

**a-Si TFT LCD Single Chip Driver
320RGBx240 Resolution and 16.7M color**

Datasheet
Preliminary

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1. Introduction

ILI9322 is a one-chip SoC driver for a-TFT liquid crystal display with resolution of 320RGBx240 dots, which can handle 256 (8-bit) gray scale levels for each color and drive versatile panels with max. 320RGBx240 dots resolution and delta or strip color filter array (CFA). The source driver, timing controller, DC/DC charge-pump, regulator, level shifter, and gamma correction circuits for R, G, B are also integrated in ILI9322, which generates all control signals to drive a-TFT panels.

ILI9322 has four kinds of system interfaces for display data transfers, which are 8-bit serial RGB interface, 24-bit parallel RGB interface, ITU-R BT.601 interface and ITU-R BT.656 interface. The SPI interface is used to access the internal registers and control the function of ILI9322.

The internal power supply circuit is implemented to provide all the necessary power levels of source, gate, gamma, I/O and internal digital circuit.

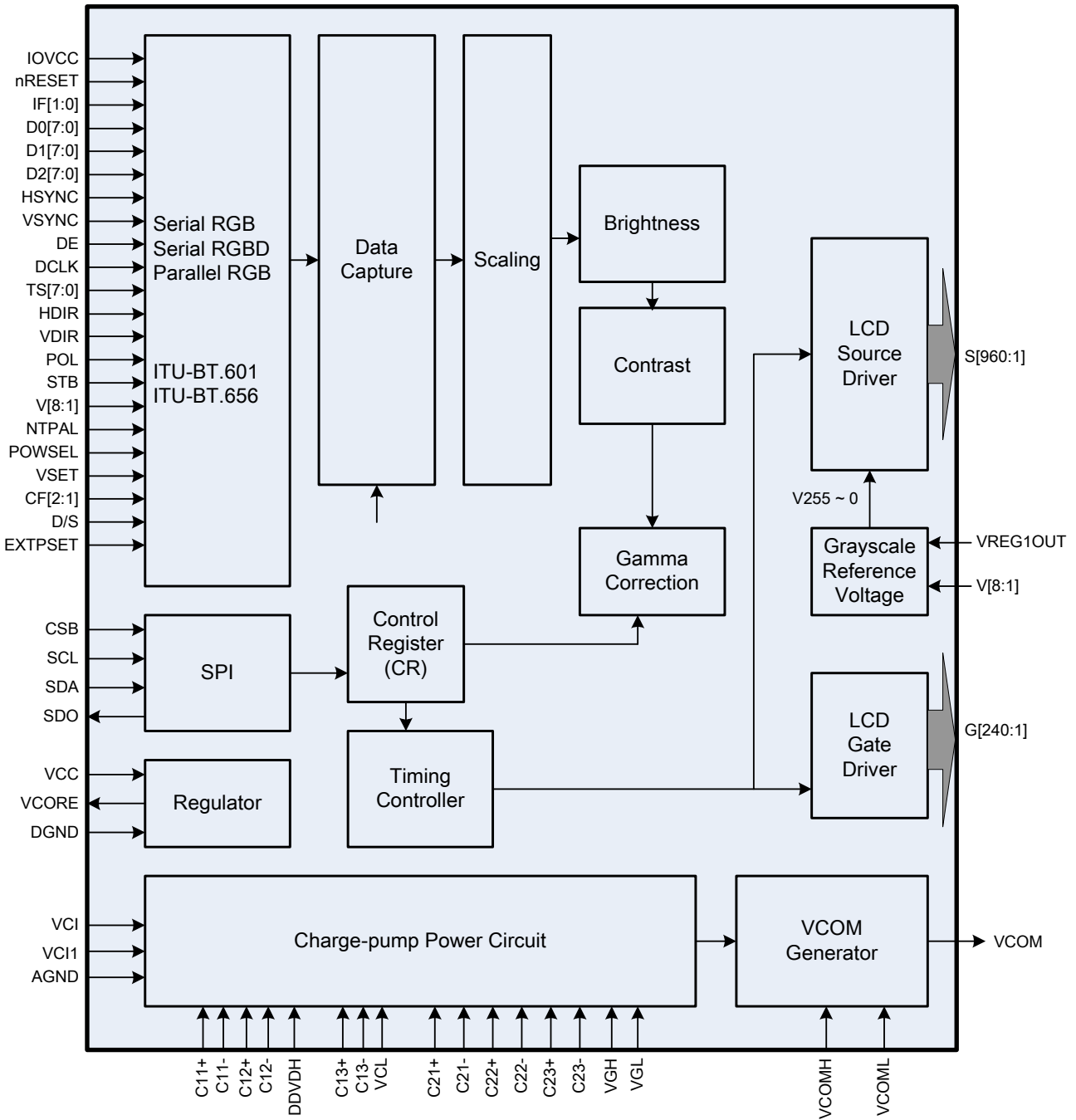
The ILI9322 supports power saving operation with single input power to generate voltage to drive liquid crystal. The ILI9322 also supports versatile input interfaces of various digital video standards to make ILI9322 the ideal solution for any medium or small sized portable battery-driven products such as the digital still camera, digital camcorder, and media player applications where long battery life and board size are major concern.

2. Features

- ◆ Single chip solution for landscape QVGA a-TFT LCD display driver
- ◆ Incorporate 960-channel source driver and 240-channel gate driver
- ◆ 320RGBx240-dot resolution capable with real 16.7M display color
- ◆ System interfaces
 - 8-bit serial RGB interface
 - 24-bit parallel RGB interface
 - 8-bit ITU-R BT.601
 - 8-bit ITU-R BT.656 with embedded syncs
 - 3-wire serial interface (SPI) for registers configuration: CSB, SCL, SDA, SDO
- ◆ Support NTSC/PAL TV system
- ◆ Line/Frame inversion is supported
- ◆ Reversible Up/Down and Left/Right display direction
- ◆ Built-in power supply circuit for all the power levels
- ◆ Incorporate step-up circuits for stepping up a liquid crystal drive voltage level up to 6 times (x6)
- ◆ Booster circuit is implemented to provide all the voltage for LCD display
- ◆ Low -power consumption architecture
 - standby mode
 - Low operating power supplies:
 - IOVcc = 1.65 ~ 3.6 V (interface I/O)

- Vcc = 2.7 ~ 3.6 V (internal logic)
- Vci = 2.7 ~ 3.6V (analog)
- LCD Voltage Drive: VREG1OUT - AGND = 3.6 ~6.0V

3. Block Diagram



4. Pin Descriptions

| Pin Name | I/O | Type | Descriptions | | | | | | | | | | | | | | | |
|-------------------------------|-----|-------------------------------|---|-----|-----|--------------------------|---|---|----------------------------|---|---|-------------------------------|---|---|--------------|---|---|--------------|
| Input Interface | | | | | | | | | | | | | | | | | | |
| IF2, IF1 | I | IOVcc | System interface selection pins <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>IF2</th> <th>IF1</th> <th>Interface Mode Selection</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>8-bit Serial RGB Interface</td> </tr> <tr> <td>0</td> <td>1</td> <td>24-bit Parallel RGB Interface</td> </tr> <tr> <td>1</td> <td>0</td> <td>ITU-R BT.601</td> </tr> <tr> <td>1</td> <td>1</td> <td>ITU-R BT.656</td> </tr> </tbody> </table> | IF2 | IF1 | Interface Mode Selection | 0 | 0 | 8-bit Serial RGB Interface | 0 | 1 | 24-bit Parallel RGB Interface | 1 | 0 | ITU-R BT.601 | 1 | 1 | ITU-R BT.656 |
| IF2 | IF1 | Interface Mode Selection | | | | | | | | | | | | | | | | |
| 0 | 0 | 8-bit Serial RGB Interface | | | | | | | | | | | | | | | | |
| 0 | 1 | 24-bit Parallel RGB Interface | | | | | | | | | | | | | | | | |
| 1 | 0 | ITU-R BT.601 | | | | | | | | | | | | | | | | |
| 1 | 1 | ITU-R BT.656 | | | | | | | | | | | | | | | | |
| DCLK | I | IOVcc | Clock signal The input data is latched on the rising edge of CLK. | | | | | | | | | | | | | | | |
| D0[7:0] D1[7:0] D2[7:0] | I | IOVcc | Digital data input Dx7 is the MSB and Dx0 is LSB. When the serial RGB interface or ITU-R BT601/656 input interface is selected, the D0[7:0] data bus are used, and the other pins are not used. Fix unused pins to GND level when not in use. | | | | | | | | | | | | | | | |
| VSYNC | I | IOVcc | Vertical synchronizing input signal When the ITU-R BT656 input interface is selected, this pin is unused and short VSYNC pin to GND. | | | | | | | | | | | | | | | |
| HSYNC | I | IOVcc | Horizontal synchronizing input signal When the ITU-R BT656 input interface is selected, this pin is unused and short HSYNC pin to GND. | | | | | | | | | | | | | | | |
| DE | I | IOVcc | Input data enable signal VSYNC+HSYNC mode: This pin is shorted to GND normally and the back/front porch is determined by the control register. VSYNC+HSYNC+DE mode: The valid data is determined by the VSYNC+HSYNC+DE pin. DE mode: VSYNC and HSYNC are unused and shorted to GND. The valid input data is determined by DE pin. Fix DE to GND level when not in use. | | | | | | | | | | | | | | | |
| HDIR | I | IOVcc | Data Shift direction When HDIR =L, OUT960 → OUT959 → → OUT1 When HDIR =H, OUT1 → OUT2 → → OUT960 Fix HDIR to GND level when not in use. | | | | | | | | | | | | | | | |
| VDIR | I | IOVcc | Scan direction selection When VDIR=L, scan direction is from bottom to top (reverse scan) When VDIR=H, scan direction is from top to bottom (normal scan) Fix VDIR to GND level when not in use. | | | | | | | | | | | | | | | |
| POL | O | IOVcc | Polarity output signal When POL=L, output voltage is negative polarity. When POL=H, output voltage is positive polarity. Let POL as floating when not used. | | | | | | | | | | | | | | | |
| STB | I | IOVcc | Operation mode selection STB=L, ILI9322 enters the standby mode and all outputs stop. STB=H, ILI9322 enters normal operation mode. Fix STB to GND level when not in use. | | | | | | | | | | | | | | | |
| POWSEL | I | IOVcc | Internal/external power selection When POWSEL =H, the external power supply is applied (internal charge-pump stops). When POWSEL =L, internal charge-pump is enabled. | | | | | | | | | | | | | | | |
| NTPAL | O | IOVcc | NTSC or PAL mode auto detection result When NTPAL=H, NTSC input signal is detected. | | | | | | | | | | | | | | | |

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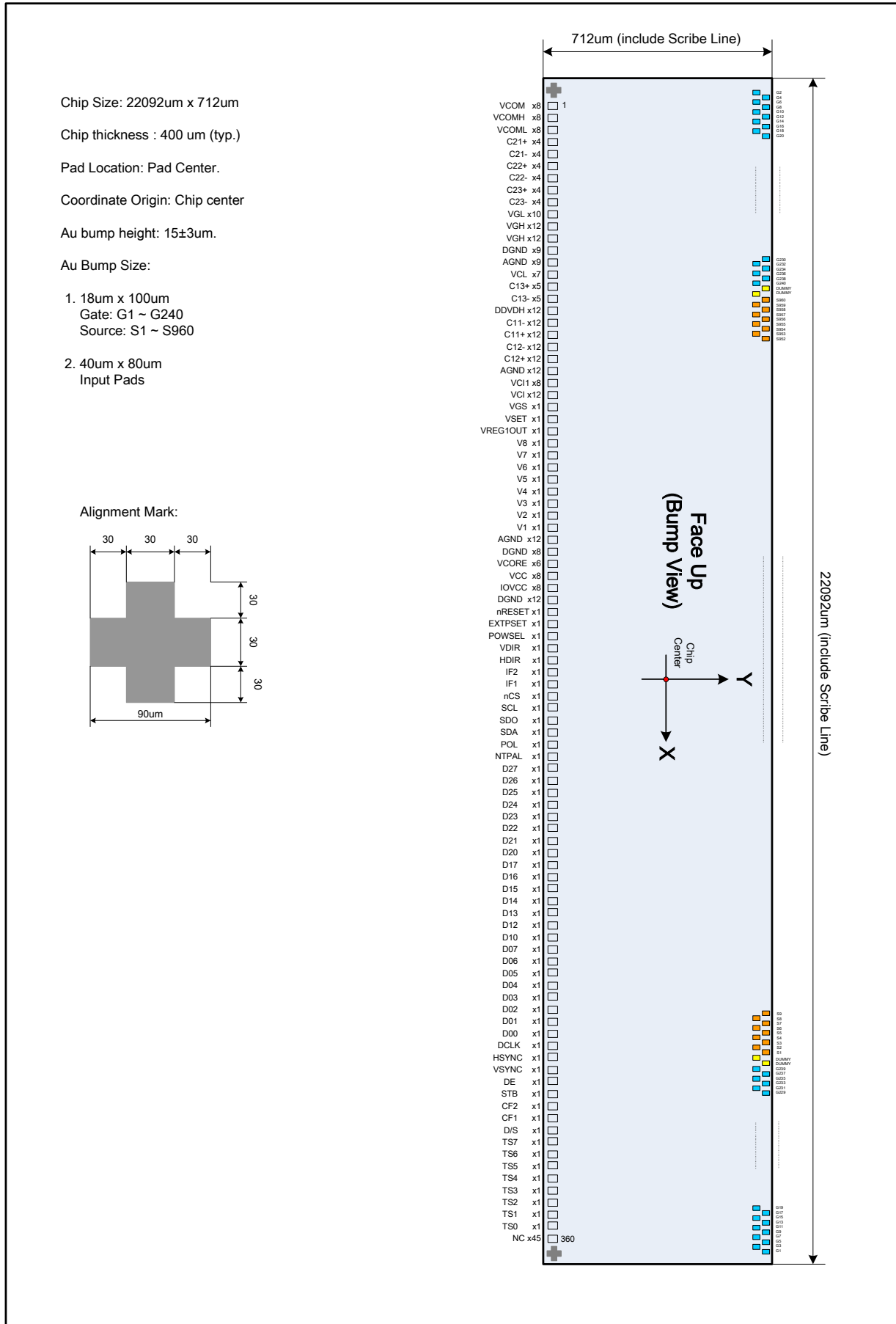
| Pin Name | I/O | Type | Descriptions |
|--|-----|-----------------------|---|
| | | | When NTPAL=L, PAL input signal is detected. Let NTPAL as floating when not used. |
| VSET | I | IOVcc | Gamma correction internal/external voltage selection When VSET=L, internal gamma correction voltage selected. When VSET=H, external gamma correction voltage selected. |
| VGS | I | VREG1OUT | Gamma correction adjustment input. This pin is tied to GND for normal operation. |
| V1 ~ V8 | I | VREG1OUT | Gamma correction adjustment input voltage Let V1~V8 as floating when not used. |
| CF[2:1] | I | IOVcc | Select the delta type color filter arrangement |
| D/S | I | IOVcc | Color filter type selection When D/S =H, stripe CF type When D/S =L, delta CF type |
| EXTPSET | I | IOVcc | External pin control signal EXTPSET = H, Using the register to control the HDIR, VDIR and STB. EXTPSET = L, Using the I/O pin control the HDIR, VDIR and STB. |
| nRESET | I | IOVcc | A reset pin. Initializes the ILI9322 with a low input. Be sure to execute a power-on reset after supplying power. |
| CSB | I | IOVcc | A chip select signal. CSB = L: the ILI9322 is selected and accessible CSB = H: the ILI9322 is not selected and not accessible Fix CSB to the IOVCC level when not in use. |
| SCL | I | IOVcc | SPI clock signal. Fix SCL to GND level when not in use. |
| SDA | I | IOVcc | SPI interface input pin. The data is latched on the rising edge of the SCL signal. Fix SDA to GND level when not in use. |
| SDO | O | IOVcc | SPI interface output pin. The data is outputted on the falling edge of the SCL signal. Let SDO as floating when not used. |
| LCD Driving signals | | | |
| S[960:1] | O | VREG1OUT | Source driver outputs |
| G[240:1] | I | VREG1OUT | Gate driver outputs |
| VCOM | O | TFT common electrode | A supply voltage to the common electrode of TFT panel. VCOM is AC voltage alternating signal between the VCOMH and VCOML levels. |
| VCOMH | O | Stabilizing capacitor | The high level of VCOM AC voltage. Connect to a stabilizing capacitor. |
| VCOML | O | Stabilizing capacitor | The low level of VCOM AC voltage. Adjust the VCOML level with the VDV bits. Connect to a stabilizing capacitor. To fix the VCOML level to AGND and set VCL_EN = "0". In this case, capacitor connection is not necessary. |
| Charge-pump and Regulator Circuit | | | |
| VCC | I | Power | Digital power supply VCC = 2.7V ~ 3.6V |
| Vcore | O | Stabilizing capacitor | Digital power (internal generation) Vcore= 1.8V |
| GND | I | Power | Digital ground |
| IOVcc | I | Power | Interface power supply IOVCC= 1.65V ~ 3.6V |
| VCI | I | Power supply | A supply voltage to the analog circuit. Connect to an external power supply of 2.7V ~ 3.6V. |
| VCI1 | I | Stabilizing capacitor | Regulated voltage VCI1 is regulated from VCI. |
| AGND | I | Power supply | AGND for the analog side: AGND = 0V. In case of COG, connect to GND on the FPC to prevent noise. |

| Pin Name | I/O | Type | Descriptions |
|--|-----|-----------------------|--|
| DDVDH | O | Stabilizing capacitor | Output voltage from the step-up circuit 1, which is generated from VCI1. Place a stabilizing capacitor between AGND. |
| VREG1OUT | O | Stabilizing capacitor | Output voltage from the step-up circuit 1. The step-up factor is set by "BT" bits. VREG1OUT= 3.6 ~6.0V Place a stabilizing capacitor between AGND. |
| VGH | I | Stabilizing capacitor | Power supply for the gate driver. |
| VGL | I | Stabilizing capacitor | Power supply for the gate driver. |
| VCL | O | Stabilizing capacitor | VcomL driver power supply. VCLC = 0 ~ -3.0V. Place a stabilizing capacitor between AGND |
| C11+, C11- C12+, C12- | I/O | Step-up capacitor | Capacitor connection pins for the step-up circuit DDVDH |
| C13+, C13- | I/O | Step-up capacitor | Capacitor connection pins for the step-up circuit VCL |
| C21+, C21- C22+, C22- C23+, C23- | I/O | Step-up capacitor | Capacitor connection pins for the step-up circuit VGH/VGL. |
| Test Pads | | | |
| TS[7:0] | I | IOVcc | Test pin. Leave these pin as floating |
| DUMMY | - | IOVcc | Test pin. Leave these pin as floating |
| NC | - | IOVcc | Test pin. Leave these pin as floating |

Liquid crystal power supply specifications Table 1

| No. | Item | Description | |
|-----|-----------------------------------|----------------------------------|--------------------------|
| 1 | TFT Source Driver | 960 pins (320 x RGB) | |
| 2 | TFT Gate Driver | 240 pins | |
| 3 | TFT Display's Capacitor Structure | Cst structure only (Common VCOM) | |
| 4 | Liquid Crystal Drive Output | S[960:1] | V0 ~ V255 grayscales |
| | | G[240:1] | VGH - VGL |
| | | VCOM | VCOMH - VCOML: Amplitude |
| 5 | Input Voltage | IOVcc | 1.65 ~ 3.6V |
| | | Vcc | 2.7V ~ 3.6V |
| | | VCI | 2.7V ~ 3.6V |
| 6 | Liquid Crystal Drive Voltages | DDVDH | 4.5V ~ 6.0V |
| | | VREG1OUT | 4.0V ~ 5.5V |
| | | VGH | 10V ~ 18V |
| | | VGL | -9V ~ -15V |
| | | VCL | 0V ~ -3.0V |
| | | VGH - VGL | Max. 32V |
| | | VCI - VCL | Max. 6.0V |
| 7 | Internal Step-up Circuits | DDVDH | VCI1 x2 |
| | | VGH | VCI1 x4, x5, x6 |
| | | VGL | VCI1 x-3, x-4, x-5 |
| | | VCL | VCI1 x-1 |

5. Pad Arrangement and Coordination



| No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y |
|-----|-------|--------|------|-----|------|-------|------|-----|-------|-------|------|-----|----------|-------|------|-----|-------|------|------|
| 1 | VCOM | -10770 | -266 | 51 | VGL | -7770 | -266 | 101 | C13- | -4770 | -266 | 151 | C12- | -1770 | -266 | 201 | V8 | 1230 | -266 |
| 2 | VCOM | -10710 | -266 | 52 | VGL | -7710 | -266 | 102 | C13- | -4710 | -266 | 152 | C12- | -1710 | -266 | 202 | V7 | 1290 | -266 |
| 3 | VCOM | -10650 | -266 | 53 | VGL | -7650 | -266 | 103 | C13- | -4650 | -266 | 153 | C12- | -1650 | -266 | 203 | V6 | 1350 | -266 |
| 4 | VCOM | -10590 | -266 | 54 | VGL | -7590 | -266 | 104 | C13- | -4590 | -266 | 154 | C12+ | -1590 | -266 | 204 | V5 | 1410 | -266 |
| 5 | VCOM | -10530 | -266 | 55 | VGL | -7530 | -266 | 105 | C13- | -4530 | -266 | 155 | C12+ | -1530 | -266 | 205 | V4 | 1470 | -266 |
| 6 | VCOM | -10470 | -266 | 56 | VGL | -7470 | -266 | 106 | DDVDH | -4470 | -266 | 156 | C12+ | -1470 | -266 | 206 | V3 | 1530 | -266 |
| 7 | VCOM | -10410 | -266 | 57 | VGL | -7410 | -266 | 107 | DDVDH | -4410 | -266 | 157 | C12+ | -1410 | -266 | 207 | V2 | 1590 | -266 |
| 8 | VCOM | -10350 | -266 | 58 | VGL | -7350 | -266 | 108 | DDVDH | -4350 | -266 | 158 | C12+ | -1350 | -266 | 208 | V1 | 1650 | -266 |
| 9 | VCOMH | -10290 | -266 | 59 | VGH | -7290 | -266 | 109 | DDVDH | -4290 | -266 | 159 | C12+ | -1290 | -266 | 209 | AGND | 1710 | -266 |
| 10 | VCOMH | -10230 | -266 | 60 | VGH | -7230 | -266 | 110 | DDVDH | -4230 | -266 | 160 | C12+ | -1230 | -266 | 210 | AGND | 1770 | -266 |
| 11 | VCOMH | -10170 | -266 | 61 | VGH | -7170 | -266 | 111 | DDVDH | -4170 | -266 | 161 | C12+ | -1170 | -266 | 211 | AGND | 1830 | -266 |
| 12 | VCOMH | -10110 | -266 | 62 | VGH | -7110 | -266 | 112 | DDVDH | -4110 | -266 | 162 | C12+ | -1110 | -266 | 212 | AGND | 1890 | -266 |
| 13 | VCOMH | -10050 | -266 | 63 | VGH | -7050 | -266 | 113 | DDVDH | -4050 | -266 | 163 | C12+ | -1050 | -266 | 213 | AGND | 1950 | -266 |
| 14 | VCOMH | -9990 | -266 | 64 | VGH | -6990 | -266 | 114 | DDVDH | -3990 | -266 | 164 | C12+ | -990 | -266 | 214 | AGND | 2010 | -266 |
| 15 | VCOMH | -9930 | -266 | 65 | VGH | -6930 | -266 | 115 | DDVDH | -3930 | -266 | 165 | C12+ | -930 | -266 | 215 | AGND | 2070 | -266 |
| 16 | VCOMH | -9870 | -266 | 66 | VGH | -6870 | -266 | 116 | DDVDH | -3870 | -266 | 166 | AGND | -870 | -266 | 216 | AGND | 2130 | -266 |
| 17 | VCOML | -9810 | -266 | 67 | VGH | -6810 | -266 | 117 | DDVDH | -3810 | -266 | 167 | AGND | -810 | -266 | 217 | AGND | 2190 | -266 |
| 18 | VCOML | -9750 | -266 | 68 | VGH | -6750 | -266 | 118 | C11- | -3750 | -266 | 168 | AGND | -750 | -266 | 218 | AGND | 2250 | -266 |
| 19 | VCOML | -9690 | -266 | 69 | VGH | -6690 | -266 | 119 | C11- | -3690 | -266 | 169 | AGND | -690 | -266 | 219 | AGND | 2310 | -266 |
| 20 | VCOML | -9630 | -266 | 70 | VGH | -6630 | -266 | 120 | C11- | -3630 | -266 | 170 | AGND | -630 | -266 | 220 | AGND | 2370 | -266 |
| 21 | VCOML | -9570 | -266 | 71 | DGND | -6570 | -266 | 121 | C11- | -3570 | -266 | 171 | AGND | -570 | -266 | 221 | DGND | 2430 | -266 |
| 22 | VCOML | -9510 | -266 | 72 | DGND | -6510 | -266 | 122 | C11- | -3510 | -266 | 172 | AGND | -510 | -266 | 222 | DGND | 2490 | -266 |
| 23 | VCOML | -9450 | -266 | 73 | DGND | -6450 | -266 | 123 | C11- | -3450 | -266 | 173 | AGND | -450 | -266 | 223 | DGND | 2550 | -266 |
| 24 | VCOML | -9390 | -266 | 74 | DGND | -6390 | -266 | 124 | C11- | -3390 | -266 | 174 | AGND | -390 | -266 | 224 | DGND | 2610 | -266 |
| 25 | C21+ | -9330 | -266 | 75 | DGND | -6330 | -266 | 125 | C11- | -3330 | -266 | 175 | AGND | -330 | -266 | 225 | DGND | 2670 | -266 |
| 26 | C21+ | -9270 | -266 | 76 | DGND | -6270 | -266 | 126 | C11- | -3270 | -266 | 176 | AGND | -270 | -266 | 226 | DGND | 2730 | -266 |
| 27 | C21+ | -9210 | -266 | 77 | DGND | -6210 | -266 | 127 | C11- | -3210 | -266 | 177 | AGND | -210 | -266 | 227 | DGND | 2790 | -266 |
| 28 | C21+ | -9150 | -266 | 78 | DGND | -6150 | -266 | 128 | C11- | -3150 | -266 | 178 | VCI1 | -150 | -266 | 228 | DGND | 2850 | -266 |
| 29 | C21- | -9090 | -266 | 79 | DGND | -6090 | -266 | 129 | C11- | -3090 | -266 | 179 | VCI1 | -90 | -266 | 229 | VCORE | 2910 | -266 |
| 30 | C21- | -9030 | -266 | 80 | AGND | -6030 | -266 | 130 | C11+ | -3030 | -266 | 180 | VCI1 | -30 | -266 | 230 | VCORE | 2970 | -266 |
| 31 | C21- | -8970 | -266 | 81 | AGND | -5970 | -266 | 131 | C11+ | -2970 | -266 | 181 | VCI1 | 30 | -266 | 231 | VCORE | 3030 | -266 |
| 32 | C21- | -8910 | -266 | 82 | AGND | -5910 | -266 | 132 | C11+ | -2910 | -266 | 182 | VCI1 | 90 | -266 | 232 | VCORE | 3090 | -266 |
| 33 | C22+ | -8850 | -266 | 83 | AGND | -5850 | -266 | 133 | C11+ | -2850 | -266 | 183 | VCI1 | 150 | -266 | 233 | VCORE | 3150 | -266 |
| 34 | C22+ | -8790 | -266 | 84 | AGND | -5790 | -266 | 134 | C11+ | -2790 | -266 | 184 | VCI1 | 210 | -266 | 234 | VCORE | 3210 | -266 |
| 35 | C22+ | -8730 | -266 | 85 | AGND | -5730 | -266 | 135 | C11+ | -2730 | -266 | 185 | VCI1 | 270 | -266 | 235 | VCC | 3270 | -266 |
| 36 | C22+ | -8670 | -266 | 86 | AGND | -5670 | -266 | 136 | C11+ | -2670 | -266 | 186 | VCI | 330 | -266 | 236 | VCC | 3330 | -266 |
| 37 | C22- | -8610 | -266 | 87 | AGND | -5610 | -266 | 137 | C11+ | -2610 | -266 | 187 | VCI | 390 | -266 | 237 | VCC | 3390 | -266 |
| 38 | C22- | -8550 | -266 | 88 | AGND | -5550 | -266 | 138 | C11+ | -2550 | -266 | 188 | VCI | 450 | -266 | 238 | VCC | 3450 | -266 |
| 39 | C22- | -8490 | -266 | 89 | VCL | -5490 | -266 | 139 | C11+ | -2490 | -266 | 189 | VCI | 510 | -266 | 239 | VCC | 3510 | -266 |
| 40 | C22- | -8430 | -266 | 90 | VCL | -5430 | -266 | 140 | C11+ | -2430 | -266 | 190 | VCI | 570 | -266 | 240 | VCC | 3570 | -266 |
| 41 | C23+ | -8370 | -266 | 91 | VCL | -5370 | -266 | 141 | C11+ | -2370 | -266 | 191 | VCI | 630 | -266 | 241 | VCC | 3630 | -266 |
| 42 | C23+ | -8310 | -266 | 92 | VCL | -5310 | -266 | 142 | C12- | -2310 | -266 | 192 | VCI | 690 | -266 | 242 | VCC | 3690 | -266 |
| 43 | C23+ | -8250 | -266 | 93 | VCL | -5250 | -266 | 143 | C12- | -2250 | -266 | 193 | VCI | 750 | -266 | 243 | IOVCC | 3750 | -266 |
| 44 | C23+ | -8190 | -266 | 94 | VCL | -5190 | -266 | 144 | C12- | -2190 | -266 | 194 | VCI | 810 | -266 | 244 | IOVCC | 3810 | -266 |
| 45 | C23- | -8130 | -266 | 95 | VCL | -5130 | -266 | 145 | C12- | -2130 | -266 | 195 | VCI | 870 | -266 | 245 | IOVCC | 3870 | -266 |
| 46 | C23- | -8070 | -266 | 96 | C13+ | -5070 | -266 | 146 | C12- | -2070 | -266 | 196 | VCI | 930 | -266 | 246 | IOVCC | 3930 | -266 |
| 47 | C23- | -8010 | -266 | 97 | C13+ | -5010 | -266 | 147 | C12- | -2010 | -266 | 197 | VCI | 990 | -266 | 247 | IOVCC | 3990 | -266 |
| 48 | C23- | -7950 | -266 | 98 | C13+ | -4950 | -266 | 148 | C12- | -1950 | -266 | 198 | VGS | 1050 | -266 | 248 | IOVCC | 4050 | -266 |
| 49 | VGL | -7890 | -266 | 99 | C13+ | -4890 | -266 | 149 | C12- | -1890 | -266 | 199 | VSET | 1110 | -266 | 249 | IOVCC | 4110 | -266 |
| 50 | VGL | -7830 | -266 | 100 | C13+ | -4830 | -266 | 150 | C12- | -1830 | -266 | 200 | VREG1OUT | 1170 | -266 | 250 | IOVCC | 4170 | -266 |

| No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y |
|-----|---------|------|------|-----|-------|-------|------|-----|------|-------|------|-----|------|-------|-----|-----|-------|------|-----|
| 251 | DGND | 4230 | -266 | 301 | HSYNC | 7230 | -266 | 351 | NC | 10230 | -266 | 401 | G81 | 10221 | 246 | 451 | G181 | 9321 | 246 |
| 252 | DGND | 4290 | -266 | 302 | VSYNC | 7290 | -266 | 352 | NC | 10290 | -266 | 402 | G83 | 10203 | 101 | 452 | G183 | 9303 | 101 |
| 253 | DGND | 4350 | -266 | 303 | DE | 7350 | -266 | 353 | NC | 10350 | -266 | 403 | G85 | 10185 | 246 | 453 | G185 | 9285 | 246 |
| 254 | DGND | 4410 | -266 | 304 | STB | 7410 | -266 | 354 | NC | 10410 | -266 | 404 | G87 | 10167 | 101 | 454 | G187 | 9267 | 101 |
| 255 | DGND | 4470 | -266 | 305 | CF2 | 7470 | -266 | 355 | NC | 10470 | -266 | 405 | G89 | 10149 | 246 | 455 | G189 | 9249 | 246 |
| 256 | DGND | 4530 | -266 | 306 | CF1 | 7530 | -266 | 356 | NC | 10530 | -266 | 406 | G91 | 10131 | 101 | 456 | G191 | 9231 | 101 |
| 257 | DGND | 4590 | -266 | 307 | D/S | 7590 | -266 | 357 | NC | 10590 | -266 | 407 | G93 | 10113 | 246 | 457 | G193 | 9213 | 246 |
| 258 | DGND | 4650 | -266 | 308 | TS7 | 7650 | -266 | 358 | NC | 10650 | -266 | 408 | G95 | 10095 | 101 | 458 | G195 | 9195 | 101 |
| 259 | DGND | 4710 | -266 | 309 | TS6 | 7710 | -266 | 359 | NC | 10710 | -266 | 409 | G97 | 10077 | 246 | 459 | G197 | 9177 | 246 |
| 260 | DGND | 4770 | -266 | 310 | TS5 | 7770 | -266 | 360 | NC | 10770 | -266 | 410 | G99 | 10059 | 101 | 460 | G199 | 9159 | 101 |
| 261 | DGND | 4830 | -266 | 311 | TS4 | 7830 | -266 | 361 | G1 | 10941 | 246 | 411 | G101 | 10041 | 246 | 461 | G201 | 9141 | 246 |
| 262 | DGND | 4890 | -266 | 312 | TS3 | 7890 | -266 | 362 | G3 | 10923 | 101 | 412 | G103 | 10023 | 101 | 462 | G203 | 9123 | 101 |
| 263 | nRESET | 4950 | -266 | 313 | TS2 | 7950 | -266 | 363 | G5 | 10905 | 246 | 413 | G105 | 10005 | 246 | 463 | G205 | 9105 | 246 |
| 264 | EXTPSET | 5010 | -266 | 314 | TS1 | 8010 | -266 | 364 | G7 | 10887 | 101 | 414 | G107 | 9987 | 101 | 464 | G207 | 9087 | 101 |
| 265 | POWSEL | 5070 | -266 | 315 | TS0 | 8070 | -266 | 365 | G9 | 10869 | 246 | 415 | G109 | 9969 | 246 | 465 | G209 | 9069 | 246 |
| 266 | VDIR | 5130 | -266 | 316 | NC | 8130 | -266 | 366 | G11 | 10851 | 101 | 416 | G111 | 9951 | 101 | 466 | G211 | 9051 | 101 |
| 267 | HDIR | 5190 | -266 | 317 | NC | 8190 | -266 | 367 | G13 | 10833 | 246 | 417 | G113 | 9933 | 246 | 467 | G213 | 9033 | 246 |
| 268 | IF2 | 5250 | -266 | 318 | NC | 8250 | -266 | 368 | G15 | 10815 | 101 | 418 | G115 | 9915 | 101 | 468 | G215 | 9015 | 101 |
| 269 | IF1 | 5310 | -266 | 319 | NC | 8310 | -266 | 369 | G17 | 10797 | 246 | 419 | G117 | 9897 | 246 | 469 | G217 | 8997 | 246 |
| 270 | CSB | 5370 | -266 | 320 | NC | 8370 | -266 | 370 | G19 | 10779 | 101 | 420 | G119 | 9879 | 101 | 470 | G219 | 8979 | 101 |
| 271 | SCL | 5430 | -266 | 321 | NC | 8430 | -266 | 371 | G21 | 10761 | 246 | 421 | G121 | 9861 | 246 | 471 | G221 | 8961 | 246 |
| 272 | SDO | 5490 | -266 | 322 | NC | 8490 | -266 | 372 | G23 | 10743 | 101 | 422 | G123 | 9843 | 101 | 472 | G223 | 8943 | 101 |
| 273 | SDA | 5550 | -266 | 323 | NC | 8550 | -266 | 373 | G25 | 10725 | 246 | 423 | G125 | 9825 | 246 | 473 | G225 | 8925 | 246 |
| 274 | POL | 5610 | -266 | 324 | NC | 8610 | -266 | 374 | G27 | 10707 | 101 | 424 | G127 | 9807 | 101 | 474 | G227 | 8907 | 101 |
| 275 | NTPAL | 5670 | -266 | 325 | NC | 8670 | -266 | 375 | G29 | 10689 | 246 | 425 | G129 | 9789 | 246 | 475 | G229 | 8889 | 246 |
| 276 | D27 | 5730 | -266 | 326 | NC | 8730 | -266 | 376 | G31 | 10671 | 101 | 426 | G131 | 9771 | 101 | 476 | G231 | 8871 | 101 |
| 277 | D26 | 5790 | -266 | 327 | NC | 8790 | -266 | 377 | G33 | 10653 | 246 | 427 | G133 | 9753 | 246 | 477 | G233 | 8853 | 246 |
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| 280 | D23 | 5970 | -266 | 330 | NC | 8970 | -266 | 380 | G39 | 10599 | 101 | 430 | G139 | 9699 | 101 | 480 | G239 | 8799 | 101 |
| 281 | D22 | 6030 | -266 | 331 | NC | 9030 | -266 | 381 | G41 | 10581 | 246 | 431 | G141 | 9681 | 246 | 481 | Dummy | 8781 | 246 |
| 282 | D21 | 6090 | -266 | 332 | NC | 9090 | -266 | 382 | G43 | 10563 | 101 | 432 | G143 | 9663 | 101 | 482 | Dummy | 8763 | 101 |
| 283 | D20 | 6150 | -266 | 333 | NC | 9150 | -266 | 383 | G45 | 10545 | 246 | 433 | G145 | 9645 | 246 | 483 | S1 | 8731 | 246 |
| 284 | D17 | 6210 | -266 | 334 | NC | 9210 | -266 | 384 | G47 | 10527 | 101 | 434 | G147 | 9627 | 101 | 484 | S2 | 8713 | 101 |
| 285 | D16 | 6270 | -266 | 335 | NC | 9270 | -266 | 385 | G49 | 10509 | 246 | 435 | G149 | 9609 | 246 | 485 | S3 | 8695 | 246 |
| 286 | D15 | 6330 | -266 | 336 | NC | 9330 | -266 | 386 | G51 | 10491 | 101 | 436 | G151 | 9591 | 101 | 486 | S4 | 8677 | 101 |
| 287 | D14 | 6390 | -266 | 337 | NC | 9390 | -266 | 387 | G53 | 10473 | 246 | 437 | G153 | 9573 | 246 | 487 | S5 | 8659 | 246 |
| 288 | D13 | 6450 | -266 | 338 | NC | 9450 | -266 | 388 | G55 | 10455 | 101 | 438 | G155 | 9555 | 101 | 488 | S6 | 8641 | 101 |
| 289 | D12 | 6510 | -266 | 339 | NC | 9510 | -266 | 389 | G57 | 10437 | 246 | 439 | G157 | 9537 | 246 | 489 | S7 | 8623 | 246 |
| 290 | D11 | 6570 | -266 | 340 | NC | 9570 | -266 | 390 | G59 | 10419 | 101 | 440 | G159 | 9519 | 101 | 490 | S8 | 8605 | 101 |
| 291 | D10 | 6630 | -266 | 341 | NC | 9630 | -266 | 391 | G61 | 10401 | 246 | 441 | G161 | 9501 | 246 | 491 | S9 | 8587 | 246 |
| 292 | D07 | 6690 | -266 | 342 | NC | 9690 | -266 | 392 | G63 | 10383 | 101 | 442 | G163 | 9483 | 101 | 492 | S10 | 8569 | 101 |
| 293 | D06 | 6750 | -266 | 343 | NC | 9750 | -266 | 393 | G65 | 10365 | 246 | 443 | G165 | 9465 | 246 | 493 | S11 | 8551 | 246 |
| 294 | D05 | 6810 | -266 | 344 | NC | 9810 | -266 | 394 | G67 | 10347 | 101 | 444 | G167 | 9447 | 101 | 494 | S12 | 8533 | 101 |
| 295 | D04 | 6870 | -266 | 345 | NC | 9870 | -266 | 395 | G69 | 10329 | 246 | 445 | G169 | 9429 | 246 | 495 | S13 | 8515 | 246 |
| 296 | D03 | 6930 | -266 | 346 | NC | 9930 | -266 | 396 | G71 | 10311 | 101 | 446 | G171 | 9411 | 101 | 496 | S14 | 8497 | 101 |
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| 298 | D01 | 7050 | -266 | 348 | NC | 10050 | -266 | 398 | G75 | 10275 | 101 | 448 | G175 | 9375 | 101 | 498 | S16 | 8461 | 101 |
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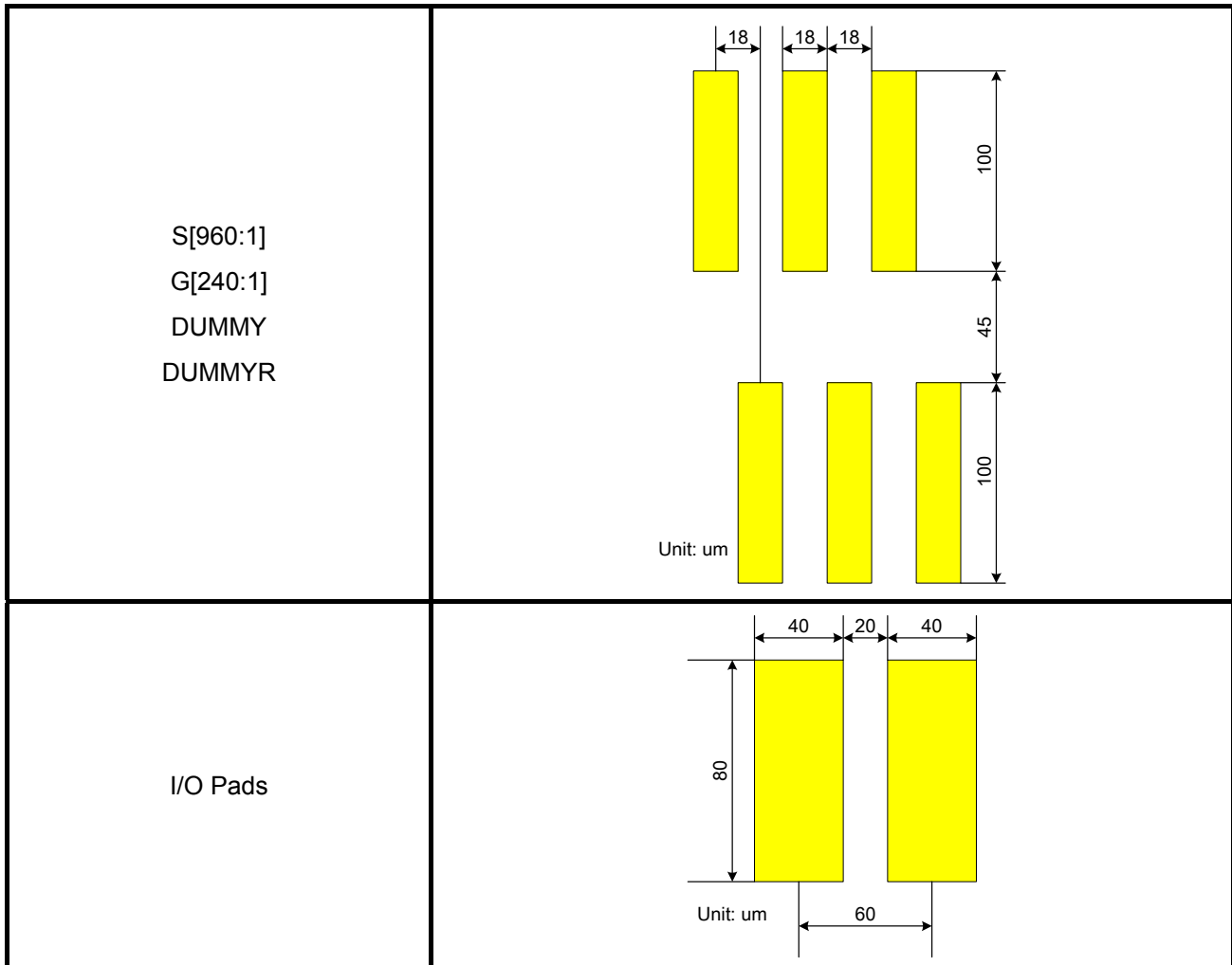
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| 501 | S19 | 8407 | 246 | 551 | S69 | 7507 | 246 | 601 | S119 | 6607 | 246 | 651 | S169 | 5707 | 246 | 701 | S219 | 4807 | 246 |
| 502 | S20 | 8389 | 101 | 552 | S70 | 7489 | 101 | 602 | S120 | 6589 | 101 | 652 | S170 | 5689 | 101 | 702 | S220 | 4789 | 101 |
| 503 | S21 | 8371 | 246 | 553 | S71 | 7471 | 246 | 603 | S121 | 6571 | 246 | 653 | S171 | 5671 | 246 | 703 | S221 | 4771 | 246 |
| 504 | S22 | 8353 | 101 | 554 | S72 | 7453 | 101 | 604 | S122 | 6553 | 101 | 654 | S172 | 5653 | 101 | 704 | S222 | 4753 | 101 |
| 505 | S23 | 8335 | 246 | 555 | S73 | 7435 | 246 | 605 | S123 | 6535 | 246 | 655 | S173 | 5635 | 246 | 705 | S223 | 4735 | 246 |
| 506 | S24 | 8317 | 101 | 556 | S74 | 7417 | 101 | 606 | S124 | 6517 | 101 | 656 | S174 | 5617 | 101 | 706 | S224 | 4717 | 101 |
| 507 | S25 | 8299 | 246 | 557 | S75 | 7399 | 246 | 607 | S125 | 6499 | 246 | 657 | S175 | 5599 | 246 | 707 | S225 | 4699 | 246 |
| 508 | S26 | 8281 | 101 | 558 | S76 | 7381 | 101 | 608 | S126 | 6481 | 101 | 658 | S176 | 5581 | 101 | 708 | S226 | 4681 | 101 |
| 509 | S27 | 8263 | 246 | 559 | S77 | 7363 | 246 | 609 | S127 | 6463 | 246 | 659 | S177 | 5563 | 246 | 709 | S227 | 4663 | 246 |
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| 511 | S29 | 8227 | 246 | 561 | S79 | 7327 | 246 | 611 | S129 | 6427 | 246 | 661 | S179 | 5527 | 246 | 711 | S229 | 4627 | 246 |
| 512 | S30 | 8209 | 101 | 562 | S80 | 7309 | 101 | 612 | S130 | 6409 | 101 | 662 | S180 | 5509 | 101 | 712 | S230 | 4609 | 101 |
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| 514 | S32 | 8173 | 101 | 564 | S82 | 7273 | 101 | 614 | S132 | 6373 | 101 | 664 | S182 | 5473 | 101 | 714 | S232 | 4573 | 101 |
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| 518 | S36 | 8101 | 101 | 568 | S86 | 7201 | 101 | 618 | S136 | 6301 | 101 | 668 | S186 | 5401 | 101 | 718 | S236 | 4501 | 101 |
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| 520 | S38 | 8065 | 101 | 570 | S88 | 7165 | 101 | 620 | S138 | 6265 | 101 | 670 | S188 | 5365 | 101 | 720 | S238 | 4465 | 101 |
| 521 | S39 | 8047 | 246 | 571 | S89 | 7147 | 246 | 621 | S139 | 6247 | 246 | 671 | S189 | 5347 | 246 | 721 | S239 | 4447 | 246 |
| 522 | S40 | 8029 | 101 | 572 | S90 | 7129 | 101 | 622 | S140 | 6229 | 101 | 672 | S190 | 5329 | 101 | 722 | S240 | 4429 | 101 |
| 523 | S41 | 8011 | 246 | 573 | S91 | 7111 | 246 | 623 | S141 | 6211 | 246 | 673 | S191 | 5311 | 246 | 723 | S241 | 4411 | 246 |
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| 526 | S44 | 7957 | 101 | 576 | S94 | 7057 | 101 | 626 | S144 | 6157 | 101 | 676 | S194 | 5257 | 101 | 726 | S244 | 4357 | 101 |
| 527 | S45 | 7939 | 246 | 577 | S95 | 7039 | 246 | 627 | S145 | 6139 | 246 | 677 | S195 | 5239 | 246 | 727 | S245 | 4339 | 246 |
| 528 | S46 | 7921 | 101 | 578 | S96 | 7021 | 101 | 628 | S146 | 6121 | 101 | 678 | S196 | 5221 | 101 | 728 | S246 | 4321 | 101 |
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| 530 | S48 | 7885 | 101 | 580 | S98 | 6985 | 101 | 630 | S148 | 6085 | 101 | 680 | S198 | 5185 | 101 | 730 | S248 | 4285 | 101 |
| 531 | S49 | 7867 | 246 | 581 | S99 | 6967 | 246 | 631 | S149 | 6067 | 246 | 681 | S199 | 5167 | 246 | 731 | S249 | 4267 | 246 |
| 532 | S50 | 7849 | 101 | 582 | S100 | 6949 | 101 | 632 | S150 | 6049 | 101 | 682 | S200 | 5149 | 101 | 732 | S250 | 4249 | 101 |
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| 536 | S54 | 7777 | 101 | 586 | S104 | 6877 | 101 | 636 | S154 | 5977 | 101 | 686 | S204 | 5077 | 101 | 736 | S254 | 4177 | 101 |
| 537 | S55 | 7759 | 246 | 587 | S105 | 6859 | 246 | 637 | S155 | 5959 | 246 | 687 | S205 | 5059 | 246 | 737 | S255 | 4159 | 246 |
| 538 | S56 | 7741 | 101 | 588 | S106 | 6841 | 101 | 638 | S156 | 5941 | 101 | 688 | S206 | 5041 | 101 | 738 | S256 | 4141 | 101 |
| 539 | S57 | 7723 | 246 | 589 | S107 | 6823 | 246 | 639 | S157 | 5923 | 246 | 689 | S207 | 5023 | 246 | 739 | S257 | 4123 | 246 |
| 540 | S58 | 7705 | 101 | 590 | S108 | 6805 | 101 | 640 | S158 | 5905 | 101 | 690 | S208 | 5005 | 101 | 740 | S258 | 4105 | 101 |
| 541 | S59 | 7687 | 246 | 591 | S109 | 6787 | 246 | 641 | S159 | 5887 | 246 | 691 | S209 | 4987 | 246 | 741 | S259 | 4087 | 246 |
| 542 | S60 | 7669 | 101 | 592 | S110 | 6769 | 101 | 642 | S160 | 5869 | 101 | 692 | S210 | 4969 | 101 | 742 | S260 | 4069 | 101 |
| 543 | S61 | 7651 | 246 | 593 | S111 | 6751 | 246 | 643 | S161 | 5851 | 246 | 693 | S211 | 4951 | 246 | 743 | S261 | 4051 | 246 |
| 544 | S62 | 7633 | 101 | 594 | S112 | 6733 | 101 | 644 | S162 | 5833 | 101 | 694 | S212 | 4933 | 101 | 744 | S262 | 4033 | 101 |
| 545 | S63 | 7615 | 246 | 595 | S113 | 6715 | 246 | 645 | S163 | 5815 | 246 | 695 | S213 | 4915 | 246 | 745 | S263 | 4015 | 246 |
| 546 | S64 | 7597 | 101 | 596 | S114 | 6697 | 101 | 646 | S164 | 5797 | 101 | 696 | S214 | 4897 | 101 | 746 | S264 | 3997 | 101 |
| 547 | S65 | 7579 | 246 | 597 | S115 | 6679 | 246 | 647 | S165 | 5779 | 246 | 697 | S215 | 4879 | 246 | 747 | S265 | 3979 | 246 |
| 548 | S66 | 7561 | 101 | 598 | S116 | 6661 | 101 | 648 | S166 | 5761 | 101 | 698 | S216 | 4861 | 101 | 748 | S266 | 3961 | 101 |
| 549 | S67 | 7543 | 246 | 599 | S117 | 6643 | 246 | 649 | S167 | 5743 | 246 | 699 | S217 | 4843 | 246 | 749 | S267 | 3943 | 246 |
| 550 | S68 | 7525 | 101 | 600 | S118 | 6625 | 101 | 650 | S168 | 5725 | 101 | 700 | S218 | 4825 | 101 | 750 | S268 | 3925 | 101 |

| No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y |
|-----|------|------|-----|-----|------|------|-----|-----|------|------|-----|-----|------|------|-----|------|-------|------|-----|
| 751 | S269 | 3907 | 246 | 801 | S319 | 3007 | 246 | 851 | S369 | 2107 | 246 | 901 | S419 | 1207 | 246 | 951 | S469 | 307 | 246 |
| 752 | S270 | 3889 | 101 | 802 | S320 | 2989 | 101 | 852 | S370 | 2089 | 101 | 902 | S420 | 1189 | 101 | 952 | S470 | 289 | 101 |
| 753 | S271 | 3871 | 246 | 803 | S321 | 2971 | 246 | 853 | S371 | 2071 | 246 | 903 | S421 | 1171 | 246 | 953 | S471 | 271 | 246 |
| 754 | S272 | 3853 | 101 | 804 | S322 | 2953 | 101 | 854 | S372 | 2053 | 101 | 904 | S422 | 1153 | 101 | 954 | S472 | 253 | 101 |
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| 758 | S276 | 3781 | 101 | 808 | S326 | 2881 | 101 | 858 | S376 | 1981 | 101 | 908 | S426 | 1081 | 101 | 958 | S476 | 181 | 101 |
| 759 | S277 | 3763 | 246 | 809 | S327 | 2863 | 246 | 859 | S377 | 1963 | 246 | 909 | S427 | 1063 | 246 | 959 | S477 | 163 | 246 |
| 760 | S278 | 3745 | 101 | 810 | S328 | 2845 | 101 | 860 | S378 | 1945 | 101 | 910 | S428 | 1045 | 101 | 960 | S478 | 145 | 101 |
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| 763 | S281 | 3691 | 246 | 813 | S331 | 2791 | 246 | 863 | S381 | 1891 | 246 | 913 | S431 | 991 | 246 | 963 | DUMMY | 91 | 246 |
| 764 | S282 | 3673 | 101 | 814 | S332 | 2773 | 101 | 864 | S382 | 1873 | 101 | 914 | S432 | 973 | 101 | 964 | DUMMY | 73 | 101 |
| 765 | S283 | 3655 | 246 | 815 | S333 | 2755 | 246 | 865 | S383 | 1855 | 246 | 915 | S433 | 955 | 246 | 965 | DUMMY | 55 | 246 |
| 766 | S284 | 3637 | 101 | 816 | S334 | 2737 | 101 | 866 | S384 | 1837 | 101 | 916 | S434 | 937 | 101 | 966 | DUMMY | 37 | 101 |
| 767 | S285 | 3619 | 246 | 817 | S335 | 2719 | 246 | 867 | S385 | 1819 | 246 | 917 | S435 | 919 | 246 | 967 | DUMMY | 19 | 246 |
| 768 | S286 | 3601 | 101 | 818 | S336 | 2701 | 101 | 868 | S386 | 1801 | 101 | 918 | S436 | 901 | 101 | 968 | DUMMY | -19 | 101 |
| 769 | S287 | 3583 | 246 | 819 | S337 | 2683 | 246 | 869 | S387 | 1783 | 246 | 919 | S437 | 883 | 246 | 969 | DUMMY | -37 | 246 |
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| 772 | S290 | 3529 | 101 | 822 | S340 | 2629 | 101 | 872 | S390 | 1729 | 101 | 922 | S440 | 829 | 101 | 972 | DUMMY | -91 | 101 |
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| 776 | S294 | 3457 | 101 | 826 | S344 | 2557 | 101 | 876 | S394 | 1657 | 101 | 926 | S444 | 757 | 101 | 976 | S484 | -163 | 101 |
| 777 | S295 | 3439 | 246 | 827 | S345 | 2539 | 246 | 877 | S395 | 1639 | 246 | 927 | S445 | 739 | 246 | 977 | S485 | -181 | 246 |
| 778 | S296 | 3421 | 101 | 828 | S346 | 2521 | 101 | 878 | S396 | 1621 | 101 | 928 | S446 | 721 | 101 | 978 | S486 | -199 | 101 |
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| 783 | S301 | 3331 | 246 | 833 | S351 | 2431 | 246 | 883 | S401 | 1531 | 246 | 933 | S451 | 631 | 246 | 983 | S491 | -289 | 246 |
| 784 | S302 | 3313 | 101 | 834 | S352 | 2413 | 101 | 884 | S402 | 1513 | 101 | 934 | S452 | 613 | 101 | 984 | S492 | -307 | 101 |
| 785 | S303 | 3295 | 246 | 835 | S353 | 2395 | 246 | 885 | S403 | 1495 | 246 | 935 | S453 | 595 | 246 | 985 | S493 | -325 | 246 |
| 786 | S304 | 3277 | 101 | 836 | S354 | 2377 | 101 | 886 | S404 | 1477 | 101 | 936 | S454 | 577 | 101 | 986 | S494 | -343 | 101 |
| 787 | S305 | 3259 | 246 | 837 | S355 | 2359 | 246 | 887 | S405 | 1459 | 246 | 937 | S455 | 559 | 246 | 987 | S495 | -361 | 246 |
| 788 | S306 | 3241 | 101 | 838 | S356 | 2341 | 101 | 888 | S406 | 1441 | 101 | 938 | S456 | 541 | 101 | 988 | S496 | -379 | 101 |
| 789 | S307 | 3223 | 246 | 839 | S357 | 2323 | 246 | 889 | S407 | 1423 | 246 | 939 | S457 | 523 | 246 | 989 | S497 | -397 | 246 |
| 790 | S308 | 3205 | 101 | 840 | S358 | 2305 | 101 | 890 | S408 | 1405 | 101 | 940 | S458 | 505 | 101 | 990 | S498 | -415 | 101 |
| 791 | S309 | 3187 | 246 | 841 | S359 | 2287 | 246 | 891 | S409 | 1387 | 246 | 941 | S459 | 487 | 246 | 991 | S499 | -433 | 246 |
| 792 | S310 | 3169 | 101 | 842 | S360 | 2269 | 101 | 892 | S410 | 1369 | 101 | 942 | S460 | 469 | 101 | 992 | S500 | -451 | 101 |
| 793 | S311 | 3151 | 246 | 843 | S361 | 2251 | 246 | 893 | S411 | 1351 | 246 | 943 | S461 | 451 | 246 | 993 | S501 | -469 | 246 |
| 794 | S312 | 3133 | 101 | 844 | S362 | 2233 | 101 | 894 | S412 | 1333 | 101 | 944 | S462 | 433 | 101 | 994 | S502 | -487 | 101 |
| 795 | S313 | 3115 | 246 | 845 | S363 | 2215 | 246 | 895 | S413 | 1315 | 246 | 945 | S463 | 415 | 246 | 995 | S503 | -505 | 246 |
| 796 | S314 | 3097 | 101 | 846 | S364 | 2197 | 101 | 896 | S414 | 1297 | 101 | 946 | S464 | 397 | 101 | 996 | S504 | -523 | 101 |
| 797 | S315 | 3079 | 246 | 847 | S365 | 2179 | 246 | 897 | S415 | 1279 | 246 | 947 | S465 | 379 | 246 | 997 | S505 | -541 | 246 |
| 798 | S316 | 3061 | 101 | 848 | S366 | 2161 | 101 | 898 | S416 | 1261 | 101 | 948 | S466 | 361 | 101 | 998 | S506 | -559 | 101 |
| 799 | S317 | 3043 | 246 | 849 | S367 | 2143 | 246 | 899 | S417 | 1243 | 246 | 949 | S467 | 343 | 246 | 999 | S507 | -577 | 246 |
| 800 | S318 | 3025 | 101 | 850 | S368 | 2125 | 101 | 900 | S418 | 1225 | 101 | 950 | S468 | 325 | 101 | 1000 | S508 | -595 | 101 |

| No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y |
|------|------|-------|-----|------|------|-------|-----|------|------|-------|-----|------|------|-------|-----|------|------|-------|-----|
| 1001 | S509 | -613 | 246 | 1051 | S559 | -1513 | 246 | 1101 | S609 | -2413 | 246 | 1151 | S659 | -3313 | 246 | 1201 | S709 | -4213 | 246 |
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| 1003 | S511 | -649 | 246 | 1053 | S561 | -1549 | 246 | 1103 | S611 | -2449 | 246 | 1153 | S661 | -3349 | 246 | 1203 | S711 | -4249 | 246 |
| 1004 | S512 | -667 | 101 | 1054 | S562 | -1567 | 101 | 1104 | S612 | -2467 | 101 | 1154 | S662 | -3367 | 101 | 1204 | S712 | -4267 | 101 |
| 1005 | S513 | -685 | 246 | 1055 | S563 | -1585 | 246 | 1105 | S613 | -2485 | 246 | 1155 | S663 | -3385 | 246 | 1205 | S713 | -4285 | 246 |
| 1006 | S514 | -703 | 101 | 1056 | S564 | -1603 | 101 | 1106 | S614 | -2503 | 101 | 1156 | S664 | -3403 | 101 | 1206 | S714 | -4303 | 101 |
| 1007 | S515 | -721 | 246 | 1057 | S565 | -1621 | 246 | 1107 | S615 | -2521 | 246 | 1157 | S665 | -3421 | 246 | 1207 | S715 | -4321 | 246 |
| 1008 | S516 | -739 | 101 | 1058 | S566 | -1639 | 101 | 1108 | S616 | -2539 | 101 | 1158 | S666 | -3439 | 101 | 1208 | S716 | -4339 | 101 |
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| 1012 | S520 | -811 | 101 | 1062 | S570 | -1711 | 101 | 1112 | S620 | -2611 | 101 | 1162 | S670 | -3511 | 101 | 1212 | S720 | -4411 | 101 |
| 1013 | S521 | -829 | 246 | 1063 | S571 | -1729 | 246 | 1113 | S621 | -2629 | 246 | 1163 | S671 | -3529 | 246 | 1213 | S721 | -4429 | 246 |
| 1014 | S522 | -847 | 101 | 1064 | S572 | -1747 | 101 | 1114 | S622 | -2647 | 101 | 1164 | S672 | -3547 | 101 | 1214 | S722 | -4447 | 101 |
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| 1018 | S526 | -919 | 101 | 1068 | S576 | -1819 | 101 | 1118 | S626 | -2719 | 101 | 1168 | S676 | -3619 | 101 | 1218 | S726 | -4519 | 101 |
| 1019 | S527 | -937 | 246 | 1069 | S577 | -1837 | 246 | 1119 | S627 | -2737 | 246 | 1169 | S677 | -3637 | 246 | 1219 | S727 | -4537 | 246 |
| 1020 | S528 | -955 | 101 | 1070 | S578 | -1855 | 101 | 1120 | S628 | -2755 | 101 | 1170 | S678 | -3655 | 101 | 1220 | S728 | -4555 | 101 |
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| 1024 | S532 | -1027 | 101 | 1074 | S582 | -1927 | 101 | 1124 | S632 | -2827 | 101 | 1174 | S682 | -3727 | 101 | 1224 | S732 | -4627 | 101 |
| 1025 | S533 | -1045 | 246 | 1075 | S583 | -1945 | 246 | 1125 | S633 | -2845 | 246 | 1175 | S683 | -3745 | 246 | 1225 | S733 | -4645 | 246 |
| 1026 | S534 | -1063 | 101 | 1076 | S584 | -1963 | 101 | 1126 | S634 | -2863 | 101 | 1176 | S684 | -3763 | 101 | 1226 | S734 | -4663 | 101 |
| 1027 | S535 | -1081 | 246 | 1077 | S585 | -1981 | 246 | 1127 | S635 | -2881 | 246 | 1177 | S685 | -3781 | 246 | 1227 | S735 | -4681 | 246 |
| 1028 | S536 | -1099 | 101 | 1078 | S586 | -1999 | 101 | 1128 | S636 | -2899 | 101 | 1178 | S686 | -3799 | 101 | 1228 | S736 | -4699 | 101 |
| 1029 | S537 | -1117 | 246 | 1079 | S587 | -2017 | 246 | 1129 | S637 | -2917 | 246 | 1179 | S687 | -3817 | 246 | 1229 | S737 | -4717 | 246 |
| 1030 | S538 | -1135 | 101 | 1080 | S588 | -2035 | 101 | 1130 | S638 | -2935 | 101 | 1180 | S688 | -3835 | 101 | 1230 | S738 | -4735 | 101 |
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| 1032 | S540 | -1171 | 101 | 1082 | S590 | -2071 | 101 | 1132 | S640 | -2971 | 101 | 1182 | S690 | -3871 | 101 | 1232 | S740 | -4771 | 101 |
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| 1034 | S542 | -1207 | 101 | 1084 | S592 | -2107 | 101 | 1134 | S642 | -3007 | 101 | 1184 | S692 | -3907 | 101 | 1234 | S742 | -4807 | 101 |
| 1035 | S543 | -1225 | 246 | 1085 | S593 | -2125 | 246 | 1135 | S643 | -3025 | 246 | 1185 | S693 | -3925 | 246 | 1235 | S743 | -4825 | 246 |
| 1036 | S544 | -1243 | 101 | 1086 | S594 | -2143 | 101 | 1136 | S644 | -3043 | 101 | 1186 | S694 | -3943 | 101 | 1236 | S744 | -4843 | 101 |
| 1037 | S545 | -1261 | 246 | 1087 | S595 | -2161 | 246 | 1137 | S645 | -3061 | 246 | 1187 | S695 | -3961 | 246 | 1237 | S745 | -4861 | 246 |
| 1038 | S546 | -1279 | 101 | 1088 | S596 | -2179 | 101 | 1138 | S646 | -3079 | 101 | 1188 | S696 | -3979 | 101 | 1238 | S746 | -4879 | 101 |
| 1039 | S547 | -1297 | 246 | 1089 | S597 | -2197 | 246 | 1139 | S647 | -3097 | 246 | 1189 | S697 | -3997 | 246 | 1239 | S747 | -4897 | 246 |
| 1040 | S548 | -1315 | 101 | 1090 | S598 | -2215 | 101 | 1140 | S648 | -3115 | 101 | 1190 | S698 | -4015 | 101 | 1240 | S748 | -4915 | 101 |
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| 1042 | S550 | -1351 | 101 | 1092 | S600 | -2251 | 101 | 1142 | S650 | -3151 | 101 | 1192 | S700 | -4051 | 101 | 1242 | S750 | -4951 | 101 |
| 1043 | S551 | -1369 | 246 | 1093 | S601 | -2269 | 246 | 1143 | S651 | -3169 | 246 | 1193 | S701 | -4069 | 246 | 1243 | S751 | -4969 | 246 |
| 1044 | S552 | -1387 | 101 | 1094 | S602 | -2287 | 101 | 1144 | S652 | -3187 | 101 | 1194 | S702 | -4087 | 101 | 1244 | S752 | -4987 | 101 |
| 1045 | S553 | -1405 | 246 | 1095 | S603 | -2305 | 246 | 1145 | S653 | -3205 | 246 | 1195 | S703 | -4105 | 246 | 1245 | S753 | -5005 | 246 |
| 1046 | S554 | -1423 | 101 | 1096 | S604 | -2323 | 101 | 1146 | S654 | -3223 | 101 | 1196 | S704 | -4123 | 101 | 1246 | S754 | -5023 | 101 |
| 1047 | S555 | -1441 | 246 | 1097 | S605 | -2341 | 246 | 1147 | S655 | -3241 | 246 | 1197 | S705 | -4141 | 246 | 1247 | S755 | -5041 | 246 |
| 1048 | S556 | -1459 | 101 | 1098 | S606 | -2359 | 101 | 1148 | S656 | -3259 | 101 | 1198 | S706 | -4159 | 101 | 1248 | S756 | -5059 | 101 |
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| 1050 | S558 | -1495 | 101 | 1100 | S608 | -2395 | 101 | 1150 | S658 | -3295 | 101 | 1200 | S708 | -4195 | 101 | 1250 | S758 | -5095 | 101 |

| No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y | No. | Name | X | Y |
|------|------|-------|-----|------|------|-------|-----|------|------|-------|-----|------|------|-------|-----|------|-------|-------|-----|
| 1251 | S759 | -5113 | 246 | 1301 | S809 | -6013 | 246 | 1351 | S859 | -6913 | 246 | 1401 | S909 | -7813 | 246 | 1451 | S959 | -8713 | 246 |
| 1252 | S760 | -5131 | 101 | 1302 | S810 | -6031 | 101 | 1352 | S860 | -6931 | 101 | 1402 | S910 | -7831 | 101 | 1452 | S960 | -8731 | 101 |
| 1253 | S761 | -5149 | 246 | 1303 | S811 | -6049 | 246 | 1353 | S861 | -6949 | 246 | 1403 | S911 | -7849 | 246 | 1453 | Dummy | -8763 | 246 |
| 1254 | S762 | -5167 | 101 | 1304 | S812 | -6067 | 101 | 1354 | S862 | -6967 | 101 | 1404 | S912 | -7867 | 101 | 1454 | Dummy | -8781 | 101 |
| 1255 | S763 | -5185 | 246 | 1305 | S813 | -6085 | 246 | 1355 | S863 | -6985 | 246 | 1405 | S913 | -7885 | 246 | 1455 | G240 | -8799 | 246 |
| 1256 | S764 | -5203 | 101 | 1306 | S814 | -6103 | 101 | 1356 | S864 | -7003 | 101 | 1406 | S914 | -7903 | 101 | 1456 | G238 | -8817 | 101 |
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| 1258 | S766 | -5239 | 101 | 1308 | S816 | -6139 | 101 | 1358 | S866 | -7039 | 101 | 1408 | S916 | -7939 | 101 | 1458 | G234 | -8853 | 101 |
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| 1264 | S772 | -5347 | 101 | 1314 | S822 | -6247 | 101 | 1364 | S872 | -7147 | 101 | 1414 | S922 | -8047 | 101 | 1464 | G222 | -8961 | 101 |
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| 1268 | S776 | -5419 | 101 | 1318 | S826 | -6319 | 101 | 1368 | S876 | -7219 | 101 | 1418 | S926 | -8119 | 101 | 1468 | G214 | -9033 | 101 |
| 1269 | S777 | -5437 | 246 | 1319 | S827 | -6337 | 246 | 1369 | S877 | -7237 | 246 | 1419 | S927 | -8137 | 246 | 1469 | G212 | -9051 | 246 |
| 1270 | S778 | -5455 | 101 | 1320 | S828 | -6355 | 101 | 1370 | S878 | -7255 | 101 | 1420 | S928 | -8155 | 101 | 1470 | G210 | -9069 | 101 |
| 1271 | S779 | -5473 | 246 | 1321 | S829 | -6373 | 246 | 1371 | S879 | -7273 | 246 | 1421 | S929 | -8173 | 246 | 1471 | G208 | -9087 | 246 |
| 1272 | S780 | -5491 | 101 | 1322 | S830 | -6391 | 101 | 1372 | S880 | -7291 | 101 | 1422 | S930 | -8191 | 101 | 1472 | G206 | -9105 | 101 |
| 1273 | S781 | -5509 | 246 | 1323 | S831 | -6409 | 246 | 1373 | S881 | -7309 | 246 | 1423 | S931 | -8209 | 246 | 1473 | G204 | -9123 | 246 |
| 1274 | S782 | -5527 | 101 | 1324 | S832 | -6427 | 101 | 1374 | S882 | -7327 | 101 | 1424 | S932 | -8227 | 101 | 1474 | G202 | -9141 | 101 |
| 1275 | S783 | -5545 | 246 | 1325 | S833 | -6445 | 246 | 1375 | S883 | -7345 | 246 | 1425 | S933 | -8245 | 246 | 1475 | G200 | -9159 | 246 |
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| 1282 | S790 | -5671 | 101 | 1332 | S840 | -6571 | 101 | 1382 | S890 | -7471 | 101 | 1432 | S940 | -8371 | 101 | 1482 | G186 | -9285 | 101 |
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| 1284 | S792 | -5707 | 101 | 1334 | S842 | -6607 | 101 | 1384 | S892 | -7507 | 101 | 1434 | S942 | -8407 | 101 | 1484 | G182 | -9321 | 101 |
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| 1286 | S794 | -5743 | 101 | 1336 | S844 | -6643 | 101 | 1386 | S894 | -7543 | 101 | 1436 | S944 | -8443 | 101 | 1486 | G178 | -9357 | 101 |
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| 1288 | S796 | -5779 | 101 | 1338 | S846 | -6679 | 101 | 1388 | S896 | -7579 | 101 | 1438 | S946 | -8479 | 101 | 1488 | G174 | -9393 | 101 |
| 1289 | S797 | -5797 | 246 | 1339 | S847 | -6697 | 246 | 1389 | S897 | -7597 | 246 | 1439 | S947 | -8497 | 246 | 1489 | G172 | -9411 | 246 |
| 1290 | S798 | -5815 | 101 | 1340 | S848 | -6715 | 101 | 1390 | S898 | -7615 | 101 | 1440 | S948 | -8515 | 101 | 1490 | G170 | -9429 | 101 |
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| 1292 | S800 | -5851 | 101 | 1342 | S850 | -6751 | 101 | 1392 | S900 | -7651 | 101 | 1442 | S950 | -8551 | 101 | 1492 | G166 | -9465 | 101 |
| 1293 | S801 | -5869 | 246 | 1343 | S851 | -6769 | 246 | 1393 | S901 | -7669 | 246 | 1443 | S951 | -8569 | 246 | 1493 | G164 | -9483 | 246 |
| 1294 | S802 | -5887 | 101 | 1344 | S852 | -6787 | 101 | 1394 | S902 | -7687 | 101 | 1444 | S952 | -8587 | 101 | 1494 | G162 | -9501 | 101 |
| 1295 | S803 | -5905 | 246 | 1345 | S853 | -6805 | 246 | 1395 | S903 | -7705 | 246 | 1445 | S953 | -8605 | 246 | 1495 | G160 | -9519 | 246 |
| 1296 | S804 | -5923 | 101 | 1346 | S854 | -6823 | 101 | 1396 | S904 | -7723 | 101 | 1446 | S954 | -8623 | 101 | 1496 | G158 | -9537 | 101 |
| 1297 | S805 | -5941 | 246 | 1347 | S855 | -6841 | 246 | 1397 | S905 | -7741 | 246 | 1447 | S955 | -8641 | 246 | 1497 | G156 | -9555 | 246 |
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| 1300 | S808 | -5995 | 101 | 1350 | S858 | -6895 | 101 | 1400 | S908 | -7795 | 101 | 1450 | S958 | -8695 | 101 | 1500 | G150 | -9609 | 101 |

| No. | Name | X | Y | No. | Name | X | Y |
|------|------|--------|-----|----------------|----------------|--------|-----|
| 1500 | G150 | -9609 | 101 | 1551 | G48 | -10527 | 246 |
| 1501 | G148 | -9627 | 246 | 1552 | G46 | -10545 | 101 |
| 1502 | G146 | -9645 | 101 | 1553 | G44 | -10563 | 246 |
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| 1504 | G142 | -9681 | 101 | 1555 | G40 | -10599 | 246 |
| 1505 | G140 | -9699 | 246 | 1556 | G38 | -10617 | 101 |
| 1506 | G138 | -9717 | 101 | 1557 | G36 | -10635 | 246 |
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| 1508 | G134 | -9753 | 101 | 1559 | G32 | -10671 | 246 |
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| 1510 | G130 | -9789 | 101 | 1561 | G28 | -10707 | 246 |
| 1511 | G128 | -9807 | 246 | 1562 | G26 | -10725 | 101 |
| 1512 | G126 | -9825 | 101 | 1563 | G24 | -10743 | 246 |
| 1513 | G124 | -9843 | 246 | 1564 | G22 | -10761 | 101 |
| 1514 | G122 | -9861 | 101 | 1565 | G20 | -10779 | 246 |
| 1515 | G120 | -9879 | 246 | 1566 | G18 | -10797 | 101 |
| 1516 | G118 | -9897 | 101 | 1567 | G16 | -10815 | 246 |
| 1517 | G116 | -9915 | 246 | 1568 | G14 | -10833 | 101 |
| 1518 | G114 | -9933 | 101 | 1569 | G12 | -10851 | 246 |
| 1519 | G112 | -9951 | 246 | 1570 | G10 | -10869 | 101 |
| 1520 | G110 | -9969 | 101 | 1571 | G8 | -10887 | 246 |
| 1521 | G108 | -9987 | 246 | 1572 | G6 | -10905 | 101 |
| 1522 | G106 | -10005 | 101 | 1573 | G4 | -10923 | 246 |
| 1523 | G104 | -10023 | 246 | 1574 | G2 | -10941 | 101 |
| 1524 | G102 | -10041 | 101 | Alignment Mark | | | |
| 1525 | G100 | -10059 | 246 | | (-10945, -255) | | |
| 1526 | G98 | -10077 | 101 | | (10945, -255) | | |
| 1527 | G96 | -10095 | 246 | | | | |
| 1528 | G94 | -10113 | 101 | | | | |
| 1529 | G92 | -10131 | 246 | | | | |
| 1530 | G90 | -10149 | 101 | | | | |
| 1531 | G88 | -10167 | 246 | | | | |
| 1532 | G86 | -10185 | 101 | | | | |
| 1533 | G84 | -10203 | 246 | | | | |
| 1534 | G82 | -10221 | 101 | | | | |
| 1535 | G80 | -10239 | 246 | | | | |
| 1536 | G78 | -10257 | 101 | | | | |
| 1537 | G76 | -10275 | 246 | | | | |
| 1538 | G74 | -10293 | 101 | | | | |
| 1539 | G72 | -10311 | 246 | | | | |
| 1540 | G70 | -10329 | 101 | | | | |
| 1541 | G68 | -10347 | 246 | | | | |
| 1542 | G66 | -10365 | 101 | | | | |
| 1543 | G64 | -10383 | 246 | | | | |
| 1544 | G62 | -10401 | 101 | | | | |
| 1545 | G60 | -10419 | 246 | | | | |
| 1546 | G58 | -10437 | 101 | | | | |
| 1547 | G56 | -10455 | 246 | | | | |
| 1548 | G54 | -10473 | 101 | | | | |
| 1549 | G52 | -10491 | 246 | | | | |
| 1550 | G50 | -10509 | 101 | | | | |



6. System Interface

6.1. Input Interfaces

6.1.1. ITU-R BT.601 Interface

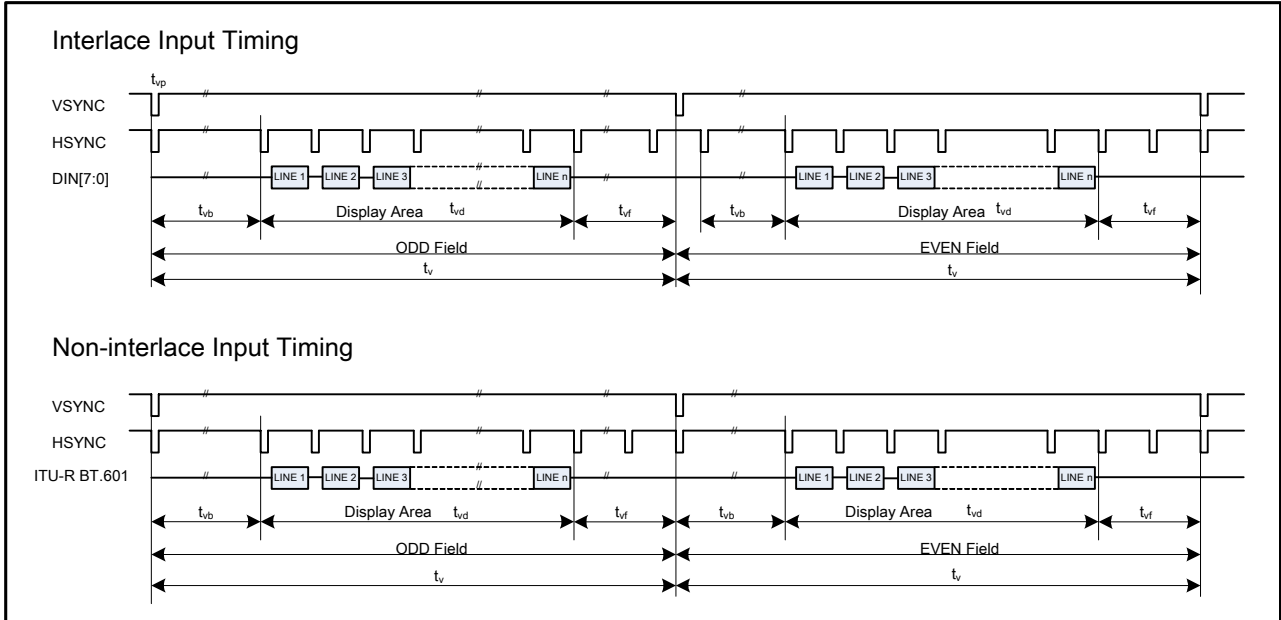


Figure1 ITR-R BT.601 Vertical Input Signal

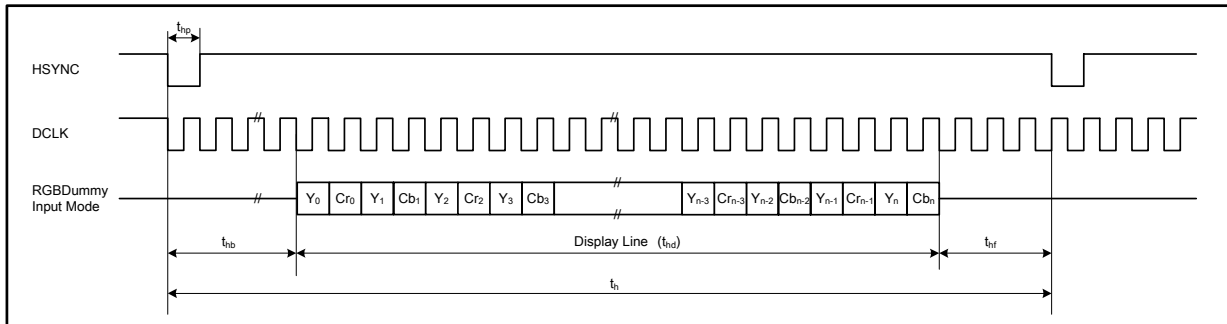


Figure2 ITR-R BT.601 Horizontal Input Signal

ITU-R BT.601 27 MHz (360 Mode) timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|---------------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 27 | - | MHZ | |
| Horizontal Period | t_h | - | 1716 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1440 | 1440 | 1440 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 252 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 16 | 24 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262.5 (312.5) | - | t_h | |
| Vertical Display Period | t_{vd} | - | 240 (288) | - | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 18 | - | t_h | |
| Vertical Front Porch | t_{vf} | 2 | 4 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

ITU-R BT.601 24.54 MHz (320 Mode) timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|---------------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 24.54 | - | MHZ | |
| Horizontal Period | t_h | - | 1560 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1280 | 1280 | 1280 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 252 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 16 | 28 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262.5 (312.5) | - | t_h | |
| Vertical Display Period | t_{vd} | - | 240 (288) | - | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 18 | - | t_h | |
| Vertical Front Porch | t_{vf} | 2 | 4 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

Note

1. Horizontal back porch time (H_BP) is adjustable by setting register HBP; requirement of min. back porch and min. front porch time must be satisfied.
2. Vertical back porch time (V_BP) is adjustable by setting register VBP; requirement of min. back porch and min. front porch time must be satisfied.
3. Interlace and non-interlace vertical input interfaces are acceptable.

6.1.2. ITU-R BT.656 Interface

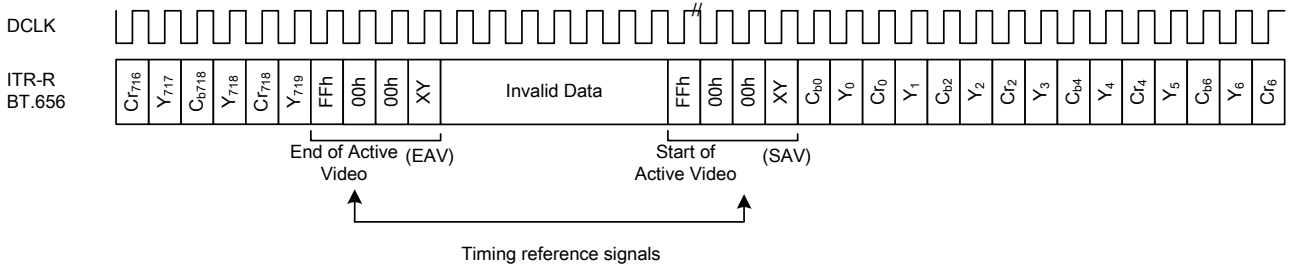


Figure3 ITR-R BT.656 Input Signal

Note:

1. FFh, 00h, 00h, XY signals are involved with the HSYNC, VSYNC and Field signals

F: field indication

V: Vertical blanking indication

H: Horizontal blanking indication

P3 ~ P0: protection bits

$$P3 = V \oplus H, \quad P2 = F \oplus H, \quad P1 = F \oplus V, \quad P0 = F \oplus V \oplus H$$

| Data bit number | First Word (FFh) | Second Word (00h) | Third Word (00h) | Fourth Word (XY) |
|-----------------|------------------|-------------------|------------------|------------------|
| 7 (MSB) | 1 | 0 | 0 | 1 |
| 6 | 1 | 0 | 0 | F |
| 5 | 1 | 0 | 0 | V |
| 4 | 1 | 0 | 0 | H |
| 3 | 1 | 0 | 0 | P3 |
| 2 | 1 | 0 | 0 | P2 |
| 1 | 1 | 0 | 0 | P1 |
| 0 (LSB) | 1 | 0 | 0 | P0 |

2. Horizontal blanking section consists of repeating pattern 80, 10, 80, 10.
3. Vertical back porch time (V_BP) is adjustable by setting register VBP; requirement of min. back porch and min. front porch time must be satisfied.
4. Interlace and non-interlace vertical input interfaces are acceptable.

6.1.3. 8-bit Serial RGB Interface

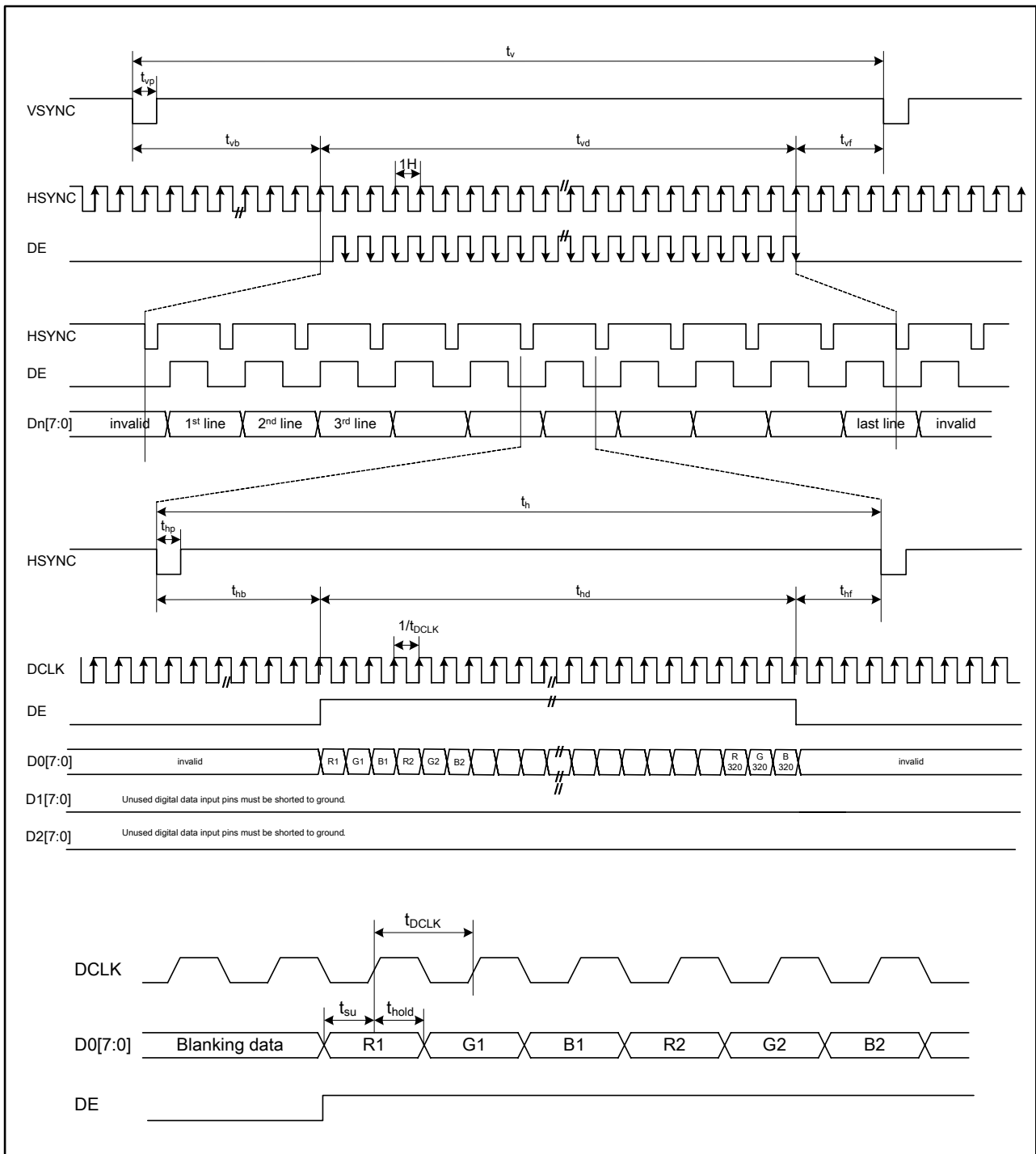


Figure4 Serial RGB Input Signal Timing

24.535MHz Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|--------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 24.535 | - | MHZ | |
| Horizontal Period | t_h | - | 1560 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 960 | 960 | 960 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 16 | 359 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262 | - | t_h | |
| Vertical Display Period | t_{vd} | 240 | 240 | 240 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 18 | - | t_h | |
| Vertical Front Porch | t_{vf} | 1 | 4 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

20MHz Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 20 | - | MHZ | |
| Horizontal Period | t_h | - | 1360 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 960 | 960 | 960 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 16 | 159 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 245 | - | t_h | |
| Vertical Display Period | t_{vd} | 240 | 240 | 240 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 4 | - | t_h | |
| Vertical Front Porch | t_{vf} | 1 | 1 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

Note

- ◆ Horizontal back porch time (t_{hb}) is adjustable by setting register HBP; requirement of min. back porch and min. front porch time must be satisfied.
- ◆ Vertical back porch time (t_{vb}) is adjustable by setting register VBP; requirement of min. back porch and min. front porch time must be satisfied.
- ◆ Interlace and non-interlace vertical input interfaces are acceptable.

6.1.4. 8-bit Serial RGB Dummy Interface

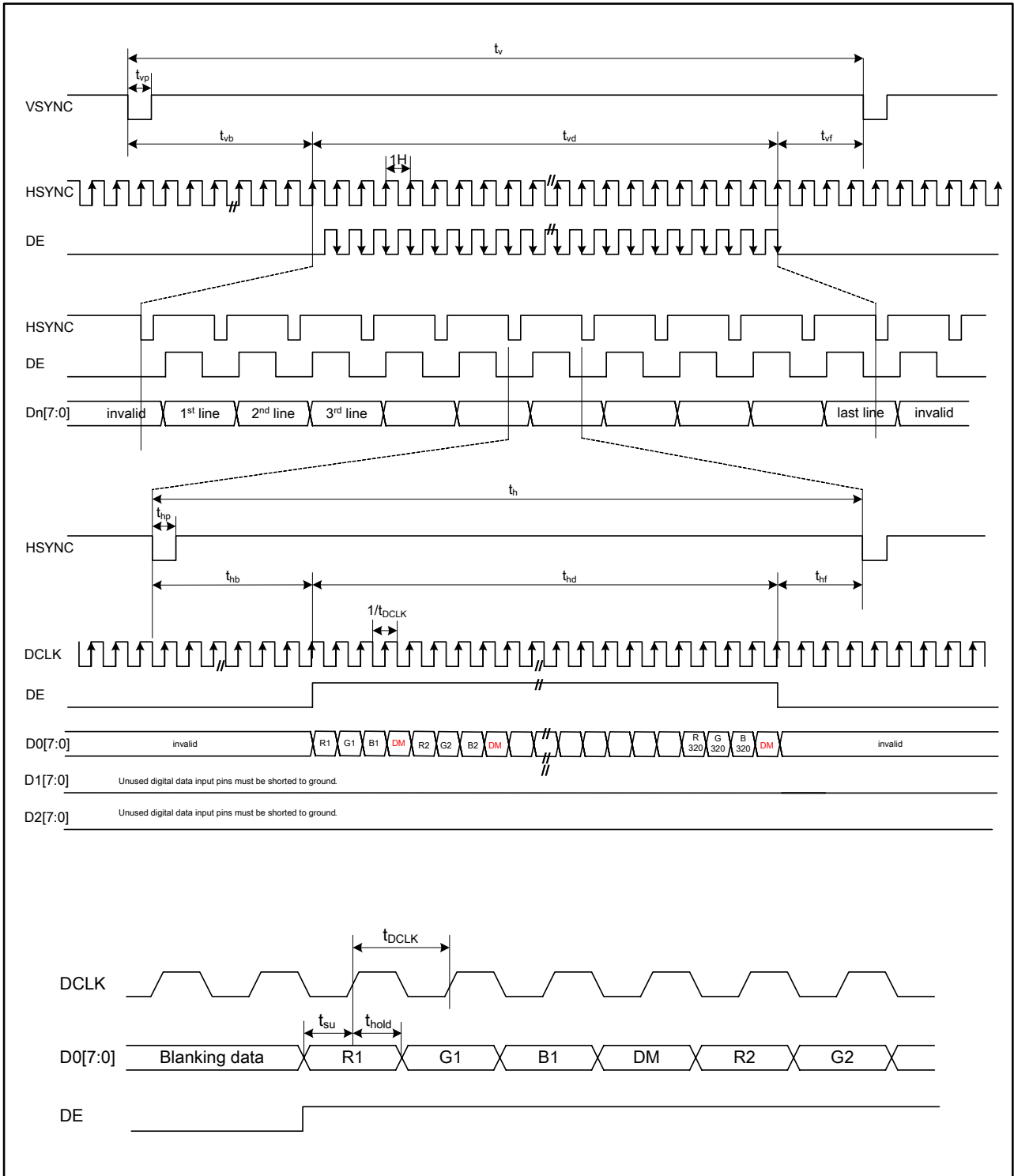


Figure5 8-bit Serial RGB Dummy Input Signal Timing

360 (NTSC) Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|-------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 27 | - | MHZ | |
| Horizontal Period | t_h | - | 1716 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1440 | 1440 | 1440 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 16 | 35 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262.5 | - | t_h | |
| Vertical Display Period | t_{vd} | 240 | 240 | 240 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 21 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

360 (PAL) Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|-------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 27 | - | MHZ | |
| Horizontal Period | t_h | - | 1728 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1440 | 1440 | 1440 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 2 | 46 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 312.5 | - | t_h | |
| Vertical Display Period | t_{vd} | 288 | 288 | 288 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 24 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

320 (NTSC) Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|--------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 24.535 | - | MHz | |
| Horizontal Period | t_h | - | 1560 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1280 | 1280 | 1280 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 2 | 39 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262.5 | - | t_h | |
| Vertical Display Period | t_{vd} | 240 | 240 | 240 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 21 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

320 (PAL) Mode timing specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|--------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 24.375 | - | MHz | |
| Horizontal Period | t_h | - | 1560 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 1280 | 1280 | 1280 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 241 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | 2 | 39 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 312.5 | - | t_h | |
| Vertical Display Period | t_{vd} | 288 | 288 | 288 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 24 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

6.1.5. 24-bit Parallel RGB Interface

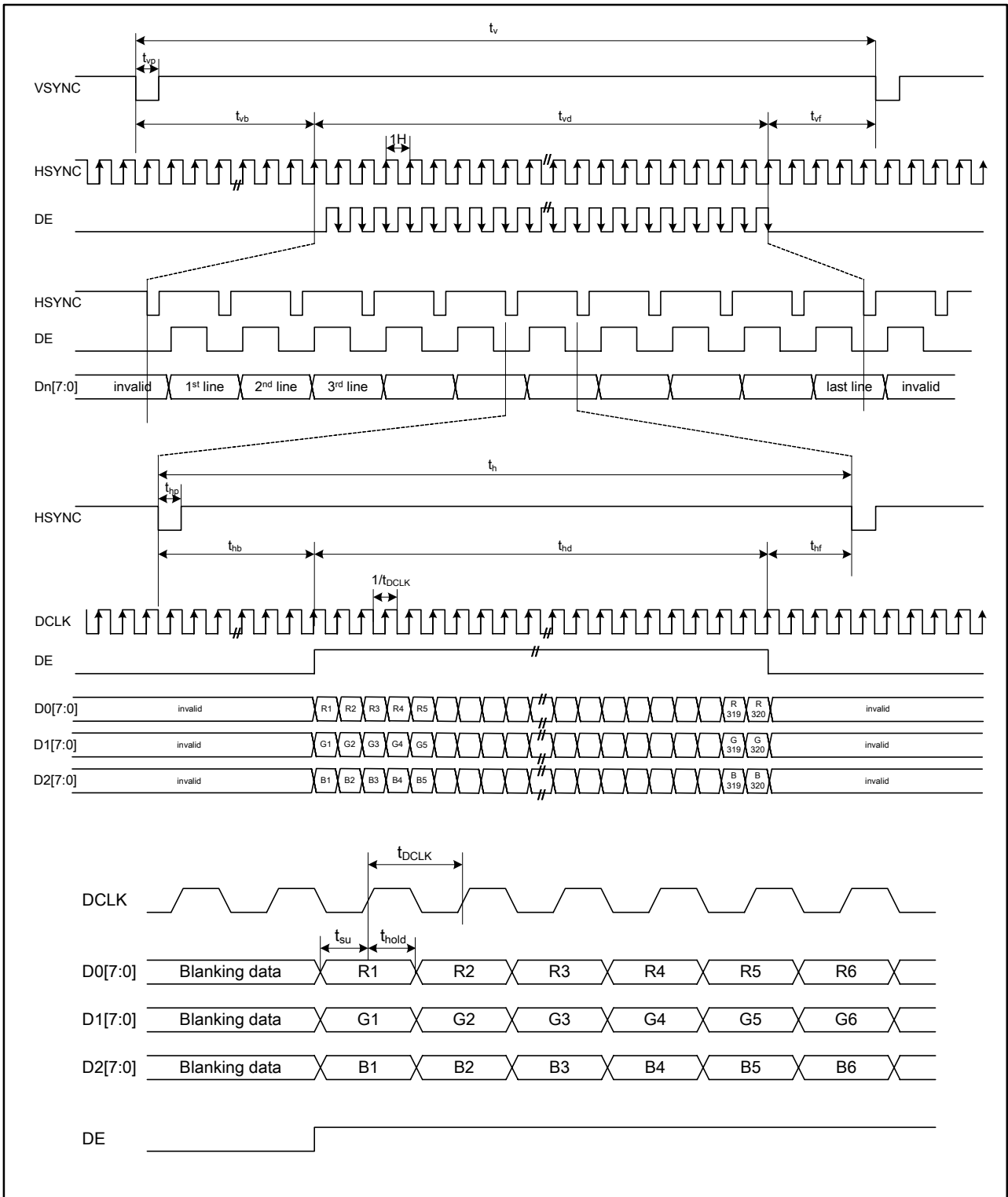


Figure6 Parallel RGB Input Signal Timing

| Parameter | Symbol | Min. | Typ. | Max. | Unit. | Note |
|---------------------------|--------------|------|------|------|------------|------|
| DCLK Frequency | $1/t_{DCLK}$ | - | 6.4 | 11 | MHz | |
| Horizontal Period | t_h | - | 408 | - | t_{DCLK} | |
| Horizontal Display Period | t_{hd} | 320 | 320 | 320 | t_{DCLK} | |
| Horizontal Back Porch | t_{hb} | - | 38 | - | t_{DCLK} | |
| Horizontal Front Porch | t_{hf} | - | 50 | - | t_{DCLK} | |
| Horizontal Pulse Width | t_{hp} | 1 | 1 | - | t_{DCLK} | |
| Vertical Period | t_v | - | 262 | - | t_h | |
| Vertical Display Period | t_{vd} | 240 | 240 | 240 | t_h | |
| Vertical Back Porch | t_{vb} | 2 | 18 | - | t_h | |
| Vertical Front Porch | t_{vf} | 2 | 4 | - | t_h | |
| Vertical Pulse Width | t_{vp} | 1 | 1 | - | t_h | |
| Data setup time | t_{su} | 12 | - | - | ns | |
| Data hold time | t_{hold} | 12 | - | - | ns | |

Note: Horizontal Back porch + Horizontal front porch \geq 50

6.2. Serial Peripheral Interface (SPI)

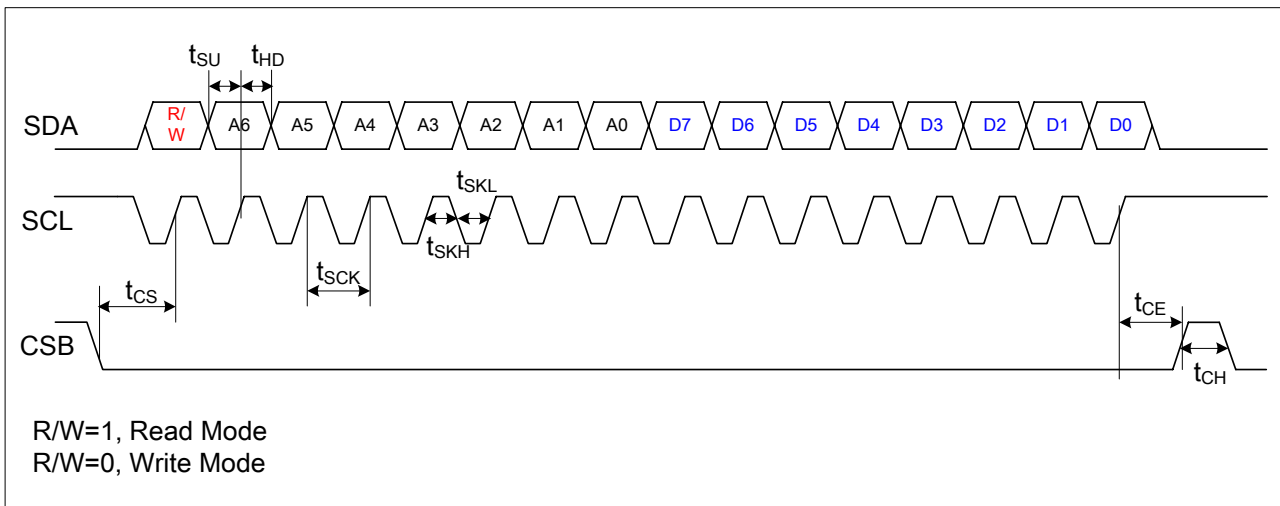


Figure7 SPI Interface Input Signal Timing

SPI Timing Specification

| Items | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------|-----------|------|------|------|------|------|
| CSB to SCL Setup time | T_{CS} | 50 | - | - | ns | |
| CSB to SCL Hold time | T_{CE} | 50 | - | - | ns | |
| SCL Period | T_{SCK} | 50 | - | - | ns | |
| SCL High Period | T_{SKH} | 25 | - | - | ns | |
| SCL Low Period | T_{SKL} | 25 | - | - | ns | |
| Data Setup Time | T_{SU} | 15 | - | - | ns | |
| Data Hold Time | T_{HD} | 15 | - | - | ns | |
| CSB High Pulse Period | T_{CH} | 50 | - | - | ns | |

7. Register

| NO. | Description | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|-----------------------|------------------|-----------|-----------|-----------|------------------|----------|-----------|-----------|
| R00 | Chip ID | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| R01 | VCOM Amplitude | - | - | - | VDV[4] | VDV[3] | VDV[2] | VDV[1] | VDV[0] |
| R02 | VCOM High Voltage | - | - | VCM[5] | VCM[4] | VCM[3] | VCM[2] | VCM[1] | VCM[0] |
| R03 | VREG1OUT Voltage | - | - | - | VREG[4] | VREG[3] | VREG[2] | VREG[1] | VREG[0] |
| R04 | Global Reset | - | - | - | - | - | - | - | GRESET |
| R05 | Power Setting | - | VC[2] | VC[1] | VC[0] | - | BT[2] | BT[1] | BT[0] |
| R06 | Entry Control | IN_SEL[3] | IN_SEL[2] | IN_SEL[1] | IN_SEL[0] | NTPAL[1] | NTPAL[0] | VDIR | HDIR |
| R07 | Power Control | AUTO_EN | VCL_EN | VCOM_EN | - | DDVDH_EN | VGH_EN | VGL_EN | STB |
| R08 | Vertical Back Porch | - | - | VBP[5] | VBP[4] | VBP[3] | VBP[2] | VBP[1] | VBP[0] |
| R09 | Horizontal Back Porch | HBP[7] | HBP[6] | HBP[5] | HBP[4] | HBP[3] | HBP[2] | HBP[1] | HBP[0] |
| R0A | Polarity | - | REV | Formula | CbCr/BGR | DE_POL | VS_POL | HS_POL | DK_POL |
| R0B | Display | - | - | - | - | RGBIF[1] | RGBIF[0] | - | F/L |
| R0C | DC/DC | - | DC2[2] | DC2[1] | DC2[0] | - | DC1[2] | DC1[1] | DC1[0] |
| R0D | Driving | - | AP[1] | AP[0] | - | GAP[1] | GAP[0] | SAP[1] | SAP[0] |
| R0E | CONTRAST | - | - | - | - | CONTRAST[3:0] | | | |
| R0F | BRIGHT | BRIGHTNESS[7:0] | | | | | | | |
| R10 | Gamma1 | Neg_Gamma_1[3:0] | | | | Pos_Gamma_1[3:0] | | | |
| R11 | Gamma2 | Neg_Gamma_2[3:0] | | | | Pos_Gamma_2[3:0] | | | |
| R12 | Gamma3 | Neg_Gamma_3[3:0] | | | | Pos_Gamma_3[3:0] | | | |
| R13 | Gamma4 | Neg_Gamma_4[3:0] | | | | Pos_Gamma_4[3:0] | | | |
| R14 | Gamma5 | Neg_Gamma_5[3:0] | | | | Pos_Gamma_5[3:0] | | | |
| R15 | Gamma6 | Neg_Gamma_6[3:0] | | | | Pos_Gamma_6[3:0] | | | |
| R16 | Gamma7 | Neg_Gamma_7[3:0] | | | | Pos_Gamma_7[3:0] | | | |
| R17 | Gamma8 | Neg_Gamma_8[3:0] | | | | Pos_Gamma_8[3:0] | | | |
| R30 | Power | - | POL_OUT | - | - | AUTO_DP | DISP_ON | A_TIME[1] | A_TIME[0] |
| R42 | OTP Program | OTP_PGM_EN | VCM_EN | VCM_OTP5 | VCM_OTP4 | VCM_OTP3 | VCM_OTP2 | VCM_OTP1 | VCM_OTP0 |
| R43 | OTP Status | PGM_CNT1 | PGM_CNT0 | VCM_D5 | VCM_D4 | VCM_D3 | VCM_D2 | VCM_D1 | VCM_D0 |
| R44 | OTP Key | OTP_KEY7 | OTP_KEY6 | OTP_KEY5 | OTP_KEY4 | OTP_KEY3 | OTP_KEY2 | OTP_KEY1 | OTP_KEY0 |

7.1. Register Description

7.1.1. Device ID (R00h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|----|----|----|----|----|----|----|
| R | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |

When reading this register, the Chip_ID will be read back (0x96).

7.1.2. VCOM AC Voltage (R01h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|----|----|--------|--------|--------|--------|--------|
| W | 0 | 0 | 0 | VDV[4] | VDV[3] | VDV[2] | VDV[1] | VDV[0] |

VDV[4:0] Select the factor of VREG1OUT to set the amplitude of Vcom alternating voltage from 0.70 to 1.32 x VREG1OUT.

| VDV[4:0] | VCOM Amplitude | VDV[4:0] | VCOM Amplitude |
|----------|-----------------|----------|----------------------------------|
| 5'h00 | VREG1OUT x 0.70 | 5'h10 | VREG1OUT x 1.02 |
| 5'h01 | VREG1OUT x 0.72 | 5'h11 | VREG1OUT x 1.04 |
| 5'h02 | VREG1OUT x 0.74 | 5'h12 | VREG1OUT x 1.06 |
| 5'h03 | VREG1OUT x 0.76 | 5'h13 | VREG1OUT x 1.08 |
| 5'h04 | VREG1OUT x 0.78 | 5'h14 | VREG1OUT x 1.10 |
| 5'h05 | VREG1OUT x 0.80 | 5'h15 | VREG1OUT x 1.12 |
| 5'h06 | VREG1OUT x 0.82 | 5'h16 | VREG1OUT x 1.14 (Default) |
| 5'h07 | VREG1OUT x 0.84 | 5'h17 | VREG1OUT x 1.16 |
| 5'h08 | VREG1OUT x 0.86 | 5'h18 | VREG1OUT x 1.18 |
| 5'h09 | VREG1OUT x 0.88 | 5'h19 | VREG1OUT x 1.20 |
| 5'h0a | VREG1OUT x 0.90 | 5'h1a | VREG1OUT x 1.22 |
| 5'h0b | VREG1OUT x 0.92 | 5'h1b | VREG1OUT x 1.24 |
| 5'h0c | VREG1OUT x 0.94 | 5'h1c | VREG1OUT x 1.26 |
| 5'h0d | VREG1OUT x 0.96 | 5'h1d | VREG1OUT x 1.28 |
| 5'h0e | VREG1OUT x 0.98 | 5'h1e | VREG1OUT x 1.30 |
| 5'h0f | VREG1OUT x 1.00 | 5'h1f | VREG1OUT x 1.32 |

7.1.3. VCOM High Voltage (R02h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|----|--------|--------|--------|--------|--------|--------|
| W | 0 | 0 | VCM[5] | VCM[4] | VCM[3] | VCM[2] | VCM[1] | VCM[0] |

VCM[5:0] Set the VCOMH voltage from 0.37 to 1.00 x VREG1OUT.

| VCM[5:0] | VCOMH | VCM[5:0] | VCOMH |
|----------|-----------------|----------|-----------------|
| 6'h00 | VREG1OUT x 0.37 | 6'h20 | VREG1OUT x 0.69 |
| 6'h01 | VREG1OUT x 0.38 | 6'h21 | VREG1OUT x 0.70 |
| 6'h02 | VREG1OUT x 0.39 | 6'h22 | VREG1OUT x 0.71 |
| 6'h03 | VREG1OUT x 0.40 | 6'h23 | VREG1OUT x 0.72 |
| 6'h04 | VREG1OUT x 0.41 | 6'h24 | VREG1OUT x 0.73 |
| 6'h05 | VREG1OUT x 0.42 | 6'h25 | VREG1OUT x 0.74 |
| 6'h06 | VREG1OUT x 0.43 | 6'h26 | VREG1OUT x 0.75 |
| 6'h07 | VREG1OUT x 0.44 | 6'h27 | VREG1OUT x 0.76 |

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| | | | |
|-------|-----------------|-------|-----------------------------------|
| 6'h08 | VREG1OUT x 0.45 | 6'h28 | VREG1OUT x 0.77 |
| 6'h09 | VREG1OUT x 0.46 | 6'h29 | VREG1OUT x 0.78 |
| 6'h0a | VREG1OUT x 0.47 | 6'h2a | VREG1OUT x 0.79 |
| 6'h0b | VREG1OUT x 0.48 | 6'h2b | VREG1OUT x 0.80 |
| 6'h0c | VREG1OUT x 0.49 | 6'h2c | VREG1OUT x 0.81 |
| 6'h0d | VREG1OUT x 0.50 | 6'h2d | VREG1OUT x 0.82 |
| 6'h0e | VREG1OUT x 0.51 | 6'h2e | VREG1OUT x 0.83 |
| 6'h0f | VREG1OUT x 0.52 | 6'h2f | VREG1OUT x 0.84 |
| 6'h10 | VREG1OUT x 0.53 | 6'h30 | VREG1OUT x 0.85 |
| 6'h11 | VREG1OUT x 0.54 | 6'h31 | VREG1OUT x 0.86 |
| 6'h12 | VREG1OUT x 0.55 | 6'h32 | VREG1OUT x 0.87 |
| 6'h13 | VREG1OUT x 0.56 | 6'h33 | VREG1OUT x 0.88 |
| 6'h14 | VREG1OUT x 0.57 | 6'h34 | VREG1OUT x 0.89 |
| 6'h15 | VREG1OUT x 0.58 | 6'h35 | VREG1OUT x 0.90 |
| 6'h16 | VREG1OUT x 0.59 | 6'h36 | VREG1OUT x 0.91(Default) |
| 6'h17 | VREG1OUT x 0.60 | 6'h37 | VREG1OUT x 0.92 |
| 6'h18 | VREG1OUT x 0.61 | 6'h38 | VREG1OUT x 0.93 |
| 6'h19 | VREG1OUT x 0.62 | 6'h39 | VREG1OUT x 0.94 |
| 6'h1a | VREG1OUT x 0.63 | 6'h3a | VREG1OUT x 0.95 |
| 6'h1b | VREG1OUT x 0.64 | 6'h3b | VREG1OUT x 0.96 |
| 6'h1c | VREG1OUT x 0.65 | 6'h3c | VREG1OUT x 0.97 |
| 6'h1d | VREG1OUT x 0.66 | 6'h3d | VREG1OUT x 0.98 |
| 6'h1e | VREG1OUT x 0.67 | 6'h3e | VREG1OUT x 0.99 |
| 6'h1f | VREG1OUT x 0.68 | 6'h3f | VREG1OUT x 1.00 |

7.1.4. VREG1OUT Voltage (R03h)

| | | | | | | | | |
|-----|----|----|----|---------|---------|---------|---------|---------|
| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| W | 0 | 0 | 0 | VREG[4] | VREG[3] | VREG[2] | VREG[1] | VREG[0] |

VREG[4:0] Set the voltage level of VREG1OUT, which is a reference level for the VCOM level and the grayscale voltage level.

| VREG [4:0] | VREG1OUT (Volt) | VREG [4:0] | VREG1OUT (Volt) |
|------------|----------------------|------------|-----------------|
| 0000 | 3.6 | 1000 | 5.2 |
| 0001 | 3.7 | 1001 | 5.3 |
| 00010 | 3.8 | 10010 | 5.4 |
| 00011 | 3.9 | 10011 | 5.5 |
| 00100 | 4 | 10100 | 5.6 |
| 00101 | 4.1 | 10101 | 5.7 |
| 00110 | 4.2 | 10110 | 5.8 |
| 00111 | 4.3 | 10111 | 5.9 |
| 01000 | 4.4 | 11000 | 6.0 |
| 01001 | 4.5 (default) | 11001 | - |
| 01010 | 4.6 | 11010 | - |
| 01011 | 4.7 | 11011 | - |
| 01100 | 4.8 | 11100 | - |
| 01101 | 4.9 | 11101 | - |
| 01110 | 5.0 | 11110 | - |
| 01111 | 5.1 | 11111 | - |

7.1.5. Global Reset (R04h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|----|----|----|----|----|----|--------|
| W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | GRESET |

Global reset signal control register.

| GRESET | Description |
|--------|--|
| 1 | Normal operation (Default) |
| 0 | Reset all the register value to the default value. |

7.1.6. Power Setting 1 (R05h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|-------|-------|-------|----|-------|-------|-------|
| W | 0 | VC[2] | VC[1] | VC[0] | 0 | BT[2] | BT[1] | BT[0] |

BT[3:0]: Sets the factor used in the step-up circuits. Select the optimal step-up factor for the operating voltage. To reduce power consumption, set a smaller factor.

| BT[2] | BT[1] | BT[0] | DDVDH | VCL | VGH | VGL |
|----------|----------|----------|-----------------|------------------|-----------------|----------------------------|
| 0 | 0 | 0 | 2 x VCI1 | -1 x VCI1 | 6 x VCI1 | -5 x VCI1 |
| 0 | 0 | 1 | 2 x VCI1 | -1 x VCI1 | 6 x VCI1 | -4 x VCI1 |
| 0 | 1 | 0 | 2 x VCI1 | -1 x VCI1 | 6 x VCI1 | -3 x VCI1 (default) |
| 0 | 1 | 1 | 2 x VCI1 | -1 x VCI1 | 5 x VCI1 | -5 x VCI1 |
| 1 | 0 | 0 | 2 x VCI1 | -1 x VCI1 | 5 x VCI1 | -4 x VCI1 |
| 1 | 0 | 1 | 2 x VCI1 | -1 x VCI1 | 5 x VCI1 | -3 x VCI1 |
| 1 | 1 | 0 | 2 x VCI1 | -1 x VCI1 | 4 x VCI1 | -4 x VCI1 |
| 1 | 1 | 1 | 2 x VCI1 | -1 x VCI1 | 4 x VCI1 | -3 x VCI1 |

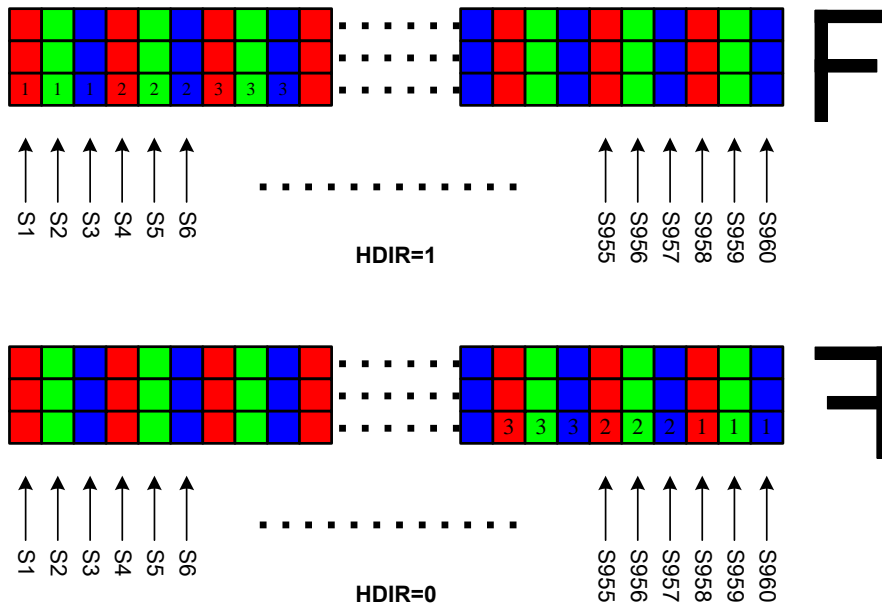
VC[2:0] Sets the ratio factor of VCI to generate the reference voltages VCI1

| VC[2] | VC[1] | VC[0] | VCI1 |
|----------|----------|----------|----------------------------------|
| 0 | 0 | 0 | VCI1=VCI × 1.00 |
| 0 | 0 | 1 | VCI1=VCI × 0.95 |
| 0 | 1 | 0 | VCI1=VCI × 0.90 (Default) |
| 0 | 1 | 1 | VCI1=VCI × 0.85 |
| 1 | 0 | 0 | VCI1=VCI × 0.80 |
| 1 | 0 | 1 | VCI1=VCI × 0.75 |
| 1 | 1 | 0 | VCI1=VCI × 0.70 |
| 1 | 1 | 1 | Disable |

7.1.7. Entry Control (R06h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|-----------|-----------|-----------|-----------|----------|----------|------|------|
| W | IN_SEL[3] | IN_SEL[2] | IN_SEL[1] | IN_SEL[0] | NTPAL[1] | NTPAL[0] | VDIR | HDIR |

| HDIR | Description |
|------|---------------------------------------|
| 1 | Left-to-Right scan (default) |
| 0 | Right-to-Left scan |



| VDIR | Description |
|------|------------------------------------|
| 1 | Up-to-down scan (default) |
| 0 | Down-to-up scan |



| NTPAL[1:0] | Description |
|------------|-----------------------------------|
| 00 | NTSC mode |
| 01 | PAL mode |
| 10 | Not defined |
| 11 | Auto-Detection (default) |

| IN_SEL[3:0] | Description |
|-------------|--|
| 0000 | Serial RGB interface (through mode) Input data must be aligned with the color filter arrangement. |
| 0001 | Serial RGB interface (alignment mode) Input data must always be the R1, G1, B1, R2, G2, B2, ... sequence, and the R/G/B data will be swapped automatically based on the selected color filter arrangement. |
| 0010 | Serial RGB Dummy interface (320x240 Mode) |
| 0011 | Serial RGB Dummy interface (360x240 Mode) |
| 0100 | Setting disable |
| 0101 | Parallel RGB Interface (through mode) Input data must be aligned with the color filter arrangement. |
| 0110 | Parallel RGB Interface (alignment mode) Input data always follows the D0[7:0]=R, D1[7:0]=G, D2[7:0]= B sequence, and the R/G/B data will be swapped automatically based on the selected color filter arrangement, VDIR, |

| | |
|------|---|
| | and HDIR. |
| 0111 | YUV Mode 640Y, 320CbCr 24.54MHz Data format |
| 1000 | YUV Mode 720Y, 360CbCr 27MHz Data format |
| 1001 | Setting disable |
| 1010 | ITU-R BT.656 interface (720Y 360CbCr 27Mhz) |
| 1011 | ITU-R BT.656 interface (640Y 320CbCr 27Mhz) |

Note:

1. The default value of IN_SEL[3:0] is dependent on the IF[2:1] status

| IF2 | IF1 | MPU-Interface Mode | IN_SEL[3:0] Default value |
|-----|-----|-------------------------------|---------------------------|
| 0 | 0 | 8-bit Serial RGB Interface | 0000 |
| 0 | 1 | 24-bit Parallel RGB Interface | 0101 |
| 1 | 0 | ITU-R BT.601 | 1000 |
| 1 | 1 | ITU-R BT.656 | 1010 |

7.1.8. Power Control (R07h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|---------|--------|---------|----|----------|--------|--------|-----|
| W | Auto_EN | VCL_EN | VCOM_EN | - | DDVDH_EN | VGH_EN | VGL_EN | STB |

| STB | Description |
|-----|----------------------------|
| 0 | Standby mode |
| 1 | Normal operation (default) |

| VGL_EN | Description |
|--------|------------------------|
| 0 | VGL power off |
| 1 | VGL power on (default) |

| VGH_EN | Description |
|--------|------------------------|
| 0 | VGH power off |
| 1 | VGH power on (default) |

| DDVDH_EN | Description |
|----------|--------------------------|
| 0 | DDVDH power off |
| 1 | DDVDH power on (default) |

| VCOM_EN | Description |
|---------|-------------------------|
| 0 | VCOM power off |
| 1 | VCOM power on (default) |

| VCL_EN | Description |
|--------|------------------------|
| 0 | VCL power off |
| 1 | VCL power on (default) |

| Auto_EN | Description |
|---------|----------------------------------|
| 0 | Manual power on sequence |
| 1 | Auto power on sequence (default) |

7.1.9. Back Porch Control (R08h, R09h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|
| W | 0 | 0 | VBP[5] | VBP[4] | VBP[3] | VBP[2] | VBP[1] | VBP[0] |
| W | HBP[7] | HBP[6] | HBP[5] | HBP[4] | HBP[3] | HBP[2] | HBP[1] | HBP[0] |

VBP (Vertical Back Porch)

| VBP[5:0] | Vertical Back Porch | UNIT |
|----------|---------------------|------|
| 00h | 1 | Line |
| ... | .. | |
| 10h | 17 | |
| 11h | 18 (default) | |
| 12h | 19 | |
| ... | .. | |
| 3Fh | 64 | |

HBP (Horizontal Back Porch)

| HBP[7:0] | Horizontal Back Porch | UNIT |
|----------|-----------------------------|------|
| 00h | TP-128 | DCLK |
| ... | .. | |
| 7Fh | TP-1 | |
| 80h | Typical value (TP, default) | |
| 81h | TP+1 | |
| ... | .. | |
| FFh | TP+127 | |

Note: Typical value is listed in each interface table.

7.1.10. Polarity Control (R0Ah)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|-----|---------|----------|--------|--------|--------|--------|
| W | 0 | REV | Formula | CbCr/BGR | DE_POL | VS_POL | HS_POL | DK_POL |

| DCLK_POL | Function |
|----------|-----------------------------|
| 0 | Negative Polarity |
| 1 | Positive Polarity (default) |

| VSYNC_POL | Function |
|-----------|-----------------------------|
| 0 | Negative Polarity (default) |
| 1 | Positive Polarity |

| HSYNC_POL | Function |
|-----------|-----------------------------|
| 0 | Negative Polarity (default) |
| 1 | Positive Polarity |

| DE_POL | Function |
|--------|-----------------------------|
| 0 | Negative Polarity |
| 1 | Positive Polarity (default) |

| CbCr/BGR | Function |
|----------|--|
| 0 | YCbCr Mode: Cb0, Y0, Cr0, Y1, Cb2, Y2, Cr2, Y3 (default) |

| | |
|---|--|
| | RGB mode: R, G, B, R, G, B |
| 1 | YCbCr Mode: Cr0, Y0, Cb0, Y1, Cr2, Y2, Cb2, Y3 RGB mode: B, G, R, B, G, R |

Note: This bit is invalid for the through mode.

| Formula | Description |
|---------|---------------------|
| 0 | Formula A (default) |
| 1 | Formula B |

RGB – YCbCr Equations Formula A:

$$R = Y + 1.371 * (Cr - 128)$$

$$G = Y - 0.698 * (Cr - 128) - 0.336 * (Cb - 128)$$

$$B = Y + 1.732 * (Cb - 128)$$

Where Y: 16 ~ 235, Cr: 16 ~ 240, Cb: 16 ~ 240

RGB – YCbCr Equations Formula B:

$$R = 1.164 * (Y - 16) + 1.596 * (Cr - 128)$$

$$G = 1.164 * (Y - 16) - 0.813 * (Cr - 128) - 0.392 * (Cb - 128)$$

$$B = 1.164 * (Y - 16) + 2.017 * (Cb - 128)$$

Where Y: 0 ~ 255, Cr: 0 ~ 255, Cb: 0 ~ 255

| REV | GRAM Data | Source Output in Display Area | |
|----------------|------------|-------------------------------|-------------------|
| | | Positive polarity | negative polarity |
| 0 | 24'h000000 | V255 | V0 |
| | . | . | . |
| | . | . | . |
| | 24'hFFFFFF | V0 | V255 |
| 1 (Default) | 24'h000000 | V0 | V255 |
| | . | . | . |
| | . | . | . |
| | 24'hFFFFFF | V255 | V0 |

7.1.11. Interface Control (R0Bh)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|----|----|----|----------|----------|----|-----|
| W | 0 | 0 | 0 | 0 | RGBIF[1] | RGBIF[0] | 0 | F/L |

| F/L | Function |
|-----|---------------------------|
| 0 | Frame inversion. |
| 1 | Line Inversion. (default) |

| RGBIF[1:0] | Function |
|------------|-------------------------------|
| 00 | HSYNC+VSYNC Mode |
| 01 | HSYNC+VSYNC+DE Mode (default) |
| 10 | DE Only Mode |
| 11 | Setting disabled |

7.1.12. Power Control 1 (R0Ch)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|--------|--------|--------|----|--------|--------|--------|
| W | 0 | DC2[2] | DC2[1] | DC2[0] | 0 | DC1[2] | DC1[1] | DC1[0] |

DC0[2:0]: Selects the operating frequency of the step-up circuit 1. The higher step-up operating frequency enhances the drivability of the step-up circuit and the quality of display but increases the current consumption. Adjust the frequency taking the trade-off between the display quality and the current consumption into account.

| DC1[2] | DC1[1] | DC1[0] | Frequency |
|--------|--------|--------|-----------------------------|
| 0 | 0 | 0 | DCLK/8 |
| 0 | 0 | 1 | DCLK/16 |
| 0 | 1 | 0 | DCLK/32 |
| 0 | 1 | 1 | DCLK/64 |
| 1 | 0 | 0 | DCLK/128 (Default) |
| 1 | 0 | 1 | DCLK/256 |
| 1 | 1 | 0 | DCLK/512 |
| 1 | 1 | 1 | Disable |

DC1[2:0]: Selects the operating frequency of the step-up circuit 2. The higher step-up operating frequency enhances the drivability of the step-up circuit and the quality of display but increases the current consumption. Adjust the frequency taking the trade-off between the display quality and the current consumption into account.

| DC2[2] | DC2[1] | DC2[0] | Frequency |
|--------|--------|--------|-----------------------------|
| 0 | 0 | 0 | DCLK/32 |
| 0 | 0 | 1 | DCLK/64 |
| 0 | 1 | 0 | DCLK/128 |
| 0 | 1 | 1 | DCLK/256 |
| 1 | 0 | 0 | DCLK/512 (Default) |
| 1 | 0 | 1 | DCLK/1024 |
| 1 | 1 | 0 | DCLK/2048 |
| 1 | 1 | 1 | Disable |

Note: Be sure $f_{DCDC1} \geq f_{DCDC2}$ when setting DC0[2:0] and DC1[2:0].

7.1.13. Power Control 2(R0Dh)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----|-------|-------|----|--------|--------|--------|--------|
| W | 0 | AP[1] | AP[0] | 0 | GAP[1] | GAP[1] | SAP[1] | SAP[0] |

| AP[1] | AP[0] | Driving Current |
|-------|-------|-------------------------|
| 0 | 0 | X1.0 (Default) |
| 0 | 1 | X0.75 |
| 1 | 0 | X1.25 |
| 1 | 1 | X 1.5 |

| GAP[1] | GAP[0] | Driving Current |
|--------|--------|-------------------------|
| 0 | 0 | X0.8 |
| 0 | 1 | X0.9 |
| 1 | 0 | X1.0 (Default) |

| | | |
|--------------------------------------|---|----------------|
| 1 | 1 | X 1.1 |
| SAP[1] SAP[0] Driving Current | | |
| 0 | 0 | X0.8 |
| 0 | 1 | X0.9 |
| 1 | 0 | X1.0 (Default) |
| 1 | 1 | X 1.1 |

7.1.14. Contrast Control (R0Eh)

| | | | | | | | | |
|-----|----|----|----|----|-------------|-------------|-------------|-------------|
| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| W | 0 | 0 | 0 | 0 | Contrast[3] | Contrast[2] | Contrast[1] | Contrast[0] |

| Contrast[3:0] | Contrast Gain (0.125/LSB) |
|---------------|---------------------------|
| 0000 | Setting disable |
| ... | ... |
| 1000 | 1 (default) |
| ... | ... |
| 1111 | 1.875 |

Output data value for display = input data value * contrast[3:0] + brightness[7:0]

7.1.15. Brightness Control (R0Fh)

| | | | | | | | | |
|-----|------------------|----|----|----|----|----|----|----|
| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| W | Brightness [7:0] | | | | | | | |

| Brightness [7:0] | Brightness Value |
|------------------|------------------|
| 00000000 | -128 |
| ... | ... |
| 10000000 | 0 (default) |
| ... | ... |
| 11111111 | 127 |

Output data value for display = input data value * contrast[3:0] + brightness[7:0]

7.1.16. Power Control 2 (R30h)

| | | | | | | | | |
|-----|----|---------|----|----|---------|---------|-----------|-----------|
| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| W | | POL_OUT | | | AUTO_DP | DISP_ON | A_TIME[1] | A_TIME[0] |

| POL_OUT | Description |
|---------|--|
| 0 | POL and VCOM are in same phase (default) |
| 1 | POL and VCOM are in reverse phase |

| AUTO_DP | Description |
|---------|-------------|
|---------|-------------|

| | |
|---|---|
| 0 | White image display time is decided by DISP_ON |
| 1 | White image display time is decided by A_TIME[1:0] (default) |

| DISP_ON | Description |
|---------|---|
| | When AUTO_DP="0", and DISP_ON="1", the normal display image is shown and the White image period is terminated (Default DISP_ON="0"). |

| A_Time[1] | A_Time[0] | White image display time |
|-----------|-----------|------------------------------|
| 0 | 0 | 10 frames |
| 0 | 1 | 20 frames (Default) |
| 1 | 0 | 40 frames |
| 1 | 1 | 80 frames |

7.1.17. OTP Programming Data (R42h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|------------|--------|----------|----------|----------|----------|----------|----------|
| W | OTP_PGM_EN | VCM_EN | VCM_OTP5 | VCM_OTP4 | VCM_OTP3 | VCM_OTP2 | VCM_OTP1 | VCM_OTP0 |

OTP_PGM_EN: OTP programming enable.

| OTP_PGM_EN | Function |
|------------|--|
| 0 | Disable OTP programming (default) |
| 1 | Enable OTP programming |

When OTP_PGM_EN is set as '1' and the OTP_KEY="55", the **VCM_OTP[5:0]** data will be written into OTP. The OTP_PGM_EN bit must be set as '0' when not to program OTP.

VCM_OTP[5:0]: OTP programming data for VCOMH voltage, the voltage refers to VCM[5:0] value.

VCOM_EN: VCOMH voltage adjustment selection

| VCOM_EN | Function |
|---------|--|
| 0 | Use the VCM register to set the VCOMH voltage (default) |
| 1 | Use OTP data to set the VCOMH voltage |

7.1.18. OTP Program Read Back Register (R43h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----------|----------|--------|--------|--------|--------|--------|--------|
| W | PGM_CNT1 | PGM_CNT0 | VCM_D5 | VCM_D4 | VCM_D3 | VCM_D2 | VCM_D1 | VCM_D0 |

PGM_CNT[1:0]: OTP programmed record. These bits are read only.

| OTP_PGM_CNT[1:0] | Description |
|------------------|--------------------------------------|
| 00 | OTP clean (default) |
| 01 | OTP programmed 1 st time |
| 10 | OTP programmed 2 nd time |
| 11 | OTP programmed 3 rd times |

Note that OTP can be programmed 3 times.

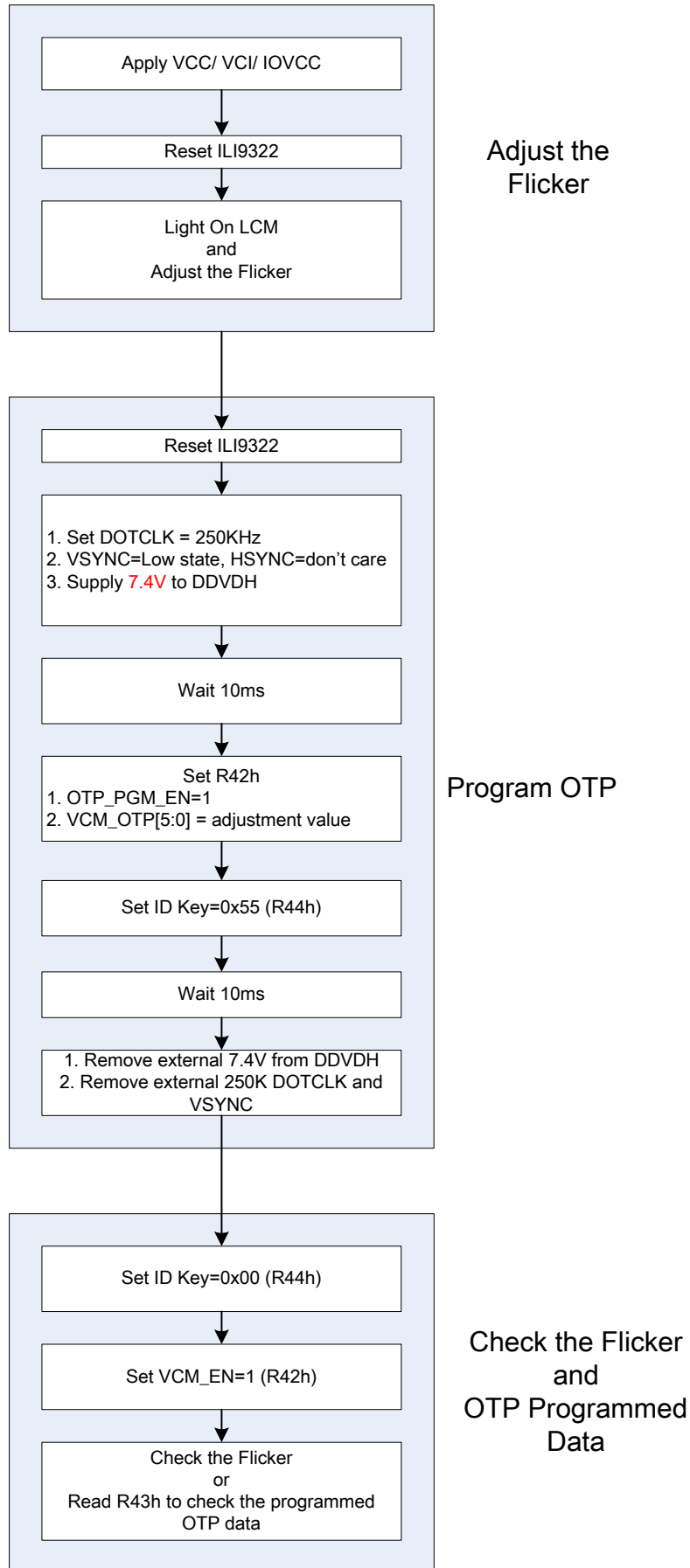
VCM_D[4:0]: OTP VCM data readback value. These bits are read only.

7.1.19. OTP Programming ID Key (R44h)

| R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| W | OTP_KEY7 | OTP_KEY6 | OTP_KEY5 | OTP_KEY4 | OTP_KEY3 | OTP_KEY2 | OTP_KEY1 | OTP_KEY0 |

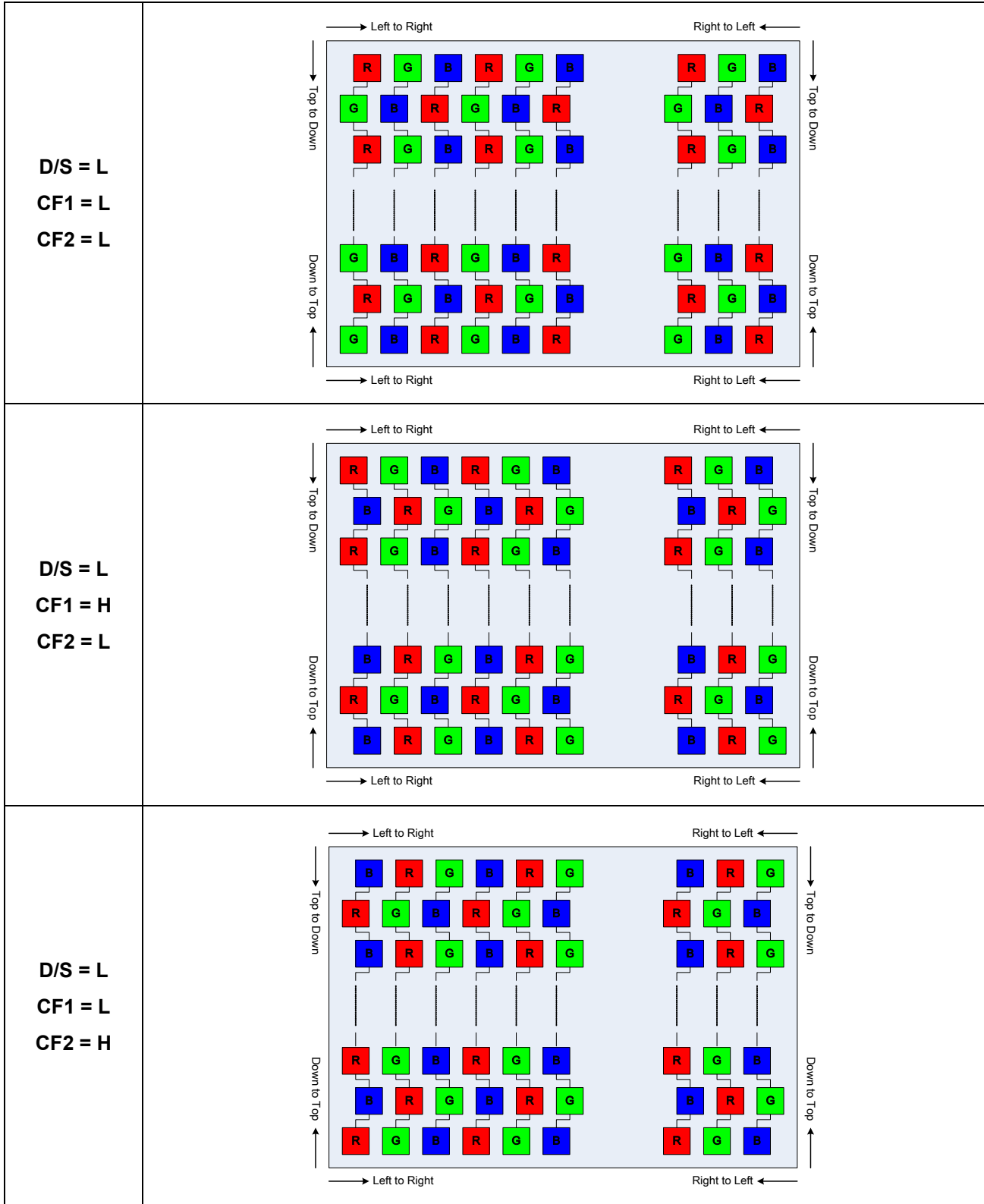
KEY[7:0]: OTP Programming ID key protection. Before writing OTP programming data R42h, R44h must be set as 0x55 to make OTP programming successfully. If R44h is not written with 0x55, OTP programming will be failed. See OTP Programming flow.

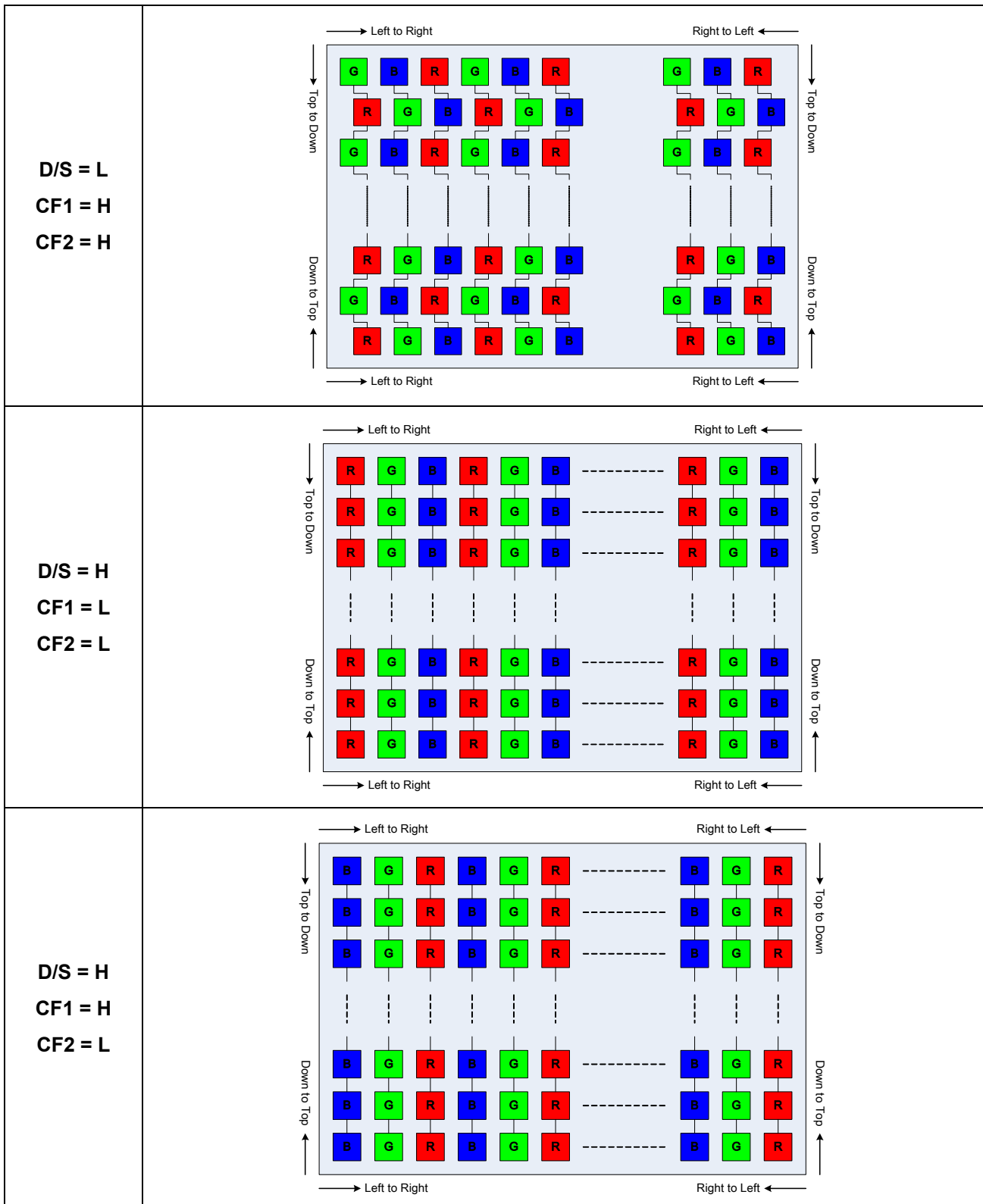
ILI9322 OTP Programming Flow



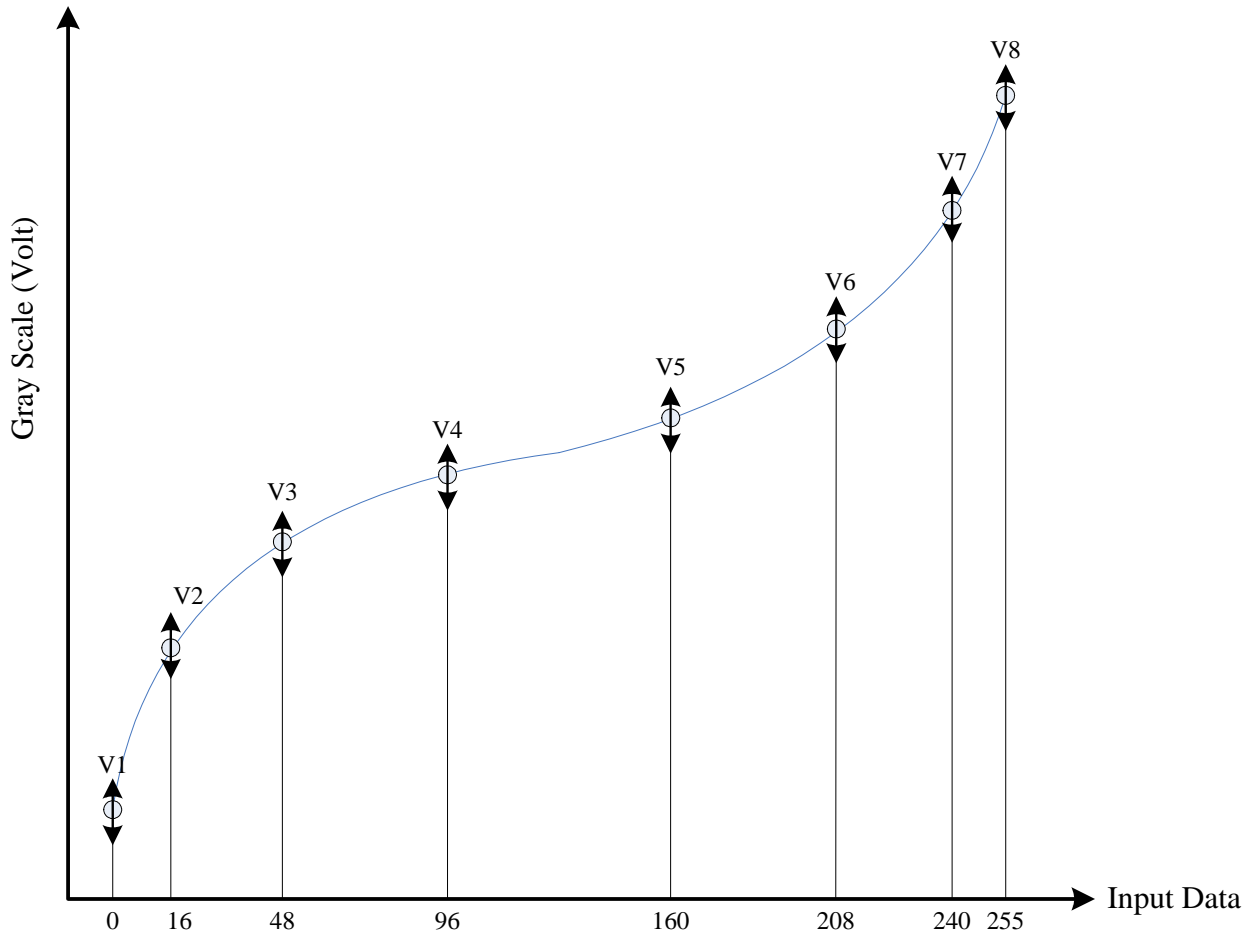
8. Color Filter Arrangement (CFA)

CF[2:1] and D/S pins define the color filter arrangement. If the serial RGB **through mode** interface are used, the input data sequence shall follow the color filter arrangement mapping.





9. Gamma Correction



| Neg_Gamma_x[3:0], x= 1 ~ 8 | Pos_Gamma_x[3:0] X= 1 ~ 8 | Percentage(V1、 V3、V4、V5、V6) | Percentage(V2、 V7、V8) |
|-------------------------------|------------------------------|--------------------------------|--------------------------|
| 0000 | 0000 | × 0.79 | × 0.72 |
| 0001 | 0001 | × 0.82 | × 0.76 |
| 0010 | 0010 | × 0.85 | × 0.80 |
| 0011 | 0011 | × 0.88 | × 0.84 |
| 0100 | 0100 | × 0.91 | × 0.88 |
| 0101 | 0101 | × 0.94 | × 0.92 |
| 0110 | 0110 | × 0.97 | × 0.96 |
| 0111 | 0111 | × 1.00 | × 1.00 |
| 1000 | 1000 | × 1.03 | × 1.04 |
| 1001 | 1001 | × 1.06 | × 1.08 |
| 1010 | 1010 | × 1.09 | × 1.12 |
| 1011 | 1011 | × 1.12 | × 1.16 |
| 1100 | 1100 | × 1.15 | × 1.20 |
| 1101 | 1101 | × 1.18 | × 1.24 |
| 1110 | 1110 | × 1.21 | × 1.28 |
| 1111 | 1111 | × 1.24 | × 1.32 |

Default Gamma Value (VREG1OUT=4.5V, Neg_Gamma_x[3:0]="0111" and Pos_Gamma_x[3:0]="0111")

| Data | Positive Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|--------------------------|
| 00H | VP0 | 4.450 (V1) | 760 | VP1 |
| 01H | VP1 | 4.253 | 760 | VP2+(VP1-VP2)*9816/12180 |
| 02H | VP2 | 4.055 | 760 | VP2+(VP1-VP2)*7440/12180 |
| 03H | VP3 | 3.858 | 760 | VP2+(VP1-VP2)*5076/12180 |
| 04H | VP4 | 3.66 | 104 | VP2+(VP1-VP2)*2700/12180 |
| 05H | VP5 | 3.633 | 104 | VP2+(VP1-VP2)*2376/12180 |
| 06H | VP6 | 3.606 | 104 | VP2+(VP1-VP2)*2052/12180 |
| 07H | VP7 | 3.579 | 104 | VP2+(VP1-VP2)*1728/12180 |
| 08H | VP8 | 3.552 | 82 | VP2+(VP1-VP2)*1404/12180 |
| 09H | VP9 | 3.531 | 82 | VP2+(VP1-VP2)*1152/12180 |
| 0AH | VP10 | 3.51 | 82 | VP2+(VP1-VP2)*900/12180 |
| 0BH | VP11 | 3.488 | 82 | VP2+(VP1-VP2)*636/12180 |
| 0CH | VP12 | 3.467 | 63 | VP2+(VP1-VP2)*384/12180 |
| 0DH | VP13 | 3.451 | 63 | VP2+(VP1-VP2)*192/12180 |
| 0EH | VP14 | 3.435 (V2) | 62 | VP2 |
| 0FH | VP15 | 3.418 | 63 | VP3+(VP2-VP3)*6768/6972 |
| 10H | VP16 | 3.402 | 52 | VP3+(VP2-VP3)*6576/6972 |
| 11H | VP17 | 3.389 | 52 | VP3+(VP2-VP3)*6420/6972 |
| 12H | VP18 | 3.375 | 52 | VP3+(VP2-VP3)*6252/6972 |
| 13H | VP19 | 3.362 | 52 | VP3+(VP2-VP3)*6096/6972 |
| 14H | VP20 | 3.348 | 50 | VP3+(VP2-VP3)*5928/6972 |
| 15H | VP21 | 3.335 | 50 | VP3+(VP2-VP3)*5772/6972 |
| 16H | VP22 | 3.322 | 50 | VP3+(VP2-VP3)*5616/6972 |
| 17H | VP23 | 3.309 | 50 | VP3+(VP2-VP3)*5460/6972 |
| 18H | VP24 | 3.296 | 40 | VP3+(VP2-VP3)*5304/6972 |
| 19H | VP25 | 3.286 | 40 | VP3+(VP2-VP3)*5184/6972 |
| 1AH | VP26 | 3.275 | 40 | VP3+(VP2-VP3)*5052/6972 |
| 1BH | VP27 | 3.265 | 40 | VP3+(VP2-VP3)*4932/6972 |
| 1CH | VP28 | 3.254 | 32 | VP3+(VP2-VP3)*4800/6972 |
| 1DH | VP29 | 3.246 | 32 | VP3+(VP2-VP3)*4704/6972 |
| 1EH | VP30 | 3.238 | 32 | VP3+(VP2-VP3)*4608/6972 |
| 1FH | VP31 | 3.229 | 32 | VP3+(VP2-VP3)*4500/6972 |
| 20H | VP32 | 3.221 | 36 | VP3+(VP2-VP3)*4404/6972 |
| 21H | VP33 | 3.212 | 36 | VP3+(VP2-VP3)*4296/6972 |
| 22H | VP34 | 3.203 | 36 | VP3+(VP2-VP3)*4188/6972 |
| 23H | VP35 | 3.193 | 36 | VP3+(VP2-VP3)*4068/6972 |
| 24H | VP36 | 3.184 | 29 | VP3+(VP2-VP3)*3960/6972 |
| 25H | VP37 | 3.177 | 29 | VP3+(VP2-VP3)*3876/6972 |
| 26H | VP38 | 3.169 | 29 | VP3+(VP2-VP3)*3780/6972 |
| 27H | VP39 | 3.162 | 29 | VP3+(VP2-VP3)*3696/6972 |
| 28H | VP40 | 3.154 | 29 | VP3+(VP2-VP3)*3600/6972 |
| 29H | VP41 | 3.147 | 29 | VP3+(VP2-VP3)*3516/6972 |
| 2AH | VP42 | 3.139 | 29 | VP3+(VP2-VP3)*3420/6972 |
| 2BH | VP43 | 3.132 | 29 | VP3+(VP2-VP3)*3336/6972 |
| 2CH | VP44 | 3.124 | 31 | VP3+(VP2-VP3)*3240/6972 |
| 2DH | VP45 | 3.116 | 31 | VP3+(VP2-VP3)*3144/6972 |
| 2EH | VP46 | 3.108 | 31 | VP3+(VP2-VP3)*3048/6972 |
| 2FH | VP47 | 3.100 | 31 | VP3+(VP2-VP3)*2952/6972 |
| 30H | VP48 | 3.092 | 25 | VP3+(VP2-VP3)*2856/6972 |
| 31H | VP49 | 3.086 | 25 | VP3+(VP2-VP3)*2784/6972 |
| 32H | VP50 | 3.079 | 25 | VP3+(VP2-VP3)*2700/6972 |
| 33H | VP51 | 3.073 | 25 | VP3+(VP2-VP3)*2628/6972 |

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| Data | Positive Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|-------------------------|
| 34H | VP52 | 3.066 | 31 | VP3+(VP2-VP3)*2544/6972 |
| 35H | VP53 | 3.058 | 31 | VP3+(VP2-VP3)*2448/6972 |
| 36H | VP54 | 3.05 | 31 | VP3+(VP2-VP3)*2352/6972 |
| 37H | VP55 | 3.042 | 31 | VP3+(VP2-VP3)*2256/6972 |
| 38H | VP56 | 3.034 | 28 | VP3+(VP2-VP3)*2160/6972 |
| 39H | VP57 | 3.027 | 28 | VP3+(VP2-VP3)*2076/6972 |
| 3AH | VP58 | 3.02 | 28 | VP3+(VP2-VP3)*1992/6972 |
| 3BH | VP59 | 3.012 | 28 | VP3+(VP2-VP3)*1896/6972 |
| 3CH | VP60 | 3.005 | 24 | VP3+(VP2-VP3)*1812/6972 |
| 3DH | VP61 | 2.999 | 24 | VP3+(VP2-VP3)*1740/6972 |
| 3EH | VP62 | 2.993 | 24 | VP3+(VP2-VP3)*1668/6972 |
| 3FH | VP63 | 2.986 | 24 | VP3+(VP2-VP3)*1584/6972 |
| 40H | VP64 | 2.98 | 22 | VP3+(VP2-VP3)*1512/6972 |
| 41H | VP65 | 2.974 | 22 | VP3+(VP2-VP3)*1440/6972 |
| 42H | VP66 | 2.969 | 22 | VP3+(VP2-VP3)*1380/6972 |
| 43H | VP67 | 2.963 | 22 | VP3+(VP2-VP3)*1308/6972 |
| 44H | VP68 | 2.957 | 24 | VP3+(VP2-VP3)*1236/6972 |
| 45H | VP69 | 2.951 | 24 | VP3+(VP2-VP3)*1164/6972 |
| 46H | VP70 | 2.945 | 24 | VP3+(VP2-VP3)*1092/6972 |
| 47H | VP71 | 2.938 | 24 | VP3+(VP2-VP3)*1008/6972 |
| 48H | VP72 | 2.932 | 22 | VP3+(VP2-VP3)*936/6972 |
| 49H | VP73 | 2.926 | 22 | VP3+(VP2-VP3)*864/6972 |
| 4AH | VP74 | 2.921 | 22 | VP3+(VP2-VP3)*804/6972 |
| 4BH | VP75 | 2.915 | 22 | VP3+(VP2-VP3)*732/6972 |
| 4CH | VP76 | 2.909 | 25 | VP3+(VP2-VP3)*660/6972 |
| 4DH | VP77 | 2.903 | 25 | VP3+(VP2-VP3)*588/6972 |
| 4EH | VP68 | 2.896 | 25 | VP3+(VP2-VP3)*504/6972 |
| 4FH | VP79 | 2.89 | 25 | VP3+(VP2-VP3)*432/6972 |
| 50H | VP80 | 2.883 | 28 | VP3+(VP2-VP3)*348/6972 |
| 51H | VP81 | 2.876 | 28 | VP3+(VP2-VP3)*264/6972 |
| 52H | VP82 | 2.869 | 28 | VP3+(VP2-VP3)*180/6972 |
| 53H | VP83 | 2.861 | 28 | VP3+(VP2-VP3)*84/6972 |
| 54H | VP84 | 2.854 (V3) | 19 | VP3 |
| 55H | VP85 | 2.849 | 19 | VP4+(VP3-VP4)*3708/3768 |
| 56H | VP86 | 2.844 | 19 | VP4+(VP3-VP4)*3648/3768 |
| 57H | VP87 | 2.839 | 19 | VP4+(VP3-VP4)*3588/3768 |
| 58H | VP88 | 2.834 | 24 | VP4+(VP3-VP4)*3528/3768 |
| 59H | VP89 | 2.828 | 24 | VP4+(VP3-VP4)*3456/3768 |
| 5AH | VP90 | 2.822 | 24 | VP4+(VP3-VP4)*3384/3768 |
| 5BH | VP91 | 2.815 | 24 | VP4+(VP3-VP4)*3300/3768 |
| 5CH | VP92 | 2.809 | 26 | VP4+(VP3-VP4)*3228/3768 |
| 5DH | VP93 | 2.802 | 26 | VP4+(VP3-VP4)*3144/3768 |
| 5EH | VP94 | 2.796 | 26 | VP4+(VP3-VP4)*3072/3768 |
| 5FH | VP95 | 2.789 | 26 | VP4+(VP3-VP4)*2988/3768 |
| 60H | VP96 | 2.782 | 23 | VP4+(VP3-VP4)*2904/3768 |
| 61H | VP97 | 2.776 | 23 | VP4+(VP3-VP4)*2832/3768 |
| 62H | VP98 | 2.77 | 23 | VP4+(VP3-VP4)*2760/3768 |
| 63H | VP99 | 2.764 | 23 | VP4+(VP3-VP4)*2688/3768 |
| 64H | VP100 | 2.758 | 24 | VP4+(VP3-VP4)*2616/3768 |
| 65H | VP101 | 2.752 | 24 | VP4+(VP3-VP4)*2544/3768 |
| 66H | VP102 | 2.746 | 24 | VP4+(VP3-VP4)*2472/3768 |
| 67H | VP103 | 2.739 | 24 | VP4+(VP3-VP4)*2388/3768 |
| 68H | VP104 | 2.733 | 25 | VP4+(VP3-VP4)*2316/3768 |
| 69H | VP105 | 2.727 | 25 | VP4+(VP3-VP4)*2244/3768 |

| Data | Positive Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|---------------------------|
| 6AH | VP106 | 2.72 | 25 | $VP4+(VP3-VP4)*2160/3768$ |
| 6BH | VP107 | 2.714 | 25 | $VP4+(VP3-VP4)*2088/3768$ |
| 6CH | VP108 | 2.707 | 27 | $VP4+(VP3-VP4)*2004/3768$ |
| 6DH | VP109 | 2.7 | 27 | $VP4+(VP3-VP4)*1920/3768$ |
| 6EH | VP110 | 2.693 | 27 | $VP4+(VP3-VP4)*1836/3768$ |
| 6FH | VP111 | 2.686 | 27 | $VP4+(VP3-VP4)*1752/3768$ |
| 70H | VP112 | 2.679 | 21 | $VP4+(VP3-VP4)*1668/3768$ |
| 71H | VP113 | 2.674 | 21 | $VP4+(VP3-VP4)*1608/3768$ |
| 72H | VP114 | 2.668 | 21 | $VP4+(VP3-VP4)*1536/3768$ |
| 73H | VP115 | 2.663 | 21 | $VP4+(VP3-VP4)*1476/3768$ |
| 74H | VP116 | 2.657 | 23 | $VP4+(VP3-VP4)*1404/3768$ |
| 75H | VP117 | 2.651 | 23 | $VP4+(VP3-VP4)*1332/3768$ |
| 76H | VP118 | 2.645 | 23 | $VP4+(VP3-VP4)*1260/3768$ |
| 77H | VP119 | 2.639 | 23 | $VP4+(VP3-VP4)*1188/3768$ |
| 78H | VP120 | 2.633 | 30 | $VP4+(VP3-VP4)*1116/3768$ |
| 79H | VP121 | 2.625 | 30 | $VP4+(VP3-VP4)*1020/3768$ |
| 7AH | VP122 | 2.618 | 30 | $VP4+(VP3-VP4)*936/3768$ |
| 7BH | VP123 | 2.61 | 30 | $VP4+(VP3-VP4)*840/3768$ |
| 7CH | VP124 | 2.602 | 27 | $VP4+(VP3-VP4)*744/3768$ |
| 7DH | VP125 | 2.595 | 27 | $VP4+(VP3-VP4)*660/3768$ |
| 7EH | VP126 | 2.588 | 27 | $VP4+(VP3-VP4)*576/3768$ |
| 7FH | VP127 | 2.581 | 27 | $VP4+(VP3-VP4)*492/3768$ |
| 80H | VP128 | 2.574 | 26 | $VP4+(VP3-VP4)*408/3768$ |
| 81H | VP129 | 2.567 | 26 | $VP4+(VP3-VP4)*324/3768$ |
| 82H | VP130 | 2.561 | 26 | $VP4+(VP3-VP4)*252/3768$ |
| 83H | VP131 | 2.554 | 26 | $VP4+(VP3-VP4)*168/3768$ |
| 84H | VP132 | 2.547 | 29 | $VP4+(VP3-VP4)*84/3768$ |
| 85H | VP133 | 2.540 (V4) | 29 | VP4 |
| 86H | VP134 | 2.532 | 29 | $VP5+(VP4-VP5)*2772/2868$ |
| 87H | VP135 | 2.525 | 29 | $VP5+(VP4-VP5)*2688/2868$ |
| 88H | VP136 | 2.517 | 30 | $VP5+(VP4-VP5)*2592/2868$ |
| 89H | VP137 | 2.509 | 30 | $VP5+(VP4-VP5)*2496/2868$ |
| 8AH | VP138 | 2.502 | 30 | $VP5+(VP4-VP5)*2412/2868$ |
| 8BH | VP139 | 2.494 | 30 | $VP5+(VP4-VP5)*2316/2868$ |
| 8CH | VP140 | 2.486 | 28 | $VP5+(VP4-VP5)*2220/2868$ |
| 8DH | VP141 | 2.479 | 28 | $VP5+(VP4-VP5)*2136/2868$ |
| 8EH | VP142 | 2.472 | 28 | $VP5+(VP4-VP5)*2052/2868$ |
| 8FH | VP143 | 2.464 | 28 | $VP5+(VP4-VP5)*1956/2868$ |
| 90H | VP144 | 2.457 | 27 | $VP5+(VP4-VP5)*1872/2868$ |
| 91H | VP145 | 2.45 | 27 | $VP5+(VP4-VP5)*1788/2868$ |
| 92H | VP146 | 2.443 | 27 | $VP5+(VP4-VP5)*1704/2868$ |
| 93H | VP147 | 2.436 | 27 | $VP5+(VP4-VP5)*1620/2868$ |
| 94H | VP148 | 2.429 | 24 | $VP5+(VP4-VP5)*1536/2868$ |
| 95H | VP149 | 2.423 | 24 | $VP5+(VP4-VP5)*1464/2868$ |
| 96H | VP150 | 2.417 | 24 | $VP5+(VP4-VP5)*1392/2868$ |
| 97H | VP151 | 2.41 | 24 | $VP5+(VP4-VP5)*1308/2868$ |
| 98H | VP152 | 2.404 | 32 | $VP5+(VP4-VP5)*1236/2868$ |
| 99H | VP153 | 2.396 | 32 | $VP5+(VP4-VP5)*1140/2868$ |
| 9AH | VP154 | 2.388 | 32 | $VP5+(VP4-VP5)*1044/2868$ |
| 9BH | VP155 | 2.379 | 32 | $VP5+(VP4-VP5)*936/2868$ |
| 9CH | VP156 | 2.371 | 37 | $VP5+(VP4-VP5)*840/2868$ |
| 9DH | VP157 | 2.361 | 38 | $VP5+(VP4-VP5)*720/2868$ |
| 9EH | VP158 | 2.352 | 37 | $VP5+(VP4-VP5)*612/2868$ |
| 9FH | VP159 | 2.342 | 37 | $VP5+(VP4-VP5)*492/2868$ |

| Data | Positive Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|-----------------------------|
| A0H | VP160 | 2.332 | 40 | $VP5+(VP4-VP5)*372/2868$ |
| A1H | VP161 | 2.322 | 40 | $VP5+(VP4-VP5)*252/2868$ |
| A2H | VP162 | 2.311 | 40 | $VP5+(VP4-VP5)*120/2868$ |
| A3H | VP163 | 2.301 (V5) | 40 | VP5 |
| A4H | VP164 | 2.29 | 35 | $VP6+(VP5-VP6)*2400/2532$ |
| A5H | VP165 | 2.281 | 35 | $VP6+(VP5-VP6)*2292/2532$ |
| A6H | VP166 | 2.272 | 35 | $VP6+(VP5-VP6)*2184/2532$ |
| A7H | VP167 | 2.263 | 35 | $VP6+(VP5-VP6)*2076/2532$ |
| A8H | VP168 | 2.254 | 25 | $VP6+(VP5-VP6)*1968/2532$ |
| A9H | VP169 | 2.248 | 25 | $VP6+(VP5-VP6)*1896/2532$ |
| AAH | VP170 | 2.241 | 25 | $VP6+(VP5-VP6)*1812/2532$ |
| ABH | VP171 | 2.235 | 25 | $VP6+(VP5-VP6)*1740/2532$ |
| ACH | VP172 | 2.228 | 26 | $VP6+(VP5-VP6)*1656/2532$ |
| ADH | VP173 | 2.221 | 26 | $VP6+(VP5-VP6)*1572/2532$ |
| AEH | VP174 | 2.215 | 26 | $VP6+(VP5-VP6)*1500/2532$ |
| AFH | VP175 | 2.208 | 26 | $VP6+(VP5-VP6)*1416/2532$ |
| B0H | VP176 | 2.201 | 42 | $VP6+(VP5-VP6)*1332/2532$ |
| B1H | VP177 | 2.19 | 42 | $VP6+(VP5-VP6)*1200/2532$ |
| B2H | VP178 | 2.179 | 42 | $VP6+(VP5-VP6)*1068/2532$ |
| B3H | VP179 | 2.168 | 42 | $VP6+(VP5-VP6)*936/2532$ |
| B4H | VP180 | 2.157 | 39 | $VP6+(VP5-VP6)*804/2532$ |
| B5H | VP181 | 2.147 | 39 | $VP6+(VP5-VP6)*684/2532$ |
| B6H | VP182 | 2.137 | 39 | $VP6+(VP5-VP6)*564/2532$ |
| B7H | VP183 | 2.126 | 39 | $VP6+(VP5-VP6)*432/2532$ |
| B8H | VP184 | 2.116 | 34 | $VP6+(VP5-VP6)*312/2532$ |
| B9H | VP185 | 2.107 | 34 | $VP6+(VP5-VP6)*204/2532$ |
| BAH | VP186 | 2.099 | 34 | $VP6+(VP5-VP6)*108/2532$ |
| BBH | VP187 | 2.090 (V6) | 34 | VP6 |
| BCH | VP188 | 2.081 | 33 | $VP7+(VP6-VP7)*3162/3270$ |
| BDH | VP189 | 2.073 | 33 | $VP7+(VP6-VP7)*3066/3270$ |
| BEH | VP190 | 2.064 | 33 | $VP7+(VP6-VP7)*2958/3270$ |
| BFH | VP191 | 2.056 | 33 | $VP7+(VP6-VP7)*2862/3270$ |
| C0H | VP192 | 2.047 | 48 | $VP7+(VP6-VP7)*2754/3270$ |
| C1H | VP193 | 2.035 | 48 | $VP7+(VP6-VP7)*2610/3270$ |
| C2H | VP194 | 2.022 | 48 | $VP7+(VP6-VP7)*2454/3270$ |
| C3H | VP195 | 2.01 | 48 | $VP7+(VP6-VP7)*2310/3270$ |
| C4H | VP196 | 1.997 | 48 | $VP7+(VP6-VP7)*2154/3270$ |
| C5H | VP197 | 1.985 | 48 | $VP7+(VP6-VP7)*2010/3270$ |
| C6H | VP198 | 1.972 | 48 | $VP7+(VP6-VP7)*1854/3270$ |
| C7H | VP199 | 1.96 | 48 | $VP7+(VP6-VP7)*1710/3270$ |
| C8H | VP200 | 1.947 | 48 | $VP7+(VP6-VP7)*1554/3270$ |
| C9H | VP201 | 1.935 | 48 | $VP7+(VP6-VP7)*1410/3270$ |
| CAH | VP202 | 1.922 | 48 | $VP7+(VP6-VP7)*1254/3270$ |
| CBH | VP203 | 1.91 | 48 | $VP7+(VP6-VP7)*1110/3270$ |
| CCH | VP204 | 1.897 | 62 | $VP7+(VP6-VP7)*954/3270$ |
| CDH | VP205 | 1.881 | 63 | $VP7+(VP6-VP7)*762/3270$ |
| CEH | VP206 | 1.865 | 62 | $VP7+(VP6-VP7)*570/3270$ |
| CFH | VP207 | 1.848 | 62 | $VP7+(VP6-VP7)*366/3270$ |
| D0H | VP208 | 1.832 | 54 | $VP7+(VP6-VP7)*174/3270$ |
| D1H | VP209 | 1.818 (V7) | 54 | VP7 |
| D2H | VP210 | 1.810 | 54 | $VP8+(VP7-VP8)*15121/15208$ |
| D3H | VP211 | 1.803 | 54 | $VP8+(VP7-VP8)*15034/15208$ |
| D4H | VP212 | 1.795 | 57 | $VP8+(VP7-VP8)*14946/15208$ |
| D5H | VP213 | 1.788 | 57 | $VP8+(VP7-VP8)*14858/15208$ |

| Data | Positive Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|-----------|-----|-----------------------------|
| D6H | VP214 | 1.780 | 57 | $VP8+(VP7-VP8)*14769/15208$ |
| D7H | VP215 | 1.772 | 57 | $VP8+(VP7-VP8)*14680/15208$ |
| D8H | VP216 | 1.764 | 75 | $VP8+(VP7-VP8)*14587/15208$ |
| D9H | VP217 | 1.756 | 75 | $VP8+(VP7-VP8)*14492/15208$ |
| DAH | VP218 | 1.748 | 75 | $VP8+(VP7-VP8)*14396/15208$ |
| DBH | VP219 | 1.739 | 75 | $VP8+(VP7-VP8)*14300/15208$ |
| DCH | VP220 | 1.731 | 94 | $VP8+(VP7-VP8)*14203/15208$ |
| DDH | VP221 | 1.722 | 94 | $VP8+(VP7-VP8)*14106/15208$ |
| DEH | VP222 | 1.714 | 94 | $VP8+(VP7-VP8)*14008/15208$ |
| DFH | VP223 | 1.706 | 94 | $VP8+(VP7-VP8)*13910/15208$ |
| E0H | VP224 | 1.697 | 87 | $VP8+(VP7-VP8)*13811/15208$ |
| E1H | VP225 | 1.688 | 88 | $VP8+(VP7-VP8)*13711/15208$ |
| E2H | VP226 | 1.680 | 87 | $VP8+(VP7-VP8)*13611/15208$ |
| E3H | VP227 | 1.671 | 87 | $VP8+(VP7-VP8)*13510/15208$ |
| E4H | VP228 | 1.661 | 90 | $VP8+(VP7-VP8)*13391/15208$ |
| E5H | VP229 | 1.650 | 90 | $VP8+(VP7-VP8)*13265/15208$ |
| E6H | VP230 | 1.639 | 90 | $VP8+(VP7-VP8)*13138/15208$ |
| E7H | VP231 | 1.628 | 90 | $VP8+(VP7-VP8)*13010/15208$ |
| E8H | VP232 | 1.616 | 115 | $VP8+(VP7-VP8)*12882/15208$ |
| E9H | VP233 | 1.605 | 115 | $VP8+(VP7-VP8)*12753/15208$ |
| EAH | VP234 | 1.594 | 115 | $VP8+(VP7-VP8)*12623/15208$ |
| EBH | VP235 | 1.583 | 115 | $VP8+(VP7-VP8)*12493/15208$ |
| ECH | VP236 | 1.571 | 148 | $VP8+(VP7-VP8)*12362/15208$ |
| EDH | VP237 | 1.558 | 148 | $VP8+(VP7-VP8)*12210/15208$ |
| EEH | VP238 | 1.544 | 148 | $VP8+(VP7-VP8)*12046/15208$ |
| EFH | VP239 | 1.530 | 148 | $VP8+(VP7-VP8)*11881/15208$ |
| F0H | VP240 | 1.515 | 183 | $VP8+(VP7-VP8)*11716/15208$ |
| F1H | VP241 | 1.501 | 183 | $VP8+(VP7-VP8)*11550/15208$ |
| F2H | VP242 | 1.487 | 183 | $VP8+(VP7-VP8)*11383/15208$ |
| F3H | VP243 | 1.472 | 183 | $VP8+(VP7-VP8)*11215/15208$ |
| F4H | VP244 | 1.453 | 148 | $VP8+(VP7-VP8)*10997/15208$ |
| F5H | VP245 | 1.431 | 148 | $VP8+(VP7-VP8)*10746/15208$ |
| F6H | VP246 | 1.409 | 148 | $VP8+(VP7-VP8)*10494/15208$ |
| F7H | VP247 | 1.387 | 148 | $VP8+(VP7-VP8)*10240/15208$ |
| F8H | VP248 | 1.365 | 128 | $VP8+(VP7-VP8)*9985/15208$ |
| F9H | VP249 | 1.330 | 128 | $VP8+(VP7-VP8)*9575/15208$ |
| FAH | VP250 | 1.294 | 128 | $VP8+(VP7-VP8)*9160/15208$ |
| FBH | VP251 | 1.255 | 128 | $VP8+(VP7-VP8)*8716/15208$ |
| FCH | VP252 | 1.205 | 71 | $VP8+(VP7-VP8)*8131/15208$ |
| FDH | VP253 | 1.143 | 71 | $VP8+(VP7-VP8)*7420/15208$ |
| FEH | VP254 | 0.975 | 71 | $VP8+(VP7-VP8)*5476/15208$ |
| FFH | VP255 | 0.500(V8) | | VP8 |

| Data | Negative Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|---------------------------|
| 00H | VN0 | 0.500 (V8) | 760 | VN8 |
| 01H | VN1 | 0.706 | 760 | VN8+(VN7-VN8)*2376/15192 |
| 02H | VN2 | 0.911 | 760 | VN8+(VN7-VN8)*4740/15192 |
| 03H | VN3 | 1.116 | 760 | VN8+(VN7-VN8)*7116/15192 |
| 04H | VN4 | 1.321 | 104 | VN8+(VN7-VN8)*9480/15192 |
| 05H | VN5 | 1.349 | 104 | VN8+(VN7-VN8)*9804/15192 |
| 06H | VN6 | 1.377 | 104 | VN8+(VN7-VN8)*10128/15192 |
| 07H | VN7 | 1.405 | 104 | VN8+(VN7-VN8)*10452/15192 |
| 08H | VN8 | 1.433 | 82 | VN8+(VN7-VN8)*10776/15192 |
| 09H | VN9 | 1.455 | 82 | VN8+(VN7-VN8)*11028/15192 |
| 0AH | VN10 | 1.478 | 82 | VN8+(VN7-VN8)*11292/15192 |
| 0BH | VN11 | 1.500 | 82 | VN8+(VN7-VN8)*11544/15192 |
| 0CH | VN12 | 1.522 | 63 | VN8+(VN7-VN8)*11796/15192 |
| 0DH | VN13 | 1.538 | 63 | VN8+(VN7-VN8)*11988/15192 |
| 0EH | VN14 | 1.556 | 62 | VN8+(VN7-VN8)*12192/15192 |
| 0FH | VN15 | 1.573 | 63 | VN8+(VN7-VN8)*12384/15192 |
| 10H | VN16 | 1.589 | 52 | VN8+(VN7-VN8)*12576/15192 |
| 11H | VN17 | 1.604 | 52 | VN8+(VN7-VN8)*12744/15192 |
| 12H | VN18 | 1.617 | 52 | VN8+(VN7-VN8)*12900/15192 |
| 13H | VN19 | 1.632 | 52 | VN8+(VN7-VN8)*13068/15192 |
| 14H | VN20 | 1.646 | 50 | VN8+(VN7-VN8)*13224/15192 |
| 15H | VN21 | 1.659 | 50 | VN8+(VN7-VN8)*13380/15192 |
| 16H | VN22 | 1.673 | 50 | VN8+(VN7-VN8)*13536/15192 |
| 17H | VN23 | 1.686 | 50 | VN8+(VN7-VN8)*13692/15192 |
| 18H | VN24 | 1.700 | 40 | VN8+(VN7-VN8)*13848/15192 |
| 19H | VN25 | 1.711 | 40 | VN8+(VN7-VN8)*13980/15192 |
| 1AH | VN26 | 1.721 | 40 | VN8+(VN7-VN8)*14100/15192 |
| 1BH | VN27 | 1.733 | 40 | VN8+(VN7-VN8)*14232/15192 |
| 1CH | VN28 | 1.743 | 32 | VN8+(VN7-VN8)*14352/15192 |
| 1DH | VN29 | 1.752 | 32 | VN8+(VN7-VN8)*14448/15192 |
| 1EH | VN30 | 1.761 | 32 | VN8+(VN7-VN8)*14556/15192 |
| 1FH | VN31 | 1.769 | 32 | VN8+(VN7-VN8)*14652/15192 |
| 20H | VN32 | 1.778 | 36 | VN8+(VN7-VN8)*14748/15192 |
| 21H | VN33 | 1.787 | 36 | VN8+(VN7-VN8)*14856/15192 |
| 22H | VN34 | 1.797 | 36 | VN8+(VN7-VN8)*14976/15192 |
| 23H | VN35 | 1.807 | 36 | VN8+(VN7-VN8)*15084/15192 |
| 24H | VN36 | 1.816 (V7) | 29 | VN7 |
| 25H | VN37 | 1.824 | 29 | VN7+(VN6-VN7)*96/3300 |
| 26H | VN38 | 1.831 | 29 | VN7+(VN6-VN7)*180/3300 |
| 27H | VN39 | 1.839 | 29 | VN7+(VN6-VN7)*276/3300 |
| 28H | VN40 | 1.846 | 29 | VN7+(VN6-VN7)*360/3300 |
| 29H | VN41 | 1.854 | 29 | VN7+(VN6-VN7)*456/3300 |
| 2AH | VN42 | 1.861 | 29 | VN7+(VN6-VN7)*540/3300 |
| 2BH | VN43 | 1.869 | 29 | VN7+(VN6-VN7)*636/3300 |
| 2CH | VN44 | 1.876 | 31 | VN7+(VN6-VN7)*720/3300 |
| 2DH | VN45 | 1.884 | 31 | VN7+(VN6-VN7)*816/3300 |
| 2EH | VN46 | 1.892 | 31 | VN7+(VN6-VN7)*912/3300 |
| 2FH | VN47 | 1.900 | 31 | VN7+(VN6-VN7)*1008/3300 |
| 30H | VN48 | 1.908 | 25 | VN7+(VN6-VN7)*1104/3300 |
| 31H | VN49 | 1.915 | 25 | VN7+(VN6-VN7)*1188/3300 |
| 32H | VN50 | 1.921 | 25 | VN7+(VN6-VN7)*1260/3300 |
| 33H | VN51 | 1.928 | 25 | VN7+(VN6-VN7)*1344/3300 |
| 34H | VN52 | 1.934 | 31 | VN7+(VN6-VN7)*1416/3300 |

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| Data | Negative Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|---------------------------|
| 35H | VN53 | 1.942 | 31 | $VN7+(VN6-VN7)*1512/3300$ |
| 36H | VN54 | 1.95 | 31 | $VN7+(VN6-VN7)*1608/3300$ |
| 37H | VN55 | 1.958 | 31 | $VN7+(VN6-VN7)*1704/3300$ |
| 38H | VN56 | 1.966 | 28 | $VN7+(VN6-VN7)*1800/3300$ |
| 39H | VN57 | 1.973 | 28 | $VN7+(VN6-VN7)*1884/3300$ |
| 3AH | VN58 | 1.981 | 28 | $VN7+(VN6-VN7)*1980/3300$ |
| 3BH | VN59 | 1.988 | 28 | $VN7+(VN6-VN7)*2064/3300$ |
| 3CH | VN60 | 1.995 | 24 | $VN7+(VN6-VN7)*2148/3300$ |
| 3DH | VN61 | 2.001 | 24 | $VN7+(VN6-VN7)*2220/3300$ |
| 3EH | VN62 | 2.008 | 24 | $VN7+(VN6-VN7)*2304/3300$ |
| 3FH | VN63 | 2.014 | 24 | $VN7+(VN6-VN7)*2376/3300$ |
| 40H | VN64 | 2.02 | 22 | $VN7+(VN6-VN7)*2448/3300$ |
| 41H | VN65 | 2.026 | 22 | $VN7+(VN6-VN7)*2520/3300$ |
| 42H | VN66 | 2.032 | 22 | $VN7+(VN6-VN7)*2592/3300$ |
| 43H | VN67 | 2.037 | 22 | $VN7+(VN6-VN7)*2652/3300$ |
| 44H | VN68 | 2.043 | 24 | $VN7+(VN6-VN7)*2724/3300$ |
| 45H | VN69 | 2.049 | 24 | $VN7+(VN6-VN7)*2796/3300$ |
| 46H | VN70 | 2.056 | 24 | $VN7+(VN6-VN7)*2880/3300$ |
| 47H | VN71 | 2.062 | 24 | $VN7+(VN6-VN7)*2952/3300$ |
| 48H | VN72 | 2.068 | 22 | $VN7+(VN6-VN7)*3024/3300$ |
| 49H | VN73 | 2.074 | 22 | $VN7+(VN6-VN7)*3096/3300$ |
| 4AH | VN74 | 2.08 | 22 | $VN7+(VN6-VN7)*3168/3300$ |
| 4BH | VN75 | 2.085 | 22 | $VN7+(VN6-VN7)*3228/3300$ |
| 4CH | VN76 | 2.091 (V6) | 25 | VN6 |
| 4DH | VN77 | 2.098 | 25 | $VN6+(VN5-VN6)*84/2508$ |
| 4EH | VN68 | 2.104 | 25 | $VN6+(VN5-VN6)*156/2508$ |
| 4FH | VN79 | 2.111 | 25 | $VN6+(VN5-VN6)*240/2508$ |
| 50H | VN80 | 2.117 | 28 | $VN6+(VN5-VN6)*312/2508$ |
| 51H | VN81 | 2.124 | 28 | $VN6+(VN5-VN6)*396/2508$ |
| 52H | VN82 | 2.132 | 28 | $VN6+(VN5-VN6)*492/2508$ |
| 53H | VN83 | 2.139 | 28 | $VN6+(VN5-VN6)*576/2508$ |
| 54H | VN84 | 2.146 | 19 | $VN6+(VN5-VN6)*660/2508$ |
| 55H | VN85 | 2.151 | 19 | $VN6+(VN5-VN6)*720/2508$ |
| 56H | VN86 | 2.156 | 19 | $VN6+(VN5-VN6)*780/2508$ |
| 57H | VN87 | 2.161 | 19 | $VN6+(VN5-VN6)*840/2508$ |
| 58H | VN88 | 2.166 | 24 | $VN6+(VN5-VN6)*900/2508$ |
| 59H | VN89 | 2.172 | 24 | $VN6+(VN5-VN6)*972/2508$ |
| 5AH | VN90 | 2.179 | 24 | $VN6+(VN5-VN6)*1056/2508$ |
| 5BH | VN91 | 2.185 | 24 | $VN6+(VN5-VN6)*1128/2508$ |
| 5CH | VN92 | 2.191 | 26 | $VN6+(VN5-VN6)*1200/2508$ |
| 5DH | VN93 | 2.198 | 26 | $VN6+(VN5-VN6)*1284/2508$ |
| 5EH | VN94 | 2.205 | 26 | $VN6+(VN5-VN6)*1368/2508$ |
| 5FH | VN95 | 2.211 | 26 | $VN6+(VN5-VN6)*1440/2508$ |
| 60H | VN96 | 2.218 | 23 | $VN6+(VN5-VN6)*1524/2508$ |
| 61H | VN97 | 2.224 | 23 | $VN6+(VN5-VN6)*1596/2508$ |
| 62H | VN98 | 2.23 | 23 | $VN6+(VN5-VN6)*1668/2508$ |
| 63H | VN99 | 2.236 | 23 | $VN6+(VN5-VN6)*1740/2508$ |
| 64H | VN100 | 2.242 | 24 | $VN6+(VN5-VN6)*1812/2508$ |
| 65H | VN101 | 2.248 | 24 | $VN6+(VN5-VN6)*1884/2508$ |
| 66H | VN102 | 2.255 | 24 | $VN6+(VN5-VN6)*1968/2508$ |
| 67H | VN103 | 2.261 | 24 | $VN6+(VN5-VN6)*2040/2508$ |
| 68H | VN104 | 2.267 | 25 | $VN6+(VN5-VN6)*2112/2508$ |
| 69H | VN105 | 2.274 | 25 | $VN6+(VN5-VN6)*2196/2508$ |
| 6AH | VN106 | 2.28 | 25 | $VN6+(VN5-VN6)*2268/2508$ |

| Data | Negative Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|---------------------------|
| 6BH | VN107 | 2.287 | 25 | $VN6+(VN5-VN6)*2352/2508$ |
| 6CH | VN108 | 2.293 | 27 | $VN6+(VN5-VN6)*2424/2508$ |
| 6DH | VN109 | 2.300 (V5) | 27 | VN5 |
| 6EH | VN110 | 2.307 | 27 | $VN5+(VN4-VN5)*84/2916$ |
| 6FH | VN111 | 2.314 | 27 | $VN5+(VN4-VN5)*168/2916$ |
| 70H | VN112 | 2.321 | 23 | $VN5+(VN4-VN5)*252/2916$ |
| 71H | VN113 | 2.327 | 23 | $VN5+(VN4-VN5)*324/2916$ |
| 72H | VN114 | 2.332 | 23 | $VN5+(VN4-VN5)*384/2916$ |
| 73H | VN115 | 2.338 | 23 | $VN5+(VN4-VN5)*456/2916$ |
| 74H | VN116 | 2.343 | 24 | $VN5+(VN4-VN5)*516/2916$ |
| 75H | VN117 | 2.349 | 24 | $VN5+(VN4-VN5)*588/2916$ |
| 76H | VN118 | 2.355 | 24 | $VN5+(VN4-VN5)*660/2916$ |
| 77H | VN119 | 2.361 | 24 | $VN5+(VN4-VN5)*732/2916$ |
| 78H | VN120 | 2.367 | 25 | $VN5+(VN4-VN5)*804/2916$ |
| 79H | VN121 | 2.375 | 25 | $VN5+(VN4-VN5)*900/2916$ |
| 7AH | VN122 | 2.383 | 25 | $VN5+(VN4-VN5)*996/2916$ |
| 7BH | VN123 | 2.39 | 25 | $VN5+(VN4-VN5)*1080/2916$ |
| 7CH | VN124 | 2.398 | 27 | $VN5+(VN4-VN5)*1176/2916$ |
| 7DH | VN125 | 2.405 | 27 | $VN5+(VN4-VN5)*1260/2916$ |
| 7EH | VN126 | 2.412 | 27 | $VN5+(VN4-VN5)*1344/2916$ |
| 7FH | VN127 | 2.419 | 27 | $VN5+(VN4-VN5)*1428/2916$ |
| 80H | VN128 | 2.426 | 21 | $VN5+(VN4-VN5)*1512/2916$ |
| 81H | VN129 | 2.433 | 26 | $VN5+(VN4-VN5)*1596/2916$ |
| 82H | VN130 | 2.44 | 26 | $VN5+(VN4-VN5)*1680/2916$ |
| 83H | VN131 | 2.446 | 26 | $VN5+(VN4-VN5)*1752/2916$ |
| 84H | VN132 | 2.453 | 29 | $VN5+(VN4-VN5)*1836/2916$ |
| 85H | VN133 | 2.461 | 29 | $VN5+(VN4-VN5)*1932/2916$ |
| 86H | VN134 | 2.468 | 29 | $VN5+(VN4-VN5)*2016/2916$ |
| 87H | VN135 | 2.476 | 29 | $VN5+(VN4-VN5)*2112/2916$ |
| 88H | VN136 | 2.483 | 30 | $VN5+(VN4-VN5)*2196/2916$ |
| 89H | VN137 | 2.491 | 30 | $VN5+(VN4-VN5)*2292/2916$ |
| 8AH | VN138 | 2.499 | 30 | $VN5+(VN4-VN5)*2388/2916$ |
| 8BH | VN139 | 2.506 | 30 | $VN5+(VN4-VN5)*2472/2916$ |
| 8CH | VN140 | 2.514 | 28 | $VN5+(VN4-VN5)*2568/2916$ |
| 8DH | VN141 | 2.521 | 28 | $VN5+(VN4-VN5)*2652/2916$ |
| 8EH | VN142 | 2.529 | 28 | $VN5+(VN4-VN5)*2748/2916$ |
| 8FH | VN143 | 2.536 | 28 | $VN5+(VN4-VN5)*2832/2916$ |
| 90H | VN144 | 2.543 (V4) | 27 | VN4 |
| 91H | VN145 | 2.55 | 27 | $VN4+(VN3-VN4)*84/3720$ |
| 92H | VN146 | 2.557 | 27 | $VN4+(VN3-VN4)*168/3720$ |
| 93H | VN147 | 2.564 | 27 | $VN4+(VN3-VN4)*252/3720$ |
| 94H | VN148 | 2.571 | 24 | $VN4+(VN3-VN4)*336/3720$ |
| 95H | VN149 | 2.577 | 24 | $VN4+(VN3-VN4)*408/3720$ |
| 96H | VN150 | 2.584 | 24 | $VN4+(VN3-VN4)*492/3720$ |
| 97H | VN151 | 2.59 | 24 | $VN4+(VN3-VN4)*564/3720$ |
| 98H | VN152 | 2.596 | 32 | $VN4+(VN3-VN4)*636/3720$ |
| 99H | VN153 | 2.604 | 32 | $VN4+(VN3-VN4)*732/3720$ |
| 9AH | VN154 | 2.613 | 32 | $VN4+(VN3-VN4)*840/3720$ |
| 9BH | VN155 | 2.621 | 32 | $VN4+(VN3-VN4)*936/3720$ |
| 9CH | VN156 | 2.629 | 37 | $VN4+(VN3-VN4)*1032/3720$ |
| 9DH | VN157 | 2.639 | 38 | $VN4+(VN3-VN4)*1152/3720$ |
| 9EH | VN158 | 2.649 | 37 | $VN4+(VN3-VN4)*1272/3720$ |
| 9FH | VN159 | 2.658 | 37 | $VN4+(VN3-VN4)*1380/3720$ |
| A0H | VN160 | 2.668 | 40 | $VN4+(VN3-VN4)*1500/3720$ |

| Data | Negative Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|---------------------------|
| A1H | VN161 | 2.679 | 40 | $VN4+(VN3-VN4)*1632/3720$ |
| A2H | VN162 | 2.689 | 40 | $VN4+(VN3-VN4)*1752/3720$ |
| A3H | VN163 | 2.7 | 40 | $VN4+(VN3-VN4)*1884/3720$ |
| A4H | VN164 | 2.71 | 35 | $VN4+(VN3-VN4)*2004/3720$ |
| A5H | VN165 | 2.719 | 35 | $VN4+(VN3-VN4)*2112/3720$ |
| A6H | VN166 | 2.728 | 35 | $VN4+(VN3-VN4)*2220/3720$ |
| A7H | VN167 | 2.737 | 35 | $VN4+(VN3-VN4)*2328/3720$ |
| A8H | VN168 | 2.746 | 25 | $VN4+(VN3-VN4)*2436/3720$ |
| A9H | VN169 | 2.753 | 25 | $VN4+(VN3-VN4)*2520/3720$ |
| AAH | VN170 | 2.759 | 25 | $VN4+(VN3-VN4)*2592/3720$ |
| ABH | VN171 | 2.766 | 25 | $VN4+(VN3-VN4)*2676/3720$ |
| ACH | VN172 | 2.772 | 26 | $VN4+(VN3-VN4)*2748/3720$ |
| ADH | VN173 | 2.779 | 26 | $VN4+(VN3-VN4)*2832/3720$ |
| AEH | VN174 | 2.786 | 26 | $VN4+(VN3-VN4)*2916/3720$ |
| AFH | VN175 | 2.792 | 26 | $VN4+(VN3-VN4)*2988/3720$ |
| B0H | VN176 | 2.799 | 42 | $VN4+(VN3-VN4)*3072/3720$ |
| B1H | VN177 | 2.81 | 42 | $VN4+(VN3-VN4)*3204/3720$ |
| B2H | VN178 | 2.821 | 42 | $VN4+(VN3-VN4)*3336/3720$ |
| B3H | VN179 | 2.832 | 42 | $VN4+(VN3-VN4)*3468/3720$ |
| B4H | VN180 | 2.843 | 39 | $VN4+(VN3-VN4)*3600/3720$ |
| B5H | VN181 | 2.853 (V3) | 39 | VN3 |
| B6H | VN182 | 2.868 | 39 | $VN3+(VN2-VN3)*132/5252$ |
| B7H | VN183 | 2.881 | 39 | $VN3+(VN2-VN3)*252/5252$ |
| B8H | VN184 | 2.894 | 34 | $VN3+(VN2-VN3)*372/5252$ |
| B9H | VN185 | 2.906 | 34 | $VN3+(VN2-VN3)*480/5252$ |
| BAH | VN186 | 2.918 | 34 | $VN3+(VN2-VN3)*588/5252$ |
| BBH | VN187 | 2.929 | 34 | $VN3+(VN2-VN3)*684/5252$ |
| BCH | VN188 | 2.941 | 33 | $VN3+(VN2-VN3)*792/5252$ |
| BDH | VN189 | 2.953 | 33 | $VN3+(VN2-VN3)*900/5252$ |
| BEH | VN190 | 2.963 | 33 | $VN3+(VN2-VN3)*996/5252$ |
| BFH | VN191 | 2.975 | 33 | $VN3+(VN2-VN3)*1104/5252$ |
| C0H | VN192 | 2.986 | 48 | $VN3+(VN2-VN3)*1200/5252$ |
| C1H | VN193 | 3.003 | 48 | $VN3+(VN2-VN3)*1356/5252$ |
| C2H | VN194 | 3.019 | 48 | $VN3+(VN2-VN3)*1500/5252$ |
| C3H | VN195 | 3.037 | 48 | $VN3+(VN2-VN3)*1656/5252$ |
| C4H | VN196 | 3.052 | 48 | $VN3+(VN2-VN3)*1800/5252$ |
| C5H | VN197 | 3.070 | 48 | $VN3+(VN2-VN3)*1956/5252$ |
| C6H | VN198 | 3.086 | 48 | $VN3+(VN2-VN3)*2100/5252$ |
| C7H | VN199 | 3.103 | 48 | $VN3+(VN2-VN3)*2256/5252$ |
| C8H | VN200 | 3.119 | 48 | $VN3+(VN2-VN3)*2400/5252$ |
| C9H | VN201 | 3.136 | 48 | $VN3+(VN2-VN3)*2556/5252$ |
| CAH | VN202 | 3.152 | 48 | $VN3+(VN2-VN3)*2700/5252$ |
| CBH | VN203 | 3.169 | 48 | $VN3+(VN2-VN3)*2856/5252$ |
| CCH | VN204 | 3.185 | 62 | $VN3+(VN2-VN3)*3000/5252$ |
| CDH | VN205 | 3.207 | 63 | $VN3+(VN2-VN3)*3192/5252$ |
| CEH | VN206 | 3.229 | 62 | $VN3+(VN2-VN3)*3396/5252$ |
| CFH | VN207 | 3.251 | 62 | $VN3+(VN2-VN3)*3588/5252$ |
| D0H | VN208 | 3.272 | 54 | $VN3+(VN2-VN3)*3780/5252$ |
| D1H | VN209 | 3.291 | 54 | $VN3+(VN2-VN3)*3954/5252$ |
| D2H | VN210 | 3.301 | 54 | $VN3+(VN2-VN3)*4041/5252$ |
| D3H | VN211 | 3.310 | 54 | $VN3+(VN2-VN3)*4128/5252$ |
| D4H | VN212 | 3.320 | 57 | $VN3+(VN2-VN3)*4216/5252$ |
| D5H | VN213 | 3.330 | 57 | $VN3+(VN2-VN3)*4304/5252$ |
| D6H | VN214 | 3.340 | 57 | $VN3+(VN2-VN3)*4393/5252$ |

| Data | Negative Polarity Gray Level | Voltage | Ohm | Formula |
|------|------------------------------|------------|-----|----------------------------|
| D7H | VN215 | 3.350 | 57 | $VN3+(VN2-VN3)*4482/5252$ |
| D8H | VN216 | 3.360 | 75 | $VN3+(VN2-VN3)*4575/5252$ |
| D9H | VN217 | 3.371 | 75 | $VN3+(VN2-VN3)*4670/5252$ |
| DAH | VN218 | 3.381 | 75 | $VN3+(VN2-VN3)*4766/5252$ |
| DBH | VN219 | 3.392 | 75 | $VN3+(VN2-VN3)*4862/5252$ |
| DCH | VN220 | 3.403 | 94 | $VN3+(VN2-VN3)*4959/5252$ |
| DDH | VN221 | 3.413 | 94 | $VN3+(VN2-VN3)*5056/5252$ |
| DEH | VN222 | 3.424 | 94 | $VN3+(VN2-VN3)*5154/5252$ |
| DFH | VN223 | 3.435 (V2) | 94 | VN2 |
| E0H | VN224 | 3.442 | 87 | $VN2+(VN1-VN2)*99/13910$ |
| E1H | VN225 | 3.450 | 88 | $VN2+(VN1-VN2)*199/13910$ |
| E2H | VN226 | 3.457 | 87 | $VN2+(VN1-VN2)*299/13910$ |
| E3H | VN227 | 3.464 | 87 | $VN2+(VN1-VN2)*400/13910$ |
| E4H | VN228 | 3.473 | 90 | $VN2+(VN1-VN2)*519/13910$ |
| E5H | VN229 | 3.482 | 90 | $VN2+(VN1-VN2)*645/13910$ |
| E6H | VN230 | 3.491 | 90 | $VN2+(VN1-VN2)*772/13910$ |
| E7H | VN231 | 3.501 | 90 | $VN2+(VN1-VN2)*900/13910$ |
| E8H | VN232 | 3.510 | 115 | $VN2+(VN1-VN2)*1028/13910$ |
| E9H | VN233 | 3.519 | 115 | $VN2+(VN1-VN2)*1157/13910$ |
| EAH | VN234 | 3.529 | 115 | $VN2+(VN1-VN2)*1287/13910$ |
| EBH | VN235 | 3.538 | 115 | $VN2+(VN1-VN2)*1417/13910$ |
| ECH | VN236 | 3.548 | 148 | $VN2+(VN1-VN2)*1548/13910$ |
| EDH | VN237 | 3.559 | 148 | $VN2+(VN1-VN2)*1700/13910$ |
| EEH | VN238 | 3.571 | 148 | $VN2+(VN1-VN2)*1864/13910$ |
| EFH | VN239 | 3.583 | 148 | $VN2+(VN1-VN2)*2029/13910$ |
| F0H | VN240 | 3.595 | 183 | $VN2+(VN1-VN2)*2194/13910$ |
| F1H | VN241 | 3.607 | 183 | $VN2+(VN1-VN2)*2360/13910$ |
| F2H | VN242 | 3.619 | 183 | $VN2+(VN1-VN2)*2527/13910$ |
| F3H | VN243 | 3.632 | 183 | $VN2+(VN1-VN2)*2695/13910$ |
| F4H | VN244 | 3.648 | 148 | $VN2+(VN1-VN2)*2913/13910$ |
| F5H | VN245 | 3.666 | 148 | $VN2+(VN1-VN2)*3164/13910$ |
| F6H | VN246 | 3.684 | 148 | $VN2+(VN1-VN2)*3416/13910$ |
| F7H | VN247 | 3.703 | 148 | $VN2+(VN1-VN2)*3670/13910$ |
| F8H | VN248 | 3.721 | 128 | $VN2+(VN1-VN2)*3925/13910$ |
| F9H | VN249 | 3.751 | 128 | $VN2+(VN1-VN2)*4335/13910$ |
| FAH | VN250 | 3.782 | 128 | $VN2+(VN1-VN2)*4750/13910$ |
| FBH | VN251 | 3.814 | 128 | $VN2+(VN1-VN2)*5194/13910$ |
| FCH | VN252 | 3.857 | 71 | $VN2+(VN1-VN2)*5779/13910$ |
| FDH | VN253 | 3.909 | 71 | $VN2+(VN1-VN2)*6490/13910$ |
| FEH | VN254 | 4.050 | 71 | $VN2+(VN1-VN2)*8434/13910$ |
| FFH | VN255 | 4.450 (V1) | | VN1 |

If the default VREG1OUT(V0) ≠ 4.5V, you can refer to following the formula to calculate voltage (V1~V8):

| | Positive voltage | Negative voltage | Positive voltage | Negative voltage |
|----|------------------|------------------|------------------|------------------|
| V1 | 4.45 | 4.45 | $(V0)*4.45/4.5$ | $(V0)*4.45/4.5$ |
| V2 | 3.43 | 3.43 | $(V0)*3.43/4.5$ | $(V0)*3.43/4.5$ |
| V3 | 2.85 | 2.85 | $(V0)*2.85/4.5$ | $(V0)*2.85/4.5$ |
| V4 | 2.54 | 2.54 | $(V0)*2.54/4.5$ | $(V0)*2.54/4.5$ |
| V5 | 2.30 | 2.30 | $(V0)*2.30/4.5$ | $(V0)*2.30/4.5$ |
| V6 | 2.09 | 2.09 | $(V0)*2.09/4.5$ | $(V0)*2.09/4.5$ |
| V7 | 1.82 | 1.82 | $(V0)*1.82/4.5$ | $(V0)*1.82/4.5$ |
| V8 | 0.5 | 0.5 | $(V0)*0.5/4.5$ | $(V0)*0.5/4.5$ |

10. Power Sequence

10.1. Power ON Sequence

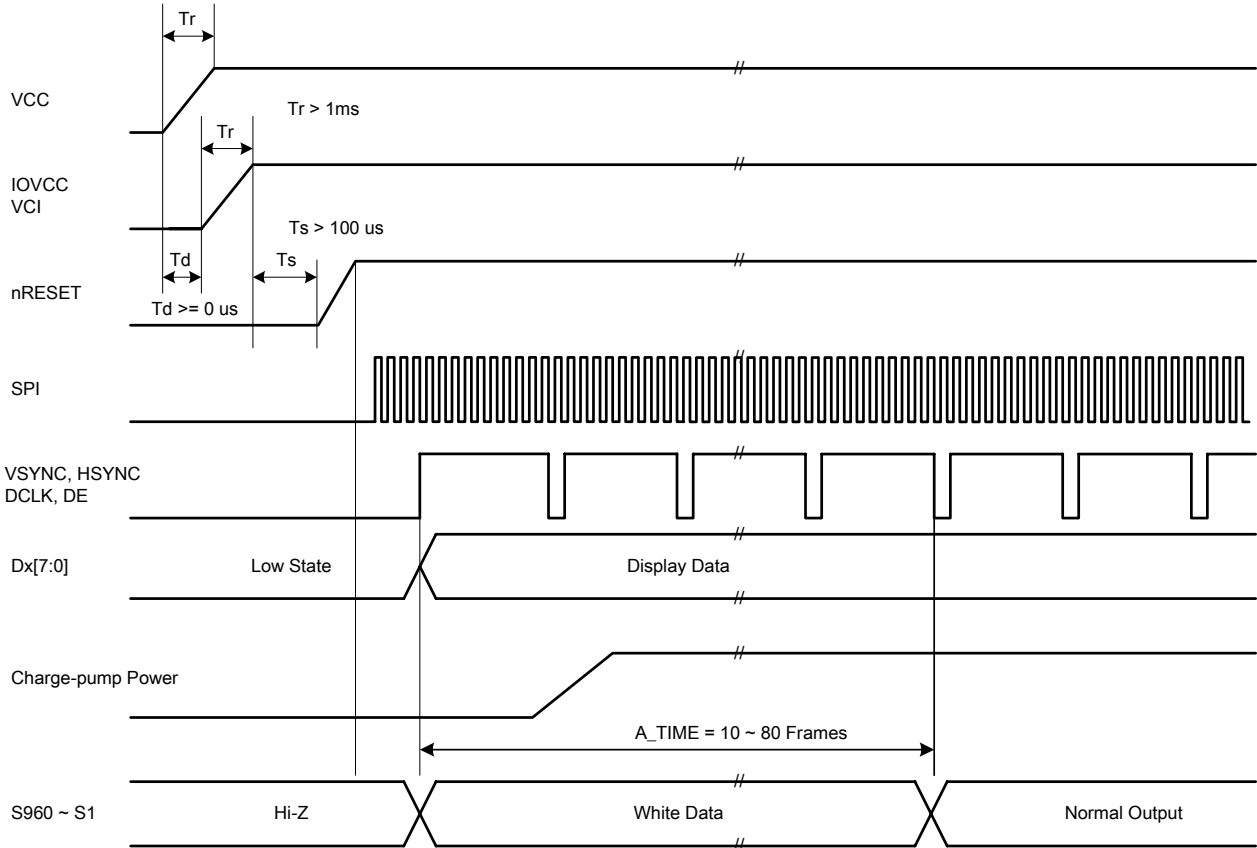


Figure8 Power On Sequence

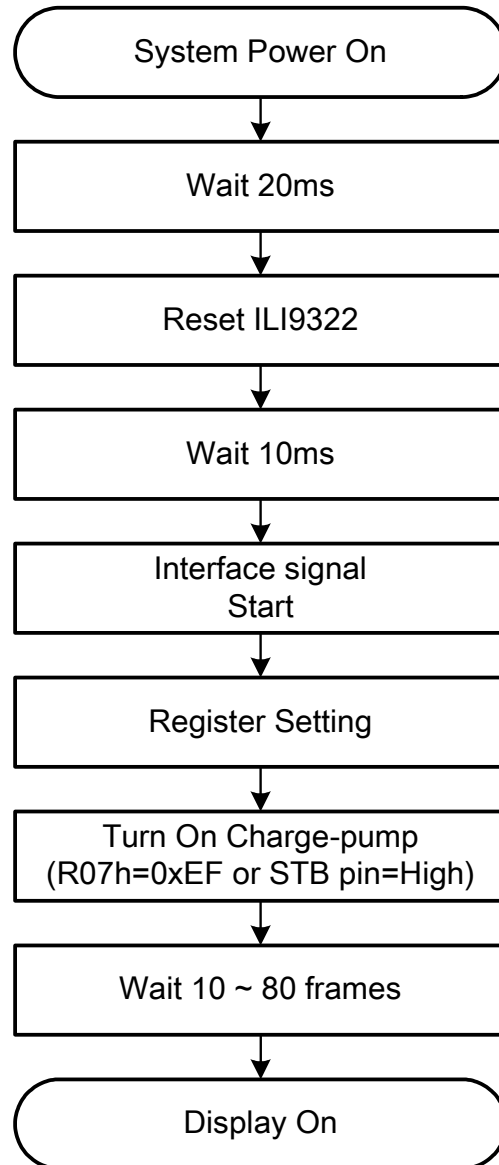


Figure9 Power On Sequence Flow Chart

10.2. Power OFF Sequence

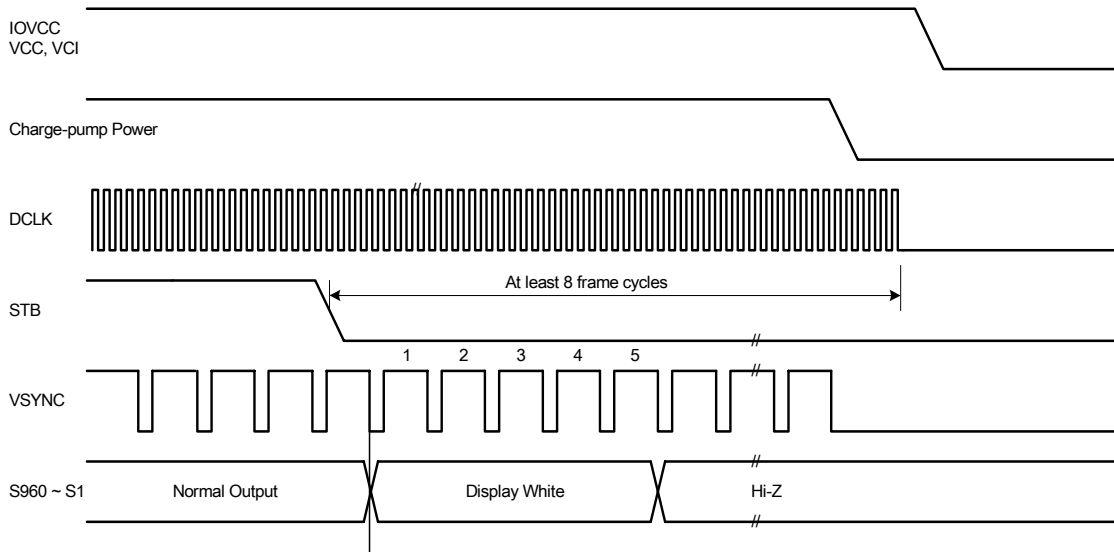


Figure 10 Power Off Sequence Flow Chart

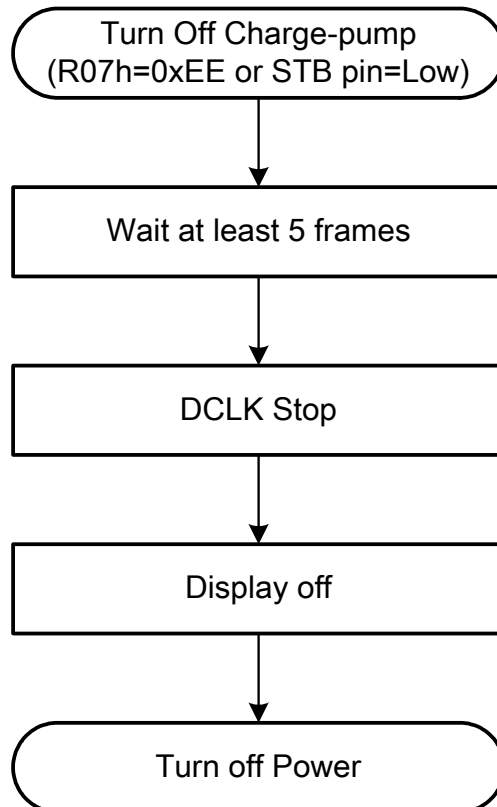


Figure11 Power Off Sequence Flow Chart

10.3. Standby Sequence

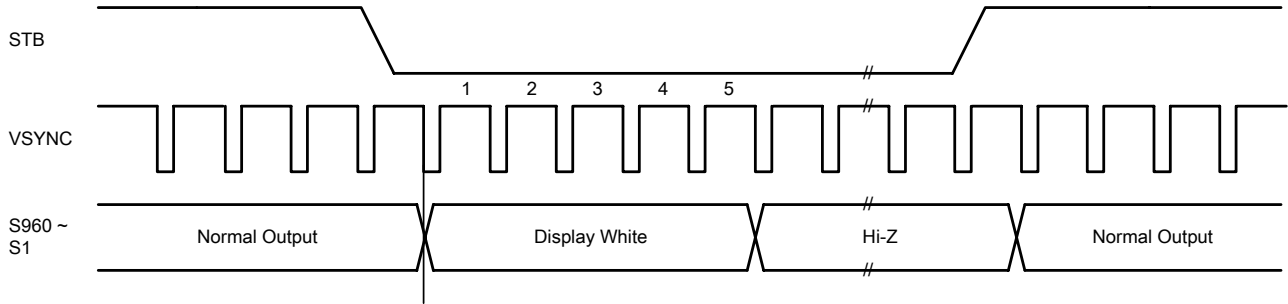


Figure12 Standby On/Off Sequence

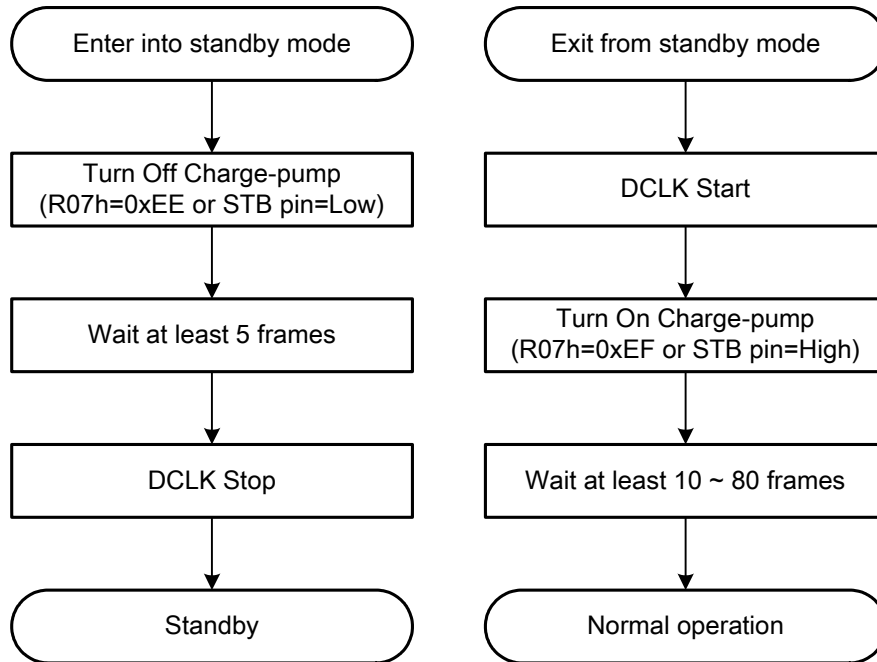


Figure13 Standby On/Off Flow Chart

11. Electrical Characteristics

11.1. Absolute Maximum Ratings

| Items | Symbol | Condition | Min. | Max. | Unit | Note |
|-----------------------|--------|-----------|------|------|------|---------------------|
| Power Voltage | VCC | GND=0 | -0.3 | 4.6 | Volt | |
| | VCI | AGND=0 | -0.3 | 4.6 | Volt | |
| | IOVCC | GND=0 | -0.3 | 4.6 | Volt | |
| Operation Temperature | Topa | - | -40 | 85 | °C | Ambient temperature |
| Storage Temperature | Tstg | - | -55 | 125 | °C | Ambient temperature |

Note:

- (1) All the voltages listed above are with respect to GND=0V.
- (2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

11.2. DC Electrical Characteristics

Typical Operating Conditions

| Items | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------|-----------------|-----------|------|-----------|------|----------------------------------|
| Power voltage | VCC | 2.7 | 3.3 | 3.6 | Volt | |
| | Vci | 2.7 | 3.3 | 3.6 | Volt | |
| | IOVcc | 1.65 | 3.3 | 3.6 | Volt | |
| Output signal high voltage | V _{OH} | 0.8*IOVcc | - | IOVCC | Volt | |
| Output signal low voltage | V _{OL} | GND | - | 0.2*IOVcc | Volt | |
| Input signal high voltage | V _{IH} | 0.7*IOVc | - | IOVcc | Volt | |
| Input signal low voltage | V _{IL} | GND | - | 0.3*IOVcc | Volt | |
| Input leakage current | I _{IN} | -1 | - | 1 | uA | |
| Digital standby current | I _{ST} | - | 10 | 50 | uA | DCLK stop and inputs are default |
| Digital operating current | I _{CC} | - | TBD | TBD | mA | DCLK=25MHz, VCC=3.3V |
| Pull high/low resistor | R _P | 150K | 200K | 300K | ohm | Digital input pads |

12. Revision History

| Version No. | Date | Page | Description |
|-------------|------------|-------|--|
| V0.8 | 2007/3/2 | | Modify the source/gate pad size (120x18um → 100 x 18um). |
| V1.0 | 2007/4/10 | 43 | Modify the OTP programming flow |
| V1.1 | 2007/5/15 | 47~61 | Modify and update the default Gamma value |
| V1.13 | 2007/06/14 | 45 | Modify and Gamma voltage setting percentage |
| V1.14 | 2007/7/13 | 17 | Add the pad 1550 coordination |
| V1.15 | 2007/8/11 | 57 | Modify the Power on Timing |
| | | | |
| | | | |
| | | | |
| | | | |

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