7186.5 | 217 |
| 368    | S[84]    | 9209.5 | 357 | 428    | S[144]   | 8189.5 | 357 | 488    | S[204]   | 7169.5 | 357 |
| 369    | S[85]    | 9192.5 | 77  | 429    | S[145]   | 8172.5 | 77  | 489    | S[205]   | 7152.5 | 77  |
| 370    | S[86]    | 9175.5 | 217 | 430    | S[146]   | 8155.5 | 217 | 490    | S[206]   | 7135.5 | 217 |
| 371    | S[87]    | 9158.5 | 357 | 431    | S[147]   | 8138.5 | 357 | 491    | S[207]   | 7118.5 | 357 |
| 372    | S[88]    | 9141.5 | 77  | 432    | S[148]   | 8121.5 | 77  | 492    | S[208]   | 7101.5 | 77  |
| 373    | S[89]    | 9124.5 | 217 | 433    | S[149]   | 8104.5 | 217 | 493    | S[209]   | 7084.5 | 217 |
| 374    | S[90]    | 9107.5 | 357 | 434    | S[150]   | 8087.5 | 357 | 494    | S[210]   | 7067.5 | 357 |
| 375    | S[91]    | 9090.5 | 77  | 435    | S[151]   | 8070.5 | 77  | 495    | S[211]   | 7050.5 | 77  |
| 376    | S[92]    | 9073.5 | 217 | 436    | S[152]   | 8053.5 | 217 | 496    | S[212]   | 7033.5 | 217 |
| 377    | S[93]    | 9056.5 | 357 | 437    | S[153]   | 8036.5 | 357 | 497    | S[213]   | 7016.5 | 357 |
| 378    | S[94]    | 9039.5 | 77  | 438    | S[154]   | 8019.5 | 77  | 498    | S[214]   | 6999.5 | 77  |
| 379    | S[95]    | 9022.5 | 217 | 439    | S[155]   | 8002.5 | 217 | 499    | S[215]   | 6982.5 | 217 |
| 380    | S[96]    | 9005.5 | 357 | 440    | S[156]   | 7985.5 | 357 | 500    | S[216]   | 6965.5 | 357 |
| 381    | S[97]    | 8988.5 | 77  | 441    | S[157]   | 7968.5 | 77  | 501    | S[217]   | 6948.5 | 77  |
| 382    | S[98]    | 8971.5 | 217 | 442    | S[158]   | 7951.5 | 217 | 502    | S[218]   | 6931.5 | 217 |
| 383    | S[99]    | 8954.5 | 357 | 443    | S[159]   | 7934.5 | 357 | 503    | S[219]   | 6914.5 | 357 |
| 384    | S[100]   | 8937.5 | 77  | 444    | S[160]   | 7917.5 | 77  | 504    | S[220]   | 6897.5 | 77  |
| 385    | S[101]   | 8920.5 | 217 | 445    | S[161]   | 7900.5 | 217 | 505    | S[221]   | 6880.5 | 217 |
| 386    | S[102]   | 8903.5 | 357 | 446    | S[162]   | 7883.5 | 357 | 506    | S[222]   | 6863.5 | 357 |
| 387    | S[103]   | 8886.5 | 77  | 447    | S[163]   | 7866.5 | 77  | 507    | S[223]   | 6846.5 | 77  |
| 388    | S[104]   | 8869.5 | 217 | 448    | S[164]   | 7849.5 | 217 | 508    | S[224]   | 6829.5 | 217 |
| 389    | S[105]   | 8852.5 | 357 | 449    | S[165]   | 7832.5 | 357 | 509    | S[225]   | 6812.5 | 357 |
| 390    | S[106]   | 8835.5 | 77  | 450    | S[166]   | 7815.5 | 77  | 510    | S[226]   | 6795.5 | 77  |
| 391    | S[107]   | 8818.5 | 217 | 451    | S[167]   | 7798.5 | 217 | 511    | S[227]   | 6778.5 | 217 |
| 392    | S[108]   | 8801.5 | 357 | 452    | S[168]   | 7781.5 | 357 | 512    | S[228]   | 6761.5 | 357 |
| 393    | S[109]   | 8784.5 | 77  | 453    | S[169]   | 7764.5 | 77  | 513    | S[229]   | 6744.5 | 77  |
| 394    | S[110]   | 8767.5 | 217 | 454    | S[170]   | 7747.5 | 217 | 514    | S[230]   | 6727.5 | 217 |
| 395    | S[111]   | 8750.5 | 357 | 455    | S[171]   | 7730.5 | 357 | 515    | S[231]   | 6710.5 | 357 |
| 396    | S[112]   | 8733.5 | 77  | 456    | S[172]   | 7713.5 | 77  | 516    | S[232]   | 6693.5 | 77  |
| 397    | S[113]   | 8716.5 | 217 | 457    | S[173]   | 7696.5 | 217 | 517    | S[233]   | 6676.5 | 217 |
| 398    | S[114]   | 8699.5 | 357 | 458    | S[174]   | 7679.5 | 357 | 518    | S[234]   | 6659.5 | 357 |
| 399    | S[115]   | 8682.5 | 77  | 459    | S[175]   | 7662.5 | 77  | 519    | S[235]   | 6642.5 | 77  |
| 400    | S[116]   | 8665.5 | 217 | 460    | S[176]   | 7645.5 | 217 | 520    | S[236]   | 6625.5 | 217 |
| 401    | S[117]   | 8648.5 | 357 | 461    | S[177]   | 7628.5 | 357 | 521    | S[237]   | 6608.5 | 357 |
| 402    | S[118]   | 8631.5 | 77  | 462    | S[178]   | 7611.5 | 77  | 522    | S[238]   | 6591.5 | 77  |
| 403    | S[119]   | 8614.5 | 217 | 463    | S[179]   | 7594.5 | 217 | 523    | S[239]   | 6574.5 | 217 |
| 404    | S[120]   | 8597.5 | 357 | 464    | S[180]   | 7577.5 | 357 | 524    | S[240]   | 6557.5 | 357 |
| 405    | S[121]   | 8580.5 | 77  | 465    | S[181]   | 7560.5 | 77  | 525    | S[241]   | 6540.5 | 77  |
| 406    | S[122]   | 8563.5 | 217 | 466    | S[182]   | 7543.5 | 217 | 526    | S[242]   | 6523.5 | 217 |
| 407    | S[123]   | 8546.5 | 357 | 467    | S[183]   | 7526.5 | 357 | 527    | S[243]   | 6506.5 | 357 |
| 408    | S[124]   | 8529.5 | 77  | 468    | S[184]   | 7509.5 | 77  | 528    | S[244]   | 6489.5 | 77  |
| 409    | S[125]   | 8512.5 | 217 | 469    | S[185]   | 7492.5 | 217 | 529    | S[245]   | 6472.5 | 217 |
| 410    | S[126]   | 8495.5 | 357 | 470    | S[186]   | 7475.5 | 357 | 530    | S[246]   | 6455.5 | 357 |
| 411    | S[127]   | 8478.5 | 77  | 471    | S[187]   | 7458.5 | 77  | 531    | S[247]   | 6438.5 | 77  |
| 412    | S[128]   | 8461.5 | 217 | 472    | S[188]   | 7441.5 | 217 | 532    | S[248]   | 6421.5 | 217 |
| 413    | S[129]   | 8444.5 | 357 | 473    | S[189]   | 7424.5 | 357 | 533    | S[249]   | 6404.5 | 357 |
| 414    | S[130]   | 8427.5 | 77  | 474    | S[190]   | 7407.5 | 77  | 534    | S[250]   | 6387.5 | 77  |
| 415    | S[131]   | 8410.5 | 217 | 475    | S[191]   | 7390.5 | 217 | 535    | S[251]   | 6370.5 | 217 |
| 416    | S[132]   | 8393.5 | 357 | 476    | S[192]   | 7373.5 | 357 | 536    | S[252]   | 6353.5 | 357 |
| 417    | S[133]   | 8376.5 | 77  | 477    | S[193]   | 7356.5 | 77  | 537    | S[253]   | 6336.5 | 77  |
| 418    | S[134]   | 8359.5 | 217 | 478    | S[194]   | 7339.5 | 217 | 538    | S[254]   | 6319.5 | 217 |
| 419    | S[135]   | 8342.5 | 357 | 479    | S[195]   | 7322.5 | 357 | 539    | S[255]   | 6302.5 | 357 |
| 420    | S[136]   | 8325.5 | 77  | 480    | S[196]   | 7305.5 | 77  | 540    | S[256]   | 6285.5 | 77  |

| number | pad name | x      | y   | number | pad name | x      | y   | number | pad name | x      | y   |
|--------|----------|--------|-----|--------|----------|--------|-----|--------|----------|--------|-----|
| 541    | S[257]   | 6268.5 | 217 | 601    | S[317]   | 5248.5 | 217 | 661    | S[377]   | 4228.5 | 217 |
| 542    | S[258]   | 6251.5 | 357 | 602    | S[318]   | 5231.5 | 357 | 662    | S[378]   | 4211.5 | 357 |
| 543    | S[259]   | 6234.5 | 77  | 603    | S[319]   | 5214.5 | 77  | 663    | S[379]   | 4194.5 | 77  |
| 544    | S[260]   | 6217.5 | 217 | 604    | S[320]   | 5197.5 | 217 | 664    | S[380]   | 4177.5 | 217 |
| 545    | S[261]   | 6200.5 | 357 | 605    | S[321]   | 5180.5 | 357 | 665    | S[381]   | 4160.5 | 357 |
| 546    | S[262]   | 6183.5 | 77  | 606    | S[322]   | 5163.5 | 77  | 666    | S[382]   | 4143.5 | 77  |
| 547    | S[263]   | 6166.5 | 217 | 607    | S[323]   | 5146.5 | 217 | 667    | S[383]   | 4126.5 | 217 |
| 548    | S[264]   | 6149.5 | 357 | 608    | S[324]   | 5129.5 | 357 | 668    | S[384]   | 4109.5 | 357 |
| 549    | S[265]   | 6132.5 | 77  | 609    | S[325]   | 5112.5 | 77  | 669    | S[385]   | 4092.5 | 77  |
| 550    | S[266]   | 6115.5 | 217 | 610    | S[326]   | 5095.5 | 217 | 670    | S[386]   | 4075.5 | 217 |
| 551    | S[267]   | 6098.5 | 357 | 611    | S[327]   | 5078.5 | 357 | 671    | S[387]   | 4058.5 | 357 |
| 552    | S[268]   | 6081.5 | 77  | 612    | S[328]   | 5061.5 | 77  | 672    | S[388]   | 4041.5 | 77  |
| 553    | S[269]   | 6064.5 | 217 | 613    | S[329]   | 5044.5 | 217 | 673    | S[389]   | 4024.5 | 217 |
| 554    | S[270]   | 6047.5 | 357 | 614    | S[330]   | 5027.5 | 357 | 674    | S[390]   | 4007.5 | 357 |
| 555    | S[271]   | 6030.5 | 77  | 615    | S[331]   | 5010.5 | 77  | 675    | S[391]   | 3990.5 | 77  |
| 556    | S[272]   | 6013.5 | 217 | 616    | S[332]   | 4993.5 | 217 | 676    | S[392]   | 3973.5 | 217 |
| 557    | S[273]   | 5996.5 | 357 | 617    | S[333]   | 4976.5 | 357 | 677    | S[393]   | 3956.5 | 357 |
| 558    | S[274]   | 5979.5 | 77  | 618    | S[334]   | 4959.5 | 77  | 678    | S[394]   | 3939.5 | 77  |
| 559    | S[275]   | 5962.5 | 217 | 619    | S[335]   | 4942.5 | 217 | 679    | S[395]   | 3922.5 | 217 |
| 560    | S[276]   | 5945.5 | 357 | 620    | S[336]   | 4925.5 | 357 | 680    | S[396]   | 3905.5 | 357 |
| 561    | S[277]   | 5928.5 | 77  | 621    | S[337]   | 4908.5 | 77  | 681    | S[397]   | 3888.5 | 77  |
| 562    | S[278]   | 5911.5 | 217 | 622    | S[338]   | 4891.5 | 217 | 682    | S[398]   | 3871.5 | 217 |
| 563    | S[279]   | 5894.5 | 357 | 623    | S[339]   | 4874.5 | 357 | 683    | S[399]   | 3854.5 | 357 |
| 564    | S[280]   | 5877.5 | 77  | 624    | S[340]   | 4857.5 | 77  | 684    | S[400]   | 3837.5 | 77  |
| 565    | S[281]   | 5860.5 | 217 | 625    | S[341]   | 4840.5 | 217 | 685    | S[401]   | 3820.5 | 217 |
| 566    | S[282]   | 5843.5 | 357 | 626    | S[342]   | 4823.5 | 357 | 686    | S[402]   | 3803.5 | 357 |
| 567    | S[283]   | 5826.5 | 77  | 627    | S[343]   | 4806.5 | 77  | 687    | S[403]   | 3786.5 | 77  |
| 568    | S[284]   | 5809.5 | 217 | 628    | S[344]   | 4789.5 | 217 | 688    | S[404]   | 3769.5 | 217 |
| 569    | S[285]   | 5792.5 | 357 | 629    | S[345]   | 4772.5 | 357 | 689    | S[405]   | 3752.5 | 357 |
| 570    | S[286]   | 5775.5 | 77  | 630    | S[346]   | 4755.5 | 77  | 690    | S[406]   | 3735.5 | 77  |
| 571    | S[287]   | 5758.5 | 217 | 631    | S[347]   | 4738.5 | 217 | 691    | S[407]   | 3718.5 | 217 |
| 572    | S[288]   | 5741.5 | 357 | 632    | S[348]   | 4721.5 | 357 | 692    | S[408]   | 3701.5 | 357 |
| 573    | S[289]   | 5724.5 | 77  | 633    | S[349]   | 4704.5 | 77  | 693    | S[409]   | 3684.5 | 77  |
| 574    | S[290]   | 5707.5 | 217 | 634    | S[350]   | 4687.5 | 217 | 694    | S[410]   | 3667.5 | 217 |
| 575    | S[291]   | 5690.5 | 357 | 635    | S[351]   | 4670.5 | 357 | 695    | S[411]   | 3650.5 | 357 |
| 576    | S[292]   | 5673.5 | 77  | 636    | S[352]   | 4653.5 | 77  | 696    | S[412]   | 3633.5 | 77  |
| 577    | S[293]   | 5656.5 | 217 | 637    | S[353]   | 4636.5 | 217 | 697    | S[413]   | 3616.5 | 217 |
| 578    | S[294]   | 5639.5 | 357 | 638    | S[354]   | 4619.5 | 357 | 698    | S[414]   | 3599.5 | 357 |
| 579    | S[295]   | 5622.5 | 77  | 639    | S[355]   | 4602.5 | 77  | 699    | S[415]   | 3582.5 | 77  |
| 580    | S[296]   | 5605.5 | 217 | 640    | S[356]   | 4585.5 | 217 | 700    | S[416]   | 3565.5 | 217 |
| 581    | S[297]   | 5588.5 | 357 | 641    | S[357]   | 4568.5 | 357 | 701    | S[417]   | 3548.5 | 357 |
| 582    | S[298]   | 5571.5 | 77  | 642    | S[358]   | 4551.5 | 77  | 702    | S[418]   | 3531.5 | 77  |
| 583    | S[299]   | 5554.5 | 217 | 643    | S[359]   | 4534.5 | 217 | 703    | S[419]   | 3514.5 | 217 |
| 584    | S[300]   | 5537.5 | 357 | 644    | S[360]   | 4517.5 | 357 | 704    | S[420]   | 3497.5 | 357 |
| 585    | S[301]   | 5520.5 | 77  | 645    | S[361]   | 4500.5 | 77  | 705    | S[421]   | 3480.5 | 77  |
| 586    | S[302]   | 5503.5 | 217 | 646    | S[362]   | 4483.5 | 217 | 706    | S[422]   | 3463.5 | 217 |
| 587    | S[303]   | 5486.5 | 357 | 647    | S[363]   | 4466.5 | 357 | 707    | S[423]   | 3446.5 | 357 |
| 588    | S[304]   | 5469.5 | 77  | 648    | S[364]   | 4449.5 | 77  | 708    | S[424]   | 3429.5 | 77  |
| 589    | S[305]   | 5452.5 | 217 | 649    | S[365]   | 4432.5 | 217 | 709    | S[425]   | 3412.5 | 217 |
| 590    | S[306]   | 5435.5 | 357 | 650    | S[366]   | 4415.5 | 357 | 710    | S[426]   | 3395.5 | 357 |
| 591    | S[307]   | 5418.5 | 77  | 651    | S[367]   | 4398.5 | 77  | 711    | S[427]   | 3378.5 | 77  |
| 592    | S[308]   | 5401.5 | 217 | 652    | S[368]   | 4381.5 | 217 | 712    | S[428]   | 3361.5 | 217 |
| 593    | S[309]   | 5384.5 | 357 | 653    | S[369]   | 4364.5 | 357 | 713    | S[429]   | 3344.5 | 357 |
| 594    | S[310]   | 5367.5 | 77  | 654    | S[370]   | 4347.5 | 77  | 714    | S[430]   | 3327.5 | 77  |
| 595    | S[311]   | 5350.5 | 217 | 655    | S[371]   | 4330.5 | 217 | 715    | S[431]   | 3310.5 | 217 |
| 596    | S[312]   | 5333.5 | 357 | 656    | S[372]   | 4313.5 | 357 | 716    | S[432]   | 3293.5 | 357 |
| 597    | S[313]   | 5316.5 | 77  | 657    | S[373]   | 4296.5 | 77  | 717    | S[433]   | 3276.5 | 77  |
| 598    | S[314]   | 5299.5 | 217 | 658    | S[374]   | 4279.5 | 217 | 718    | S[434]   | 3259.5 | 217 |
| 599    | S[315]   | 5282.5 | 357 | 659    | S[375]   | 4262.5 | 357 | 719    | S[435]   | 3242.5 | 357 |
| 600    | S[316]   | 5265.5 | 77  | 660    | S[376]   | 4245.5 | 77  | 720    | S[436]   | 3225.5 | 77  |

| number | pad name | x      | y   | number | pad name | x      | y   | number | pad name      | x      | y   |
|--------|----------|--------|-----|--------|----------|--------|-----|--------|---------------|--------|-----|
| 721    | S[437]   | 3208.5 | 217 | 781    | S[497]   | 2188.5 | 217 | 841    | S[557]        | 1168.5 | 217 |
| 722    | S[438]   | 3191.5 | 357 | 782    | S[498]   | 2171.5 | 357 | 842    | S[558]        | 1151.5 | 357 |
| 723    | S[439]   | 3174.5 | 77  | 783    | S[499]   | 2154.5 | 77  | 843    | S[559]        | 1134.5 | 77  |
| 724    | S[440]   | 3157.5 | 217 | 784    | S[500]   | 2137.5 | 217 | 844    | S[560]        | 1117.5 | 217 |
| 725    | S[441]   | 3140.5 | 357 | 785    | S[501]   | 2120.5 | 357 | 845    | S[561]        | 1100.5 | 357 |
| 726    | S[442]   | 3123.5 | 77  | 786    | S[502]   | 2103.5 | 77  | 846    | S[562]        | 1083.5 | 77  |
| 727    | S[443]   | 3106.5 | 217 | 787    | S[503]   | 2086.5 | 217 | 847    | S[563]        | 1066.5 | 217 |
| 728    | S[444]   | 3089.5 | 357 | 788    | S[504]   | 2069.5 | 357 | 848    | S[564]        | 1049.5 | 357 |
| 729    | S[445]   | 3072.5 | 77  | 789    | S[505]   | 2052.5 | 77  | 849    | S[565]        | 1032.5 | 77  |
| 730    | S[446]   | 3055.5 | 217 | 790    | S[506]   | 2035.5 | 217 | 850    | S[566]        | 1015.5 | 217 |
| 731    | S[447]   | 3038.5 | 357 | 791    | S[507]   | 2018.5 | 357 | 851    | S[567]        | 998.5  | 357 |
| 732    | S[448]   | 3021.5 | 77  | 792    | S[508]   | 2001.5 | 77  | 852    | S[568]        | 981.5  | 77  |
| 733    | S[449]   | 3004.5 | 217 | 793    | S[509]   | 1984.5 | 217 | 853    | S[569]        | 964.5  | 217 |
| 734    | S[450]   | 2987.5 | 357 | 794    | S[510]   | 1967.5 | 357 | 854    | S[570]        | 947.5  | 357 |
| 735    | S[451]   | 2970.5 | 77  | 795    | S[511]   | 1950.5 | 77  | 855    | S[571]        | 930.5  | 77  |
| 736    | S[452]   | 2953.5 | 217 | 796    | S[512]   | 1933.5 | 217 | 856    | S[572]        | 913.5  | 217 |
| 737    | S[453]   | 2936.5 | 357 | 797    | S[513]   | 1916.5 | 357 | 857    | S[573]        | 896.5  | 357 |
| 738    | S[454]   | 2919.5 | 77  | 798    | S[514]   | 1899.5 | 77  | 858    | S[574]        | 879.5  | 77  |
| 739    | S[455]   | 2902.5 | 217 | 799    | S[515]   | 1882.5 | 217 | 859    | S[575]        | 862.5  | 217 |
| 740    | S[456]   | 2885.5 | 357 | 800    | S[516]   | 1865.5 | 357 | 860    | S[576]        | 845.5  | 357 |
| 741    | S[457]   | 2868.5 | 77  | 801    | S[517]   | 1848.5 | 77  | 861    | S[577]        | 828.5  | 77  |
| 742    | S[458]   | 2851.5 | 217 | 802    | S[518]   | 1831.5 | 217 | 862    | S[578]        | 811.5  | 217 |
| 743    | S[459]   | 2834.5 | 357 | 803    | S[519]   | 1814.5 | 357 | 863    | S[579]        | 794.5  | 357 |
| 744    | S[460]   | 2817.5 | 77  | 804    | S[520]   | 1797.5 | 77  | 864    | S[580]        | 777.5  | 77  |
| 745    | S[461]   | 2800.5 | 217 | 805    | S[521]   | 1780.5 | 217 | 865    | S[581]        | 760.5  | 217 |
| 746    | S[462]   | 2783.5 | 357 | 806    | S[522]   | 1763.5 | 357 | 866    | S[582]        | 743.5  | 357 |
| 747    | S[463]   | 2766.5 | 77  | 807    | S[523]   | 1746.5 | 77  | 867    | S[583]        | 726.5  | 77  |
| 748    | S[464]   | 2749.5 | 217 | 808    | S[524]   | 1729.5 | 217 | 868    | S[584]        | 709.5  | 217 |
| 749    | S[465]   | 2732.5 | 357 | 809    | S[525]   | 1712.5 | 357 | 869    | S[585]        | 692.5  | 357 |
| 750    | S[466]   | 2715.5 | 77  | 810    | S[526]   | 1695.5 | 77  | 870    | S[586]        | 675.5  | 77  |
| 751    | S[467]   | 2698.5 | 217 | 811    | S[527]   | 1678.5 | 217 | 871    | S[587]        | 658.5  | 217 |
| 752    | S[468]   | 2681.5 | 357 | 812    | S[528]   | 1661.5 | 357 | 872    | S[588]        | 641.5  | 357 |
| 753    | S[469]   | 2664.5 | 77  | 813    | S[529]   | 1644.5 | 77  | 873    | S[589]        | 624.5  | 77  |
| 754    | S[470]   | 2647.5 | 217 | 814    | S[530]   | 1627.5 | 217 | 874    | S[590]        | 607.5  | 217 |
| 755    | S[471]   | 2630.5 | 357 | 815    | S[531]   | 1610.5 | 357 | 875    | S[591]        | 590.5  | 357 |
| 756    | S[472]   | 2613.5 | 77  | 816    | S[532]   | 1593.5 | 77  | 876    | S[592]        | 573.5  | 77  |
| 757    | S[473]   | 2596.5 | 217 | 817    | S[533]   | 1576.5 | 217 | 877    | S[593]        | 556.5  | 217 |
| 758    | S[474]   | 2579.5 | 357 | 818    | S[534]   | 1559.5 | 357 | 878    | S[594]        | 539.5  | 357 |
| 759    | S[475]   | 2562.5 | 77  | 819    | S[535]   | 1542.5 | 77  | 879    | S[595]        | 522.5  | 77  |
| 760    | S[476]   | 2545.5 | 217 | 820    | S[536]   | 1525.5 | 217 | 880    | S[596]        | 505.5  | 217 |
| 761    | S[477]   | 2528.5 | 357 | 821    | S[537]   | 1508.5 | 357 | 881    | S[597]        | 488.5  | 357 |
| 762    | S[478]   | 2511.5 | 77  | 822    | S[538]   | 1491.5 | 77  | 882    | S[598]        | 471.5  | 77  |
| 763    | S[479]   | 2494.5 | 217 | 823    | S[539]   | 1474.5 | 217 | 883    | S[599]        | 454.5  | 217 |
| 764    | S[480]   | 2477.5 | 357 | 824    | S[540]   | 1457.5 | 357 | 884    | S[600]        | 437.5  | 357 |
| 765    | S[481]   | 2460.5 | 77  | 825    | S[541]   | 1440.5 | 77  | 885    | SHIELDING[60] | 420.5  | 357 |
| 766    | S[482]   | 2443.5 | 217 | 826    | S[542]   | 1423.5 | 217 | 886    | SHIELDING[61] | 403.5  | 357 |
| 767    | S[483]   | 2426.5 | 357 | 827    | S[543]   | 1406.5 | 357 | 887    | SHIELDING[62] | 386.5  | 357 |
| 768    | S[484]   | 2409.5 | 77  | 828    | S[544]   | 1389.5 | 77  | 888    | SHIELDING[63] | 369.5  | 357 |
| 769    | S[485]   | 2392.5 | 217 | 829    | S[545]   | 1372.5 | 217 | 889    | SHIELDING[64] | 352.5  | 357 |
| 770    | S[486]   | 2375.5 | 357 | 830    | S[546]   | 1355.5 | 357 | 890    | SHIELDING[65] | 335.5  | 357 |
| 771    | S[487]   | 2358.5 | 77  | 831    | S[547]   | 1338.5 | 77  | 891    | SHIELDING[66] | 318.5  | 357 |
| 772    | S[488]   | 2341.5 | 217 | 832    | S[548]   | 1321.5 | 217 | 892    | SHIELDING[67] | 301.5  | 357 |
| 773    | S[489]   | 2324.5 | 357 | 833    | S[549]   | 1304.5 | 357 | 893    | SHIELDING[68] | 284.5  | 357 |
| 774    | S[490]   | 2307.5 | 77  | 834    | S[550]   | 1287.5 | 77  | 894    | SHIELDING[69] | 267.5  | 357 |
| 775    | S[491]   | 2290.5 | 217 | 835    | S[551]   | 1270.5 | 217 | 895    | SHIELDING[70] | 250.5  | 357 |
| 776    | S[492]   | 2273.5 | 357 | 836    | S[552]   | 1253.5 | 357 | 896    | SHIELDING[71] | 233.5  | 357 |
| 777    | S[493]   | 2256.5 | 77  | 837    | S[553]   | 1236.5 | 77  | 897    | S[601]        | 216.5  | 357 |
| 778    | S[494]   | 2239.5 | 217 | 838    | S[554]   | 1219.5 | 217 | 898    | S[602]        | 199.5  | 357 |
| 779    | S[495]   | 2222.5 | 357 | 839    | S[555]   | 1202.5 | 357 | 899    | S[603]        | 182.5  | 357 |
| 780    | S[496]   | 2205.5 | 77  | 840    | S[556]   | 1185.5 | 77  | 900    | S[604]        | 165.5  | 357 |

| number | pad name | x       | y   | number | pad name | x       | y   | number | pad name | x       | y   |
|--------|----------|---------|-----|--------|----------|---------|-----|--------|----------|---------|-----|
| 901    | S[605]   | -505.5  | 217 | 961    | S[665]   | -1525.5 | 217 | 1021   | S[725]   | -2545.5 | 217 |
| 902    | S[606]   | -522.5  | 77  | 962    | S[666]   | -1542.5 | 77  | 1022   | S[726]   | -2562.5 | 77  |
| 903    | S[607]   | -539.5  | 357 | 963    | S[667]   | -1559.5 | 357 | 1023   | S[727]   | -2579.5 | 357 |
| 904    | S[608]   | -556.5  | 217 | 964    | S[668]   | -1576.5 | 217 | 1024   | S[728]   | -2596.5 | 217 |
| 905    | S[609]   | -573.5  | 77  | 965    | S[669]   | -1593.5 | 77  | 1025   | S[729]   | -2613.5 | 77  |
| 906    | S[610]   | -590.5  | 357 | 966    | S[670]   | -1610.5 | 357 | 1026   | S[730]   | -2630.5 | 357 |
| 907    | S[611]   | -607.5  | 217 | 967    | S[671]   | -1627.5 | 217 | 1027   | S[731]   | -2647.5 | 217 |
| 908    | S[612]   | -624.5  | 77  | 968    | S[672]   | -1644.5 | 77  | 1028   | S[732]   | -2664.5 | 77  |
| 909    | S[613]   | -641.5  | 357 | 969    | S[673]   | -1661.5 | 357 | 1029   | S[733]   | -2681.5 | 357 |
| 910    | S[614]   | -658.5  | 217 | 970    | S[674]   | -1678.5 | 217 | 1030   | S[734]   | -2698.5 | 217 |
| 911    | S[615]   | -675.5  | 77  | 971    | S[675]   | -1695.5 | 77  | 1031   | S[735]   | -2715.5 | 77  |
| 912    | S[616]   | -692.5  | 357 | 972    | S[676]   | -1712.5 | 357 | 1032   | S[736]   | -2732.5 | 357 |
| 913    | S[617]   | -709.5  | 217 | 973    | S[677]   | -1729.5 | 217 | 1033   | S[737]   | -2749.5 | 217 |
| 914    | S[618]   | -726.5  | 77  | 974    | S[678]   | -1746.5 | 77  | 1034   | S[738]   | -2766.5 | 77  |
| 915    | S[619]   | -743.5  | 357 | 975    | S[679]   | -1763.5 | 357 | 1035   | S[739]   | -2783.5 | 357 |
| 916    | S[620]   | -760.5  | 217 | 976    | S[680]   | -1780.5 | 217 | 1036   | S[740]   | -2800.5 | 217 |
| 917    | S[621]   | -777.5  | 77  | 977    | S[681]   | -1797.5 | 77  | 1037   | S[741]   | -2817.5 | 77  |
| 918    | S[622]   | -794.5  | 357 | 978    | S[682]   | -1814.5 | 357 | 1038   | S[742]   | -2834.5 | 357 |
| 919    | S[623]   | -811.5  | 217 | 979    | S[683]   | -1831.5 | 217 | 1039   | S[743]   | -2851.5 | 217 |
| 920    | S[624]   | -828.5  | 77  | 980    | S[684]   | -1848.5 | 77  | 1040   | S[744]   | -2868.5 | 77  |
| 921    | S[625]   | -845.5  | 357 | 981    | S[685]   | -1865.5 | 357 | 1041   | S[745]   | -2885.5 | 357 |
| 922    | S[626]   | -862.5  | 217 | 982    | S[686]   | -1882.5 | 217 | 1042   | S[746]   | -2902.5 | 217 |
| 923    | S[627]   | -879.5  | 77  | 983    | S[687]   | -1899.5 | 77  | 1043   | S[747]   | -2919.5 | 77  |
| 924    | S[628]   | -896.5  | 357 | 984    | S[688]   | -1916.5 | 357 | 1044   | S[748]   | -2936.5 | 357 |
| 925    | S[629]   | -913.5  | 217 | 985    | S[689]   | -1933.5 | 217 | 1045   | S[749]   | -2953.5 | 217 |
| 926    | S[630]   | -930.5  | 77  | 986    | S[690]   | -1950.5 | 77  | 1046   | S[750]   | -2970.5 | 77  |
| 927    | S[631]   | -947.5  | 357 | 987    | S[691]   | -1967.5 | 357 | 1047   | S[751]   | -2987.5 | 357 |
| 928    | S[632]   | -964.5  | 217 | 988    | S[692]   | -1984.5 | 217 | 1048   | S[752]   | -3004.5 | 217 |
| 929    | S[633]   | -981.5  | 77  | 989    | S[693]   | -2001.5 | 77  | 1049   | S[753]   | -3021.5 | 77  |
| 930    | S[634]   | -998.5  | 357 | 990    | S[694]   | -2018.5 | 357 | 1050   | S[754]   | -3038.5 | 357 |
| 931    | S[635]   | -1015.5 | 217 | 991    | S[695]   | -2035.5 | 217 | 1051   | S[755]   | -3055.5 | 217 |
| 932    | S[636]   | -1032.5 | 77  | 992    | S[696]   | -2052.5 | 77  | 1052   | S[756]   | -3072.5 | 77  |
| 933    | S[637]   | -1049.5 | 357 | 993    | S[697]   | -2069.5 | 357 | 1053   | S[757]   | -3089.5 | 357 |
| 934    | S[638]   | -1066.5 | 217 | 994    | S[698]   | -2086.5 | 217 | 1054   | S[758]   | -3106.5 | 217 |
| 935    | S[639]   | -1083.5 | 77  | 995    | S[699]   | -2103.5 | 77  | 1055   | S[759]   | -3123.5 | 77  |
| 936    | S[640]   | -1100.5 | 357 | 996    | S[700]   | -2120.5 | 357 | 1056   | S[760]   | -3140.5 | 357 |
| 937    | S[641]   | -1117.5 | 217 | 997    | S[701]   | -2137.5 | 217 | 1057   | S[761]   | -3157.5 | 217 |
| 938    | S[642]   | -1134.5 | 77  | 998    | S[702]   | -2154.5 | 77  | 1058   | S[762]   | -3174.5 | 77  |
| 939    | S[643]   | -1151.5 | 357 | 999    | S[703]   | -2171.5 | 357 | 1059   | S[763]   | -3191.5 | 357 |
| 940    | S[644]   | -1168.5 | 217 | 1000   | S[704]   | -2188.5 | 217 | 1060   | S[764]   | -3208.5 | 217 |
| 941    | S[645]   | -1185.5 | 77  | 1001   | S[705]   | -2205.5 | 77  | 1061   | S[765]   | -3225.5 | 77  |
| 942    | S[646]   | -1202.5 | 357 | 1002   | S[706]   | -2222.5 | 357 | 1062   | S[766]   | -3242.5 | 357 |
| 943    | S[647]   | -1219.5 | 217 | 1003   | S[707]   | -2239.5 | 217 | 1063   | S[767]   | -3259.5 | 217 |
| 944    | S[648]   | -1236.5 | 77  | 1004   | S[708]   | -2256.5 | 77  | 1064   | S[768]   | -3276.5 | 77  |
| 945    | S[649]   | -1253.5 | 357 | 1005   | S[709]   | -2273.5 | 357 | 1065   | S[769]   | -3293.5 | 357 |
| 946    | S[650]   | -1270.5 | 217 | 1006   | S[710]   | -2290.5 | 217 | 1066   | S[770]   | -3310.5 | 217 |
| 947    | S[651]   | -1287.5 | 77  | 1007   | S[711]   | -2307.5 | 77  | 1067   | S[771]   | -3327.5 | 77  |
| 948    | S[652]   | -1304.5 | 357 | 1008   | S[712]   | -2324.5 | 357 | 1068   | S[772]   | -3344.5 | 357 |
| 949    | S[653]   | -1321.5 | 217 | 1009   | S[713]   | -2341.5 | 217 | 1069   | S[773]   | -3361.5 | 217 |
| 950    | S[654]   | -1338.5 | 77  | 1010   | S[714]   | -2358.5 | 77  | 1070   | S[774]   | -3378.5 | 77  |
| 951    | S[655]   | -1355.5 | 357 | 1011   | S[715]   | -2375.5 | 357 | 1071   | S[775]   | -3395.5 | 357 |
| 952    | S[656]   | -1372.5 | 217 | 1012   | S[716]   | -2392.5 | 217 | 1072   | S[776]   | -3412.5 | 217 |
| 953    | S[657]   | -1389.5 | 77  | 1013   | S[717]   | -2409.5 | 77  | 1073   | S[777]   | -3429.5 | 77  |
| 954    | S[658]   | -1406.5 | 357 | 1014   | S[718]   | -2426.5 | 357 | 1074   | S[778]   | -3446.5 | 357 |
| 955    | S[659]   | -1423.5 | 217 | 1015   | S[719]   | -2443.5 | 217 | 1075   | S[779]   | -3463.5 | 217 |
| 956    | S[660]   | -1440.5 | 77  | 1016   | S[720]   | -2460.5 | 77  | 1076   | S[780]   | -3480.5 | 77  |
| 957    | S[661]   | -1457.5 | 357 | 1017   | S[721]   | -2477.5 | 357 | 1077   | S[781]   | -3497.5 | 357 |
| 958    | S[662]   | -1474.5 | 217 | 1018   | S[722]   | -2494.5 | 217 | 1078   | S[782]   | -3514.5 | 217 |
| 959    | S[663]   | -1491.5 | 77  | 1019   | S[723]   | -2511.5 | 77  | 1079   | S[783]   | -3531.5 | 77  |
| 960    | S[664]   | -1508.5 | 357 | 1020   | S[724]   | -2528.5 | 357 | 1080   | S[784]   | -3548.5 | 357 |

| number | pad name | x       | y   | number | pad name | x       | y   | number | pad name | x       | y   |
|--------|----------|---------|-----|--------|----------|---------|-----|--------|----------|---------|-----|
| 1081   | S[785]   | -3565.5 | 217 | 1141   | S[845]   | -4585.5 | 217 | 1201   | S[905]   | -5605.5 | 217 |
| 1082   | S[786]   | -3582.5 | 77  | 1142   | S[846]   | -4602.5 | 77  | 1202   | S[906]   | -5622.5 | 77  |
| 1083   | S[787]   | -3599.5 | 357 | 1143   | S[847]   | -4619.5 | 357 | 1203   | S[907]   | -5639.5 | 357 |
| 1084   | S[788]   | -3616.5 | 217 | 1144   | S[848]   | -4636.5 | 217 | 1204   | S[908]   | -5656.5 | 217 |
| 1085   | S[789]   | -3633.5 | 77  | 1145   | S[849]   | -4653.5 | 77  | 1205   | S[909]   | -5673.5 | 77  |
| 1086   | S[790]   | -3650.5 | 357 | 1146   | S[850]   | -4670.5 | 357 | 1206   | S[910]   | -5690.5 | 357 |
| 1087   | S[791]   | -3667.5 | 217 | 1147   | S[851]   | -4687.5 | 217 | 1207   | S[911]   | -5707.5 | 217 |
| 1088   | S[792]   | -3684.5 | 77  | 1148   | S[852]   | -4704.5 | 77  | 1208   | S[912]   | -5724.5 | 77  |
| 1089   | S[793]   | -3701.5 | 357 | 1149   | S[853]   | -4721.5 | 357 | 1209   | S[913]   | -5741.5 | 357 |
| 1090   | S[794]   | -3718.5 | 217 | 1150   | S[854]   | -4738.5 | 217 | 1210   | S[914]   | -5758.5 | 217 |
| 1091   | S[795]   | -3735.5 | 77  | 1151   | S[855]   | -4755.5 | 77  | 1211   | S[915]   | -5775.5 | 77  |
| 1092   | S[796]   | -3752.5 | 357 | 1152   | S[856]   | -4772.5 | 357 | 1212   | S[916]   | -5792.5 | 357 |
| 1093   | S[797]   | -3769.5 | 217 | 1153   | S[857]   | -4789.5 | 217 | 1213   | S[917]   | -5809.5 | 217 |
| 1094   | S[798]   | -3786.5 | 77  | 1154   | S[858]   | -4806.5 | 77  | 1214   | S[918]   | -5826.5 | 77  |
| 1095   | S[799]   | -3803.5 | 357 | 1155   | S[859]   | -4823.5 | 357 | 1215   | S[919]   | -5843.5 | 357 |
| 1096   | S[800]   | -3820.5 | 217 | 1156   | S[860]   | -4840.5 | 217 | 1216   | S[920]   | -5860.5 | 217 |
| 1097   | S[801]   | -3837.5 | 77  | 1157   | S[861]   | -4857.5 | 77  | 1217   | S[921]   | -5877.5 | 77  |
| 1098   | S[802]   | -3854.5 | 357 | 1158   | S[862]   | -4874.5 | 357 | 1218   | S[922]   | -5894.5 | 357 |
| 1099   | S[803]   | -3871.5 | 217 | 1159   | S[863]   | -4891.5 | 217 | 1219   | S[923]   | -5911.5 | 217 |
| 1100   | S[804]   | -3888.5 | 77  | 1160   | S[864]   | -4908.5 | 77  | 1220   | S[924]   | -5928.5 | 77  |
| 1101   | S[805]   | -3905.5 | 357 | 1161   | S[865]   | -4925.5 | 357 | 1221   | S[925]   | -5945.5 | 357 |
| 1102   | S[806]   | -3922.5 | 217 | 1162   | S[866]   | -4942.5 | 217 | 1222   | S[926]   | -5962.5 | 217 |
| 1103   | S[807]   | -3939.5 | 77  | 1163   | S[867]   | -4959.5 | 77  | 1223   | S[927]   | -5979.5 | 77  |
| 1104   | S[808]   | -3956.5 | 357 | 1164   | S[868]   | -4976.5 | 357 | 1224   | S[928]   | -5996.5 | 357 |
| 1105   | S[809]   | -3973.5 | 217 | 1165   | S[869]   | -4993.5 | 217 | 1225   | S[929]   | -6013.5 | 217 |
| 1106   | S[810]   | -3990.5 | 77  | 1166   | S[870]   | -5010.5 | 77  | 1226   | S[930]   | -6030.5 | 77  |
| 1107   | S[811]   | -4007.5 | 357 | 1167   | S[871]   | -5027.5 | 357 | 1227   | S[931]   | -6047.5 | 357 |
| 1108   | S[812]   | -4024.5 | 217 | 1168   | S[872]   | -5044.5 | 217 | 1228   | S[932]   | -6064.5 | 217 |
| 1109   | S[813]   | -4041.5 | 77  | 1169   | S[873]   | -5061.5 | 77  | 1229   | S[933]   | -6081.5 | 77  |
| 1110   | S[814]   | -4058.5 | 357 | 1170   | S[874]   | -5078.5 | 357 | 1230   | S[934]   | -6098.5 | 357 |
| 1111   | S[815]   | -4075.5 | 217 | 1171   | S[875]   | -5095.5 | 217 | 1231   | S[935]   | -6115.5 | 217 |
| 1112   | S[816]   | -4092.5 | 77  | 1172   | S[876]   | -5112.5 | 77  | 1232   | S[936]   | -6132.5 | 77  |
| 1113   | S[817]   | -4109.5 | 357 | 1173   | S[877]   | -5129.5 | 357 | 1233   | S[937]   | -6149.5 | 357 |
| 1114   | S[818]   | -4126.5 | 217 | 1174   | S[878]   | -5146.5 | 217 | 1234   | S[938]   | -6166.5 | 217 |
| 1115   | S[819]   | -4143.5 | 77  | 1175   | S[879]   | -5163.5 | 77  | 1235   | S[939]   | -6183.5 | 77  |
| 1116   | S[820]   | -4160.5 | 357 | 1176   | S[880]   | -5180.5 | 357 | 1236   | S[940]   | -6200.5 | 357 |
| 1117   | S[821]   | -4177.5 | 217 | 1177   | S[881]   | -5197.5 | 217 | 1237   | S[941]   | -6217.5 | 217 |
| 1118   | S[822]   | -4194.5 | 77  | 1178   | S[882]   | -5214.5 | 77  | 1238   | S[942]   | -6234.5 | 77  |
| 1119   | S[823]   | -4211.5 | 357 | 1179   | S[883]   | -5231.5 | 357 | 1239   | S[943]   | -6251.5 | 357 |
| 1120   | S[824]   | -4228.5 | 217 | 1180   | S[884]   | -5248.5 | 217 | 1240   | S[944]   | -6268.5 | 217 |
| 1121   | S[825]   | -4245.5 | 77  | 1181   | S[885]   | -5265.5 | 77  | 1241   | S[945]   | -6285.5 | 77  |
| 1122   | S[826]   | -4262.5 | 357 | 1182   | S[886]   | -5282.5 | 357 | 1242   | S[946]   | -6302.5 | 357 |
| 1123   | S[827]   | -4279.5 | 217 | 1183   | S[887]   | -5299.5 | 217 | 1243   | S[947]   | -6319.5 | 217 |
| 1124   | S[828]   | -4296.5 | 77  | 1184   | S[888]   | -5316.5 | 77  | 1244   | S[948]   | -6336.5 | 77  |
| 1125   | S[829]   | -4313.5 | 357 | 1185   | S[889]   | -5333.5 | 357 | 1245   | S[949]   | -6353.5 | 357 |
| 1126   | S[830]   | -4330.5 | 217 | 1186   | S[890]   | -5350.5 | 217 | 1246   | S[950]   | -6370.5 | 217 |
| 1127   | S[831]   | -4347.5 | 77  | 1187   | S[891]   | -5367.5 | 77  | 1247   | S[951]   | -6387.5 | 77  |
| 1128   | S[832]   | -4364.5 | 357 | 1188   | S[892]   | -5384.5 | 357 | 1248   | S[952]   | -6404.5 | 357 |
| 1129   | S[833]   | -4381.5 | 217 | 1189   | S[893]   | -5401.5 | 217 | 1249   | S[953]   | -6421.5 | 217 |
| 1130   | S[834]   | -4398.5 | 77  | 1190   | S[894]   | -5418.5 | 77  | 1250   | S[954]   | -6438.5 | 77  |
| 1131   | S[835]   | -4415.5 | 357 | 1191   | S[895]   | -5435.5 | 357 | 1251   | S[955]   | -6455.5 | 357 |
| 1132   | S[836]   | -4432.5 | 217 | 1192   | S[896]   | -5452.5 | 217 | 1252   | S[956]   | -6472.5 | 217 |
| 1133   | S[837]   | -4449.5 | 77  | 1193   | S[897]   | -5469.5 | 77  | 1253   | S[957]   | -6489.5 | 77  |
| 1134   | S[838]   | -4466.5 | 357 | 1194   | S[898]   | -5486.5 | 357 | 1254   | S[958]   | -6506.5 | 357 |
| 1135   | S[839]   | -4483.5 | 217 | 1195   | S[899]   | -5503.5 | 217 | 1255   | S[959]   | -6523.5 | 217 |
| 1136   | S[840]   | -4500.5 | 77  | 1196   | S[900]   | -5520.5 | 77  | 1256   | S[960]   | -6540.5 | 77  |
| 1137   | S[841]   | -4517.5 | 357 | 1197   | S[901]   | -5537.5 | 357 | 1257   | S[961]   | -6557.5 | 357 |
| 1138   | S[842]   | -4534.5 | 217 | 1198   | S[902]   | -5554.5 | 217 | 1258   | S[962]   | -6574.5 | 217 |
| 1139   | S[843]   | -4551.5 | 77  | 1199   | S[903]   | -5571.5 | 77  | 1259   | S[963]   | -6591.5 | 77  |
| 1140   | S[844]   | -4568.5 | 357 | 1200   | S[904]   | -5588.5 | 357 | 1260   | S[964]   | -6608.5 | 357 |

| number | pad name | x       | y   | number | pad name | x       | y   | number | pad name | x       | y   |
|--------|----------|---------|-----|--------|----------|---------|-----|--------|----------|---------|-----|
| 1261   | S[965]   | -6625.5 | 217 | 1321   | S[1025]  | -7645.5 | 217 | 1381   | S[1085]  | -8665.5 | 217 |
| 1262   | S[966]   | -6642.5 | 77  | 1322   | S[1026]  | -7662.5 | 77  | 1382   | S[1086]  | -8682.5 | 77  |
| 1263   | S[967]   | -6659.5 | 357 | 1323   | S[1027]  | -7679.5 | 357 | 1383   | S[1087]  | -8699.5 | 357 |
| 1264   | S[968]   | -6676.5 | 217 | 1324   | S[1028]  | -7696.5 | 217 | 1384   | S[1088]  | -8716.5 | 217 |
| 1265   | S[969]   | -6693.5 | 77  | 1325   | S[1029]  | -7713.5 | 77  | 1385   | S[1089]  | -8733.5 | 77  |
| 1266   | S[970]   | -6710.5 | 357 | 1326   | S[1030]  | -7730.5 | 357 | 1386   | S[1090]  | -8750.5 | 357 |
| 1267   | S[971]   | -6727.5 | 217 | 1327   | S[1031]  | -7747.5 | 217 | 1387   | S[1091]  | -8767.5 | 217 |
| 1268   | S[972]   | -6744.5 | 77  | 1328   | S[1032]  | -7764.5 | 77  | 1388   | S[1092]  | -8784.5 | 77  |
| 1269   | S[973]   | -6761.5 | 357 | 1329   | S[1033]  | -7781.5 | 357 | 1389   | S[1093]  | -8801.5 | 357 |
| 1270   | S[974]   | -6778.5 | 217 | 1330   | S[1034]  | -7798.5 | 217 | 1390   | S[1094]  | -8818.5 | 217 |
| 1271   | S[975]   | -6795.5 | 77  | 1331   | S[1035]  | -7815.5 | 77  | 1391   | S[1095]  | -8835.5 | 77  |
| 1272   | S[976]   | -6812.5 | 357 | 1332   | S[1036]  | -7832.5 | 357 | 1392   | S[1096]  | -8852.5 | 357 |
| 1273   | S[977]   | -6829.5 | 217 | 1333   | S[1037]  | -7849.5 | 217 | 1393   | S[1097]  | -8869.5 | 217 |
| 1274   | S[978]   | -6846.5 | 77  | 1334   | S[1038]  | -7866.5 | 77  | 1394   | S[1098]  | -8886.5 | 77  |
| 1275   | S[979]   | -6863.5 | 357 | 1335   | S[1039]  | -7883.5 | 357 | 1395   | S[1099]  | -8903.5 | 357 |
| 1276   | S[980]   | -6880.5 | 217 | 1336   | S[1040]  | -7900.5 | 217 | 1396   | S[1100]  | -8920.5 | 217 |
| 1277   | S[981]   | -6897.5 | 77  | 1337   | S[1041]  | -7917.5 | 77  | 1397   | S[1101]  | -8937.5 | 77  |
| 1278   | S[982]   | -6914.5 | 357 | 1338   | S[1042]  | -7934.5 | 357 | 1398   | S[1102]  | -8954.5 | 357 |
| 1279   | S[983]   | -6931.5 | 217 | 1339   | S[1043]  | -7951.5 | 217 | 1399   | S[1103]  | -8971.5 | 217 |
| 1280   | S[984]   | -6948.5 | 77  | 1340   | S[1044]  | -7968.5 | 77  | 1400   | S[1104]  | -8988.5 | 77  |
| 1281   | S[985]   | -6965.5 | 357 | 1341   | S[1045]  | -7985.5 | 357 | 1401   | S[1105]  | -9005.5 | 357 |
| 1282   | S[986]   | -6982.5 | 217 | 1342   | S[1046]  | -8002.5 | 217 | 1402   | S[1106]  | -9022.5 | 217 |
| 1283   | S[987]   | -6999.5 | 77  | 1343   | S[1047]  | -8019.5 | 77  | 1403   | S[1107]  | -9039.5 | 77  |
| 1284   | S[988]   | -7016.5 | 357 | 1344   | S[1048]  | -8036.5 | 357 | 1404   | S[1108]  | -9056.5 | 357 |
| 1285   | S[989]   | -7033.5 | 217 | 1345   | S[1049]  | -8053.5 | 217 | 1405   | S[1109]  | -9073.5 | 217 |
| 1286   | S[990]   | -7050.5 | 77  | 1346   | S[1050]  | -8070.5 | 77  | 1406   | S[1110]  | -9090.5 | 77  |
| 1287   | S[991]   | -7067.5 | 357 | 1347   | S[1051]  | -8087.5 | 357 | 1407   | S[1111]  | -9107.5 | 357 |
| 1288   | S[992]   | -7084.5 | 217 | 1348   | S[1052]  | -8104.5 | 217 | 1408   | S[1112]  | -9124.5 | 217 |
| 1289   | S[993]   | -7101.5 | 77  | 1349   | S[1053]  | -8121.5 | 77  | 1409   | S[1113]  | -9141.5 | 77  |
| 1290   | S[994]   | -7118.5 | 357 | 1350   | S[1054]  | -8138.5 | 357 | 1410   | S[1114]  | -9158.5 | 357 |
| 1291   | S[995]   | -7135.5 | 217 | 1351   | S[1055]  | -8155.5 | 217 | 1411   | S[1115]  | -9175.5 | 217 |
| 1292   | S[996]   | -7152.5 | 77  | 1352   | S[1056]  | -8172.5 | 77  | 1412   | S[1116]  | -9192.5 | 77  |
| 1293   | S[997]   | -7169.5 | 357 | 1353   | S[1057]  | -8189.5 | 357 | 1413   | S[1117]  | -9209.5 | 357 |
| 1294   | S[998]   | -7186.5 | 217 | 1354   | S[1058]  | -8206.5 | 217 | 1414   | S[1118]  | -9226.5 | 217 |
| 1295   | S[999]   | -7203.5 | 77  | 1355   | S[1059]  | -8223.5 | 77  | 1415   | S[1119]  | -9243.5 | 77  |
| 1296   | S[1000]  | -7220.5 | 357 | 1356   | S[1060]  | -8240.5 | 357 | 1416   | S[1120]  | -9260.5 | 357 |
| 1297   | S[1001]  | -7237.5 | 217 | 1357   | S[1061]  | -8257.5 | 217 | 1417   | S[1121]  | -9277.5 | 217 |
| 1298   | S[1002]  | -7254.5 | 77  | 1358   | S[1062]  | -8274.5 | 77  | 1418   | S[1122]  | -9294.5 | 77  |
| 1299   | S[1003]  | -7271.5 | 357 | 1359   | S[1063]  | -8291.5 | 357 | 1419   | S[1123]  | -9311.5 | 357 |
| 1300   | S[1004]  | -7288.5 | 217 | 1360   | S[1064]  | -8308.5 | 217 | 1420   | S[1124]  | -9328.5 | 217 |
| 1301   | S[1005]  | -7305.5 | 77  | 1361   | S[1065]  | -8325.5 | 77  | 1421   | S[1125]  | -9345.5 | 77  |
| 1302   | S[1006]  | -7322.5 | 357 | 1362   | S[1066]  | -8342.5 | 357 | 1422   | S[1126]  | -9362.5 | 357 |
| 1303   | S[1007]  | -7339.5 | 217 | 1363   | S[1067]  | -8359.5 | 217 | 1423   | S[1127]  | -9379.5 | 217 |
| 1304   | S[1008]  | -7356.5 | 77  | 1364   | S[1068]  | -8376.5 | 77  | 1424   | S[1128]  | -9396.5 | 77  |
| 1305   | S[1009]  | -7373.5 | 357 | 1365   | S[1069]  | -8393.5 | 357 | 1425   | S[1129]  | -9413.5 | 357 |
| 1306   | S[1010]  | -7390.5 | 217 | 1366   | S[1070]  | -8410.5 | 217 | 1426   | S[1130]  | -9430.5 | 217 |
| 1307   | S[1011]  | -7407.5 | 77  | 1367   | S[1071]  | -8427.5 | 77  | 1427   | S[1131]  | -9447.5 | 77  |
| 1308   | S[1012]  | -7424.5 | 357 | 1368   | S[1072]  | -8444.5 | 357 | 1428   | S[1132]  | -9464.5 | 357 |
| 1309   | S[1013]  | -7441.5 | 217 | 1369   | S[1073]  | -8461.5 | 217 | 1429   | S[1133]  | -9481.5 | 217 |
| 1310   | S[1014]  | -7458.5 | 77  | 1370   | S[1074]  | -8478.5 | 77  | 1430   | S[1134]  | -9498.5 | 77  |
| 1311   | S[1015]  | -7475.5 | 357 | 1371   | S[1075]  | -8495.5 | 357 | 1431   | S[1135]  | -9515.5 | 357 |
| 1312   | S[1016]  | -7492.5 | 217 | 1372   | S[1076]  | -8512.5 | 217 | 1432   | S[1136]  | -9532.5 | 217 |
| 1313   | S[1017]  | -7509.5 | 77  | 1373   | S[1077]  | -8529.5 | 77  | 1433   | S[1137]  | -9549.5 | 77  |
| 1314   | S[1018]  | -7526.5 | 357 | 1374   | S[1078]  | -8546.5 | 357 | 1434   | S[1138]  | -9566.5 | 357 |
| 1315   | S[1019]  | -7543.5 | 217 | 1375   | S[1079]  | -8563.5 | 217 | 1435   | S[1139]  | -9583.5 | 217 |
| 1316   | S[1020]  | -7560.5 | 77  | 1376   | S[1080]  | -8580.5 | 77  | 1436   | S[1140]  | -9600.5 | 77  |
| 1317   | S[1021]  | -7577.5 | 357 | 1377   | S[1081]  | -8597.5 | 357 | 1437   | S[1141]  | -9617.5 | 357 |
| 1318   | S[1022]  | -7594.5 | 217 | 1378   | S[1082]  | -8614.5 | 217 | 1438   | S[1142]  | -9634.5 | 217 |
| 1319   | S[1023]  | -7611.5 | 77  | 1379   | S[1083]  | -8631.5 | 77  | 1439   | S[1143]  | -9651.5 | 77  |
| 1320   | S[1024]  | -7628.5 | 357 | 1380   | S[1084]  | -8648.5 | 357 | 1440   | S[1144]  | -9668.5 | 357 |

| number | pad name | x        | y   | number | pad name      | x        | y   | number | pad name      | x      | y    |
|--------|----------|----------|-----|--------|---------------|----------|-----|--------|---------------|--------|------|
| 1441   | S[1145]  | -9685.5  | 217 | 1471   | S[1175]       | -10195.5 | 217 | 1501   | Dummy         | -10864 | 377  |
| 1442   | S[1146]  | -9702.5  | 77  | 1472   | S[1176]       | -10212.5 | 77  | 1502   | Dummy         | -10914 | 377  |
| 1443   | S[1147]  | -9719.5  | 357 | 1473   | S[1177]       | -10229.5 | 357 | 1503   | Dummy         | -11179 | 397  |
| 1444   | S[1148]  | -9736.5  | 217 | 1474   | S[1178]       | -10246.5 | 217 | 1504   | SHIELDING[74] | -11049 | 357  |
| 1445   | S[1149]  | -9753.5  | 77  | 1475   | S[1179]       | -10263.5 | 77  | 1505   | OE_V_R        | -11179 | 317  |
| 1446   | S[1150]  | -9770.5  | 357 | 1476   | S[1180]       | -10280.5 | 357 | 1506   | SHIELDING[75] | -11049 | 277  |
| 1447   | S[1151]  | -9787.5  | 217 | 1477   | S[1181]       | -10297.5 | 217 | 1507   | UD_R          | -11179 | 237  |
| 1448   | S[1152]  | -9804.5  | 77  | 1478   | S[1182]       | -10314.5 | 77  | 1508   | SHIELDING[76] | -11049 | 197  |
| 1449   | S[1153]  | -9821.5  | 357 | 1479   | S[1183]       | -10331.5 | 357 | 1509   | CKV_R         | -11179 | 157  |
| 1450   | S[1154]  | -9838.5  | 217 | 1480   | S[1184]       | -10348.5 | 217 | 1510   | SHIELDING[77] | -11049 | 117  |
| 1451   | S[1155]  | -9855.5  | 77  | 1481   | S[1185]       | -10365.5 | 77  | 1511   | STV1_R        | -11179 | 77   |
| 1452   | S[1156]  | -9872.5  | 357 | 1482   | S[1186]       | -10382.5 | 357 | 1512   | SHIELDING[78] | -11049 | 37   |
| 1453   | S[1157]  | -9889.5  | 217 | 1483   | S[1187]       | -10399.5 | 217 | 1513   | STV2_R        | -11179 | -3   |
| 1454   | S[1158]  | -9906.5  | 77  | 1484   | S[1188]       | -10416.5 | 77  | 1514   | SHIELDING[79] | -11049 | -43  |
| 1455   | S[1159]  | -9923.5  | 357 | 1485   | S[1189]       | -10433.5 | 357 | 1515   | STV1_R        | -11179 | -83  |
| 1456   | S[1160]  | -9940.5  | 217 | 1486   | S[1190]       | -10450.5 | 217 | 1516   | SHIELDING[80] | -11049 | -123 |
| 1457   | S[1161]  | -9957.5  | 77  | 1487   | S[1191]       | -10467.5 | 77  | 1517   | TP[9]         | -11179 | -163 |
| 1458   | S[1162]  | -9974.5  | 357 | 1488   | S[1192]       | -10484.5 | 357 | 1518   | SHIELDING[81] | -11049 | -203 |
| 1459   | S[1163]  | -9991.5  | 217 | 1489   | S[1193]       | -10501.5 | 217 | 1519   | Dummy         | -11179 | -243 |
| 1460   | S[1164]  | -10008.5 | 77  | 1490   | S[1194]       | -10518.5 | 77  | 1520   | SHIELDING[82] | -11049 | -283 |
| 1461   | S[1165]  | -10025.5 | 357 | 1491   | S[1195]       | -10535.5 | 357 | 1521   | TP[10]        | -11179 | -323 |
| 1462   | S[1166]  | -10042.5 | 217 | 1492   | S[1196]       | -10552.5 | 217 | 1522   | TP[11]        | -11049 | -363 |
| 1463   | S[1167]  | -10059.5 | 77  | 1493   | S[1197]       | -10569.5 | 77  |        |               |        |      |
| 1464   | S[1168]  | -10076.5 | 357 | 1494   | S[1198]       | -10586.5 | 357 |        |               |        |      |
| 1465   | S[1169]  | -10093.5 | 217 | 1495   | S[1199]       | -10603.5 | 217 |        |               |        |      |
| 1466   | S[1170]  | -10110.5 | 77  | 1496   | S[1200]       | -10620.5 | 77  |        |               |        |      |
| 1467   | S[1171]  | -10127.5 | 357 | 1497   | SHIELDING[72] | -10664   | 377 |        |               |        |      |
| 1468   | S[1172]  | -10144.5 | 217 | 1498   | COM1_T        | -10714   | 377 |        |               |        |      |
| 1469   | S[1173]  | -10161.5 | 77  | 1499   | COM1_T        | -10764   | 377 |        |               |        |      |
| 1470   | S[1174]  | -10178.5 | 357 | 1500   | Dummy         | -10814   | 377 |        |               |        |      |

Note: IC Pads coordination values that concern thermal shift issue (After bonding Process)

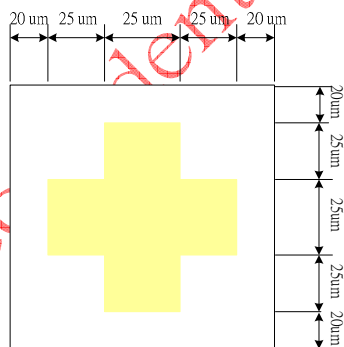
#### Alignment Mark

--Alignment mark coordinate

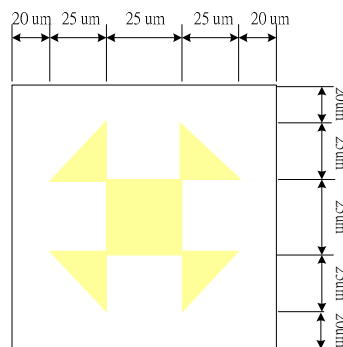
Left (-10773, 93)

Right (10773, 93)

--Alignment Mark size



Alignment Mark: Left



Alignment Mark: Right

## 16. Revision History

| Version No. | Date       | Page | Description |
|-------------|------------|------|-------------|
| V0.01       | 2012/10/12 | All  | New creat   |

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