

**Product Specification**

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# NHD-5.0-800480AF-ASXP

## TFT Liquid Crystal Display

|                 |                                      |
|-----------------|--------------------------------------|
| <b>NHD -</b>    | Newhaven Display                     |
| <b>5.0 -</b>    | 5.0" Diagonal                        |
| <b>800480 -</b> | 800xRGBx480 Pixels                   |
| <b>AF -</b>     | Model                                |
| <b>A -</b>      | Built-In Driver / Controller         |
| <b>S -</b>      | High Brightness, White LED Backlight |
| <b>X -</b>      | TFT                                  |
| <b>P -</b>      | IPS, Wide Temperature                |

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## Additional Resources

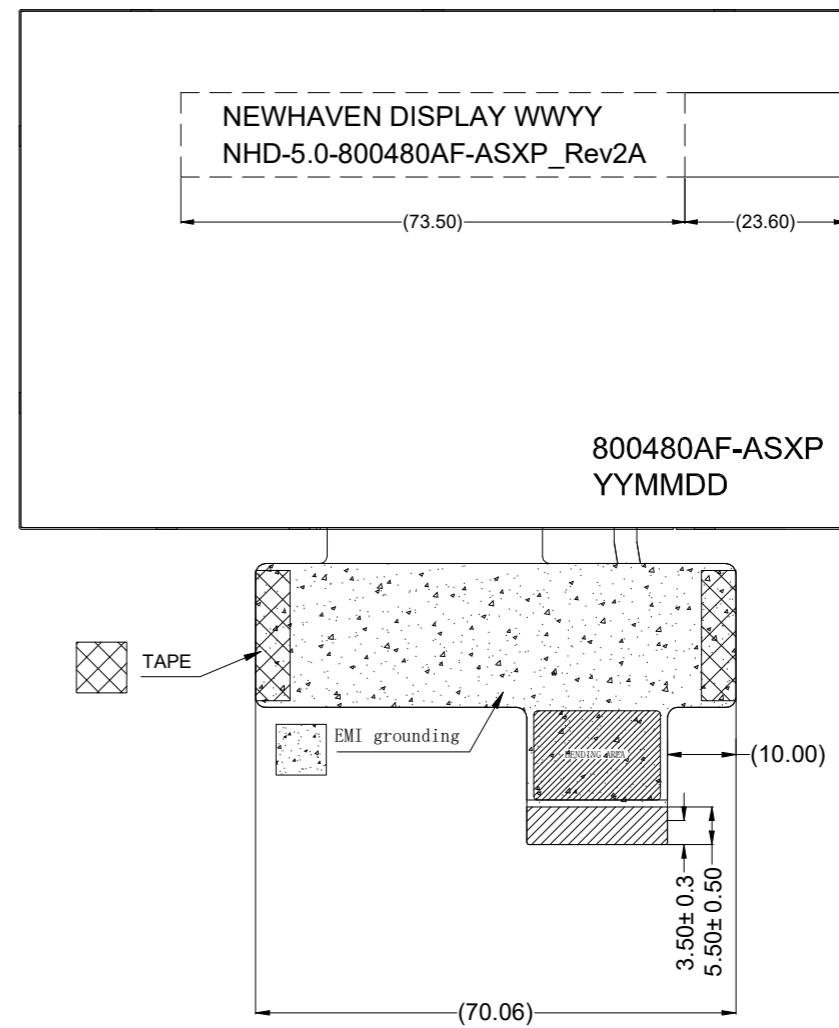
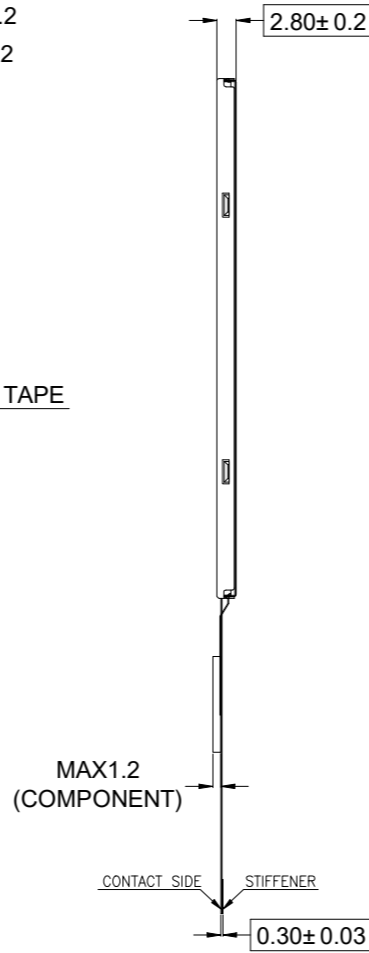
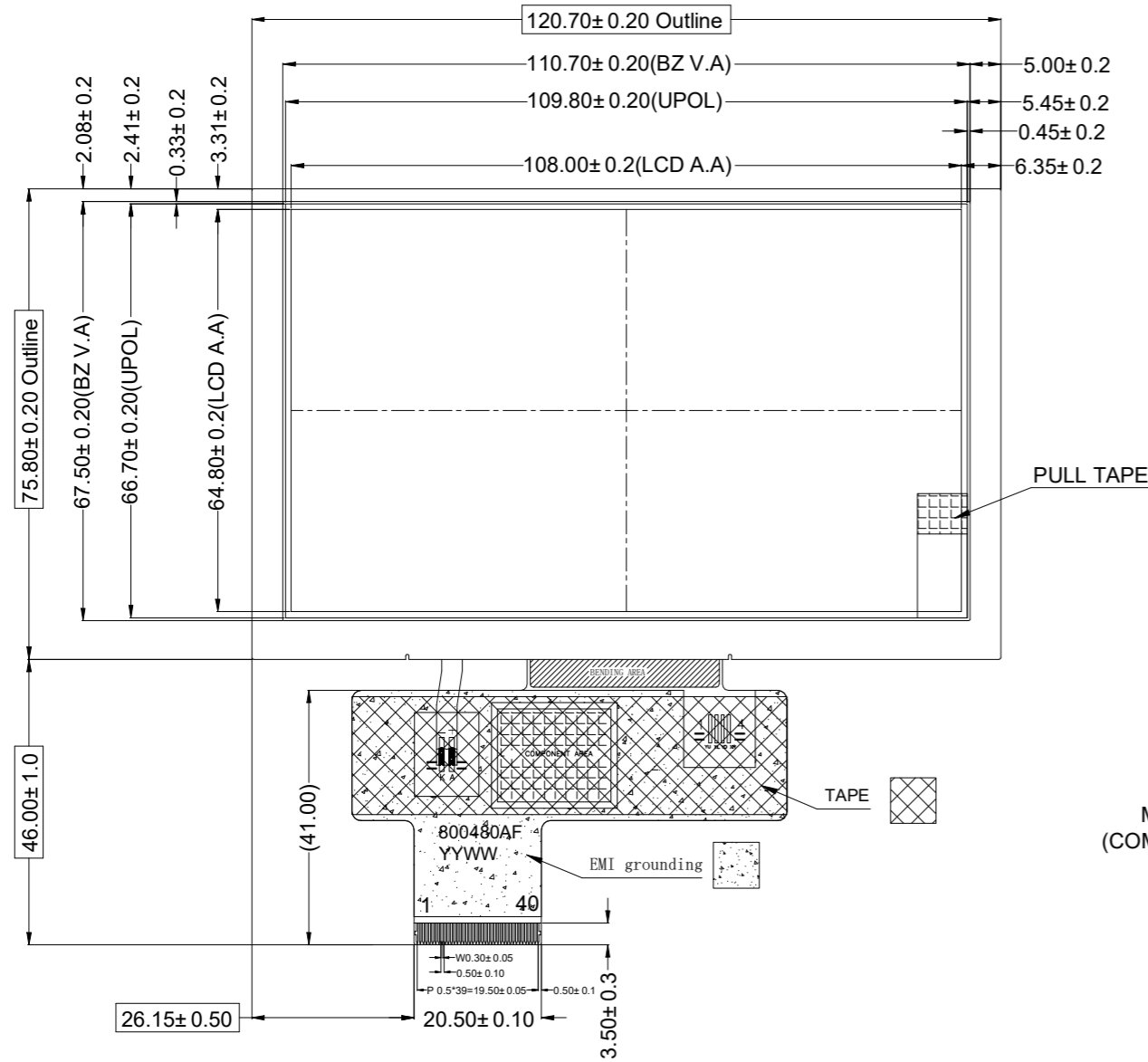
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** [https://www.newhavendisplay.com/knowledge\\_center.html](https://www.newhavendisplay.com/knowledge_center.html)
- **Quality Center:** [https://www.newhavendisplay.com/quality\\_center.html](https://www.newhavendisplay.com/quality_center.html)
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>



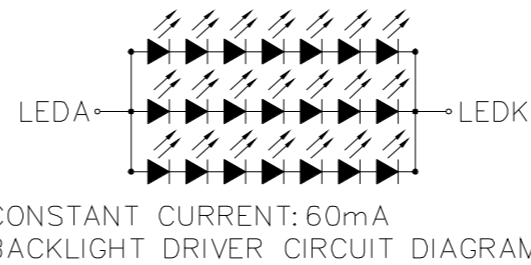
## Document Revision History

| Revision | Date       | Description                             | Changed By |
|----------|------------|---|------------|
| 0        | 02/14/2022 | Initial Release                         | JT         |
| 1        | 04/13/2022 | Include SYNC, SYNC-DE, & DE Information | ZP         |
| 2        | 06/09/2022 | RGB Interface Mode Selection Included   | JT         |
| 3        | 11/23/2022 | Mechanical Drawing Updated              | JT         |

# Mechanical Drawing



| NO. | PIN NAME |
|-----|----------|
| 1   | VLED-    |
| 2   | VLED+    |
| 3   | GND      |
| 4   | VDD      |
| 5   | R0       |
| 6   | R1       |
| 7   | R2       |
| 8   | R3       |
| 9   | R4       |
| 10  | R5       |
| 11  | R6       |
| 12  | R7       |
| 13  | G0       |
| 14  | G1       |
| 15  | G2       |
| 16  | G3       |
| 17  | G4       |
| 18  | G5       |
| 19  | G6       |
| 20  | G7       |
| 21  | B0       |
| 22  | B1       |
| 23  | B2       |
| 24  | B3       |
| 25  | B4       |
| 26  | B5       |
| 27  | B6       |
| 28  | B7       |
| 29  | GND      |
| 30  | CLKIN    |
| 31  | STBYB    |
| 32  | HSD      |
| 33  | VSD      |
| 34  | DEN      |
| 35  | NC       |
| 36  | GND      |
| 37  | NC(XR)   |
| 38  | NC(YD)   |
| 39  | NC(XL)   |
| 40  | NC(YU)   |



Product Description: 5.0" IPS TFT

1. TFT Driver IC: ST7262
2. TFT Interface: 24 bit RGB
3. TFT Power Requirements: 3.3V, Backlight: 60mA / 21.1V (Typ)
4. Optical Features: Transmissive, Normally Black, 1100 cd/m<sup>2</sup>
5. TFT Mating Connector: 40pin,0.5mm pitch;Ex. Molex 54104-4031

|   |  |                           |
|---|--|---------------------------|
| <b>Standard Tolerance:</b><br>(Unless otherwise specified)<br><br>Linear: ±0.3mm  |  |                           |
|   | Drawing/Part Number:<br><b>NHD-5.0-800480AF-ASXP</b> | Revision:<br>2A           |
| <b>Unless otherwise specified:</b><br>• Dimensions are in Millimeters<br>• Third Angle Projection   | Drawn By: J.Thomas                                   | Approved By: J.Thomas     |
|   | Drawn Date: 11/23/2022                               | Approved Date: 11/23/2022 |
| This drawing is solely the property of Newhaven Display International, Inc. The information it contains is not to be disclosed, reproduced or copied in whole or part without written approval from Newhaven Display. |  |                           |

## Pin Description

| Pin No. | Symbol          | External Connection | Function Description                  |
|---------|-----------------|---------------------|---------------------------------------|
| 1       | LED-            | LED Power Supply    | Ground for Backlight                  |
| 2       | LED+            | LED Power Supply    | Backlight Power Supply (60mA @ 21.7V) |
| 3       | GND             | Power Supply        | Ground                                |
| 4       | V <sub>DD</sub> | Power Supply        | Power supply for LCD and logic (3.3V) |
| 5-12    | [R0-R7]         | MPU                 | Red Data Signals                      |
| 13-20   | [G0-G7]         | MPU                 | Green Data Signals                    |
| 21-28   | [B0-B7]         | MPU                 | Blue Data Signals                     |
| 29      | GND             | Power Supply        | Ground                                |
| 30      | CLKIN           | MPU                 | Clock for input data (Rising Edge)    |
| 31      | STBYB           | MPU                 | 1: Normal Operation; 0: Standby Mode  |
| 32      | HSD             | MPU                 | Line synchronization signal           |
| 33      | VSD             | MPU                 | Frame synchronization signal          |
| 34      | DEN             | MPU                 | Data Enable signal                    |
| 35      | NC              | -                   | No Connect                            |
| 36      | GND             | Power Supply        | Ground                                |
| 37      | XR              | -                   | No Connect                            |
| 38      | YD              | -                   | No Connect                            |
| 39      | XL              | -                   | No Connect                            |
| 40      | YU              | -                   | No Connect                            |

**Recommended LCD connector:** 0.5mm pitch 40-Conductor FFC. Molex p/n: 54104-4031 (top contact)

**Backlight connector:** on LCD connector

**Mates with:** ---

## RGB Interface Mode Selection

The Sitronix ST7262 driver IC is user configurable for DE Mode, SYNC mode, or SYNC-DE mode RGB interface.

**DE Mode** is enabled when HSYNC and VSYNC signals are set to logic-low state, and DE signal is toggled high for valid pixel data. Data is clocked in using DCLK signal. DE mode is recommended to enable the ST7262 driver IC to synchronize the display image on TFT panel without depending on specific horizontal and vertical sync timing from host controller.

**SYNC mode** is enabled when the DE signal is set to logic-low state, and HSYNC and VSYNC signals are used to explicitly define the horizontal and vertical sync timing to synchronize the display image on TFT panel. Data is clocked in using DCLK signal. Any change to the HSYNC or VSYNC values may prevent the image from correctly appearing on the display.

**SYNC-DE Mode** is enabled when HSYNC and VSYNC signals are used to explicitly define the horizontal and vertical sync timing to synchronize the display image on TFT panel. DE signal is used as an additional indicator for transmission of valid pixel data. Data is clocked in using DCLK signal. Any change to the HSYNC or VSYNC values may prevent the image from correctly appearing on the display.

| RGB Mode Selection Table | DCLK  | HSYNC | VSYNC | DE    |
|--------------------------|-------|-------|-------|-------|
| SYNC-DE Mode             | Input | Input | Input | Input |
| SYNC Mode                | Input | Input | Input | GND   |
| DE Mode                  | Input | GND   | GND   | Input |

## Electrical Characteristics

| Item                        | Symbol           | Condition               | Min.                  | Typ. | Max.                  | Unit |
|-----------------------------|------------------|-------------------------|-----------------------|------|-----------------------|------|
| Operating Temperature Range | T <sub>OP</sub>  | Absolute Max            | -20                   | -    | +70                   | °C   |
| Storage Temperature Range   | T <sub>ST</sub>  | Absolute Max            | -30                   | -    | +80                   | °C   |
| Supply Voltage              | V <sub>DD</sub>  | -                       | 3.0                   | 3.3  | 3.6                   | V    |
| Supply Current              | I <sub>DD</sub>  | V <sub>DD</sub> = 3.3V  | 41                    | 62   | 93                    | mA   |
| "H" Level input             | V <sub>IH</sub>  | -                       | 0.7 * V <sub>DD</sub> | -    | V <sub>DD</sub>       | V    |
| "L" Level input             | V <sub>IL</sub>  | -                       | GND                   | -    | 0.3 * V <sub>DD</sub> | V    |
| "H" Level output            | V <sub>OH</sub>  | -                       | V <sub>DD</sub> - 0.4 | -    | V <sub>DD</sub>       | V    |
| "L" Level output            | V <sub>OL</sub>  | -                       | GND                   | -    | GND + 0.4             | V    |
| Backlight Supply Current    | I <sub>LED</sub> | -                       | 50                    | 60   | 72                    | mA   |
| Backlight Supply Voltage    | V <sub>LED</sub> | I <sub>LED</sub> = 60mA | 19.6                  | 21.1 | 23.1                  | V    |
| Backlight Lifetime*         | -                | T <sub>OP</sub> = 25°C  | 30,000                | -    | -                     | Hrs. |

\*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions. The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

## Optical Characteristics:

| Item                        | Symbol                          | Condition                | Min.  | Typ.  | Max.   | Unit              |   |
|-----------------------------|---------------------------------|--------------------------|-------|-------|--------|-------------------|---|
| Optimal Viewing Angles      | Top                             | φY+                      | -     | 70    | 80     | -                 | ° |
|                             | Bottom                          | φY-                      |       | 70    | 80     | -                 | ° |
|                             | Left                            | θX-                      |       | 70    | 80     | -                 | ° |
|                             | Right                           | θX+                      |       | 70    | 80     | -                 | ° |
| Contrast Ratio              | CR                              | -                        | 800   | 1000  | -      | -                 |   |
| Luminance                   | L <sub>V</sub>                  | I <sub>LED</sub> = 60 mA | 800   | 1100  | 1500   | cd/m <sup>2</sup> |   |
| Response Time (Rise + Fall) | T <sub>R</sub> + T <sub>F</sub> | T <sub>OP</sub> = 25°C   | -     | 30    | 45     | ms                |   |
| Chromaticity                | Red                             | X <sub>R</sub>           | -0.03 | +0.03 | 0.6001 | -                 |   |
|                             |                                 | Y <sub>R</sub>           |       |       | 0.3535 | -                 |   |
|                             | Green                           | X <sub>G</sub>           |       |       | 0.3732 | -                 |   |
|                             |                                 | Y <sub>G</sub>           |       |       | 0.5492 | -                 |   |
|                             | Blue                            | X <sub>B</sub>           |       |       | 0.1388 | -                 |   |
|                             |                                 | Y <sub>B</sub>           |       |       | 0.1073 | -                 |   |
|                             | White                           | X <sub>W</sub>           |       |       | 0.3100 | -                 |   |
|                             |                                 | Y <sub>W</sub>           |       |       | 0.3300 | -                 |   |

## Driver Information

Built-in ST7262 Source Driver: <https://support.newhavendisplay.com/hc/en-us/articles/6678758785175-ST7262>



## Timing Characteristics – TFT Display

### Horizontal Input Timing

| Parameter                   | Symbol      | Value |     |     | Unit | Note |
|-----------------------------|-------------|-------|-----|-----|------|------|
| Horizontal Display Area     | $T_{HDISP}$ | 800   |     |     | DCLK |      |
| DCLK Frequency              | $F_{CLK}$   | Min   | Typ | Max | MHz  |      |
|                             |             | 23    | 25  | 27  |      |      |
| 1 Horizontal Line           | $T_H$       | 808   | 816 | 896 | DCLK |      |
| HSYNC Pulse Width           | $T_{HW}$    | 2     | 4   | 8   |      |      |
| HSYNC Back Porch (Blanking) | $T_{HBP}$   | 4     | 8   | 48  |      |      |
| HSYNC Front Porch           | $T_{HFP}$   | 4     | 8   | 48  |      |      |

### Vertical Input Timing

| Parameter                   | Symbol      | Min | Typ | Max | Unit  | Note |
|-----------------------------|-------------|-----|-----|-----|-------|------|
| Vertical Display Area       | $T_{VDISP}$ | 480 |     |     | HSYNC |      |
| VSYNC Period Tim            | $T_V$       | 488 | 496 | 504 |       |      |
| VSYNC Pulse Width           | $T_{VW}$    | 2   | 4   | 8   |       |      |
| VSYNC Back Porch (Blanking) | $T_{VBP}$   | 4   | 8   | 12  |       |      |
| VSYNC Front Porch           | $T_{VFP}$   | 4   | 8   | 12  |       |      |

### AC Characteristics

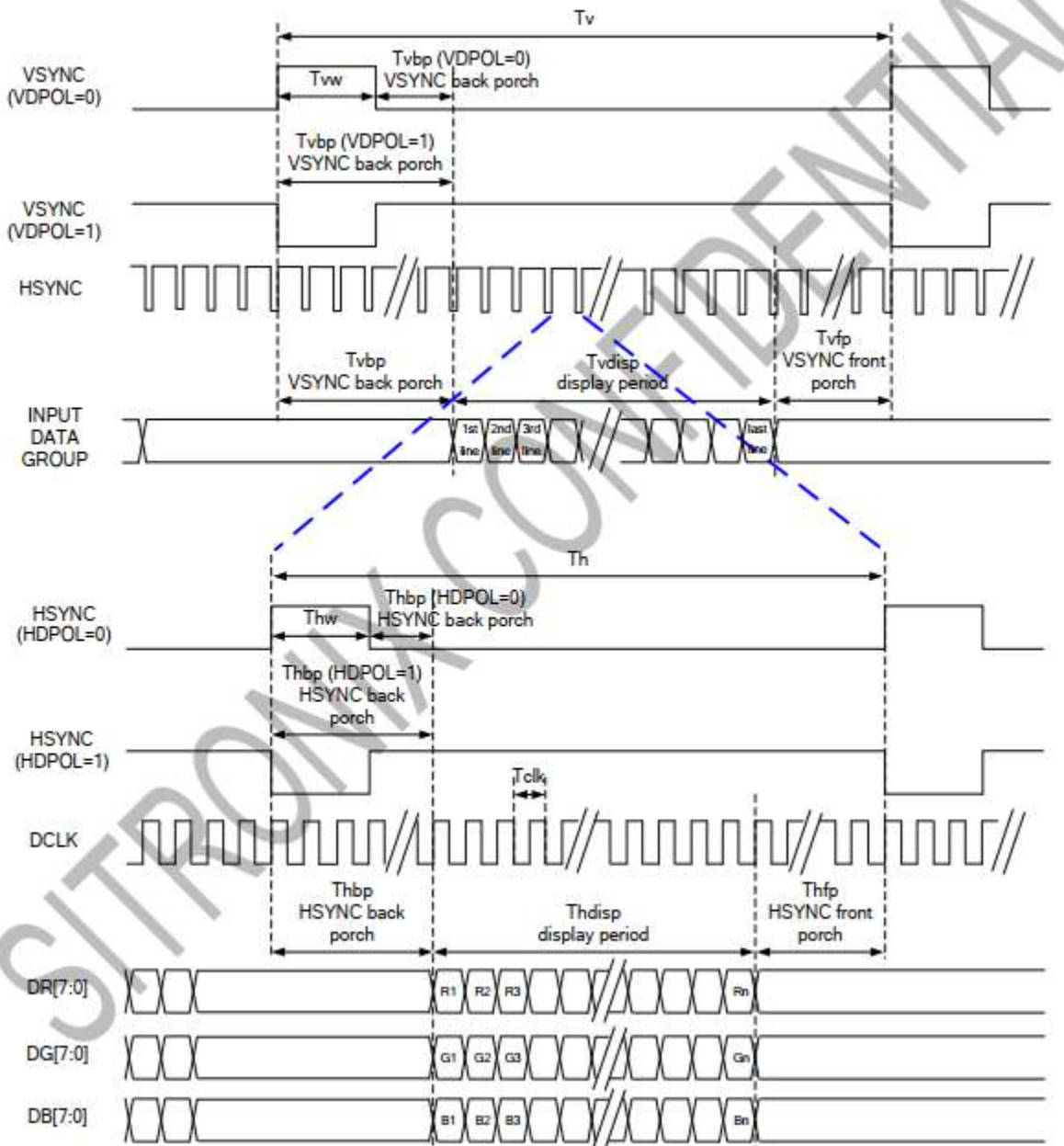
| Parameter                   | Symbol    | Min | Typ | Max | Unit    | Conditions              |
|-----------------------------|-----------|-----|-----|-----|---------|-------------------------|
| $V_{DD}$ Power ON Slew Rate | $T_{POR}$ | -   | -   | 20  | ms      | From 0V to 99% $V_{DD}$ |
| CLKIN pulse duty            | $T_{cwh}$ | 40  | 50  | 60  | %       |                         |
| HSYNC Width                 | $T_{hw}$  | 2   | -   | -   | DCLK    |                         |
| HSYNC Period                | $T_h$     | 55  | 60  | 65  | $\mu$ s |                         |
| VSYNC setup time            | $T_{vst}$ | 10  | -   | -   | ns      |                         |
| VSYNC hold time             | $T_{vhd}$ | 10  | -   | -   | ns      |                         |
| HSYNC setup time            | $T_{hst}$ | 10  | -   | -   | ns      |                         |
| HSYNC hold time             | $T_{hhd}$ | 10  | -   | -   | ns      |                         |
| Data set-up time            | $T_{dsu}$ | 10  | -   | -   | ns      |                         |
| Data hold time              | $T_{dhd}$ | 10  | -   | -   | ns      |                         |
| DE setup time               | $T_{esu}$ | 10  | -   | -   | ns      |                         |
| DE hold time                | $T_{ehd}$ | 10  | -   | -   | ns      |                         |
| Output stable time          | $T_{sst}$ | -   | -   | TBD | $\mu$ s |                         |

## RGB Interface

| RGB Mode Selection Table | DCLK  | HSYNC | VSYNC | DE    |
|--------------------------|-------|-------|-------|-------|
| SYNC - DE Mode           | Input | Input | Input | Input |
| SYNC Mode                | Input | Input | Input | GND   |
| DE Mode                  | Input | GND   | GND   | Input |

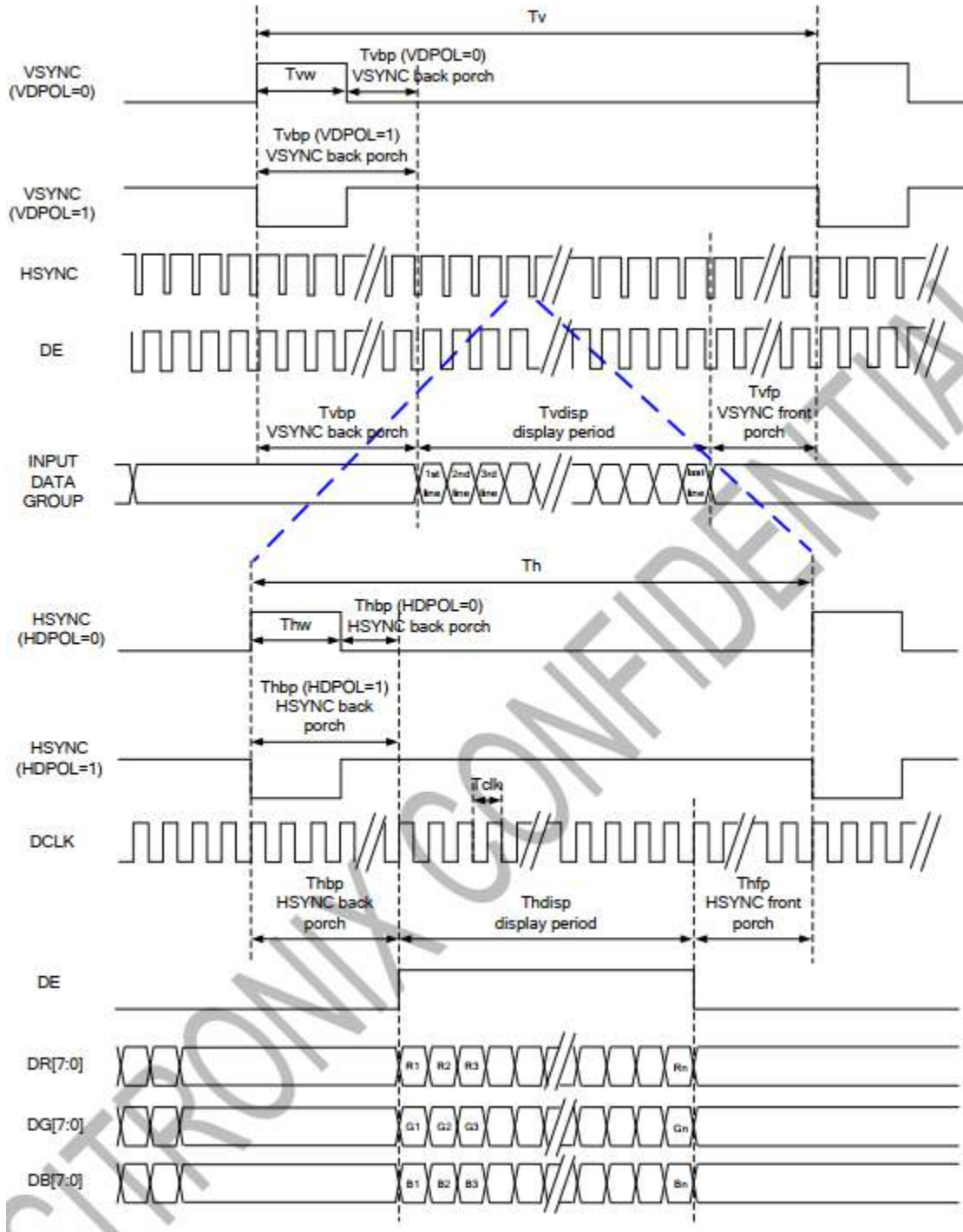
Note: "Input" means these signals are driven by host side

## SYNC Mode

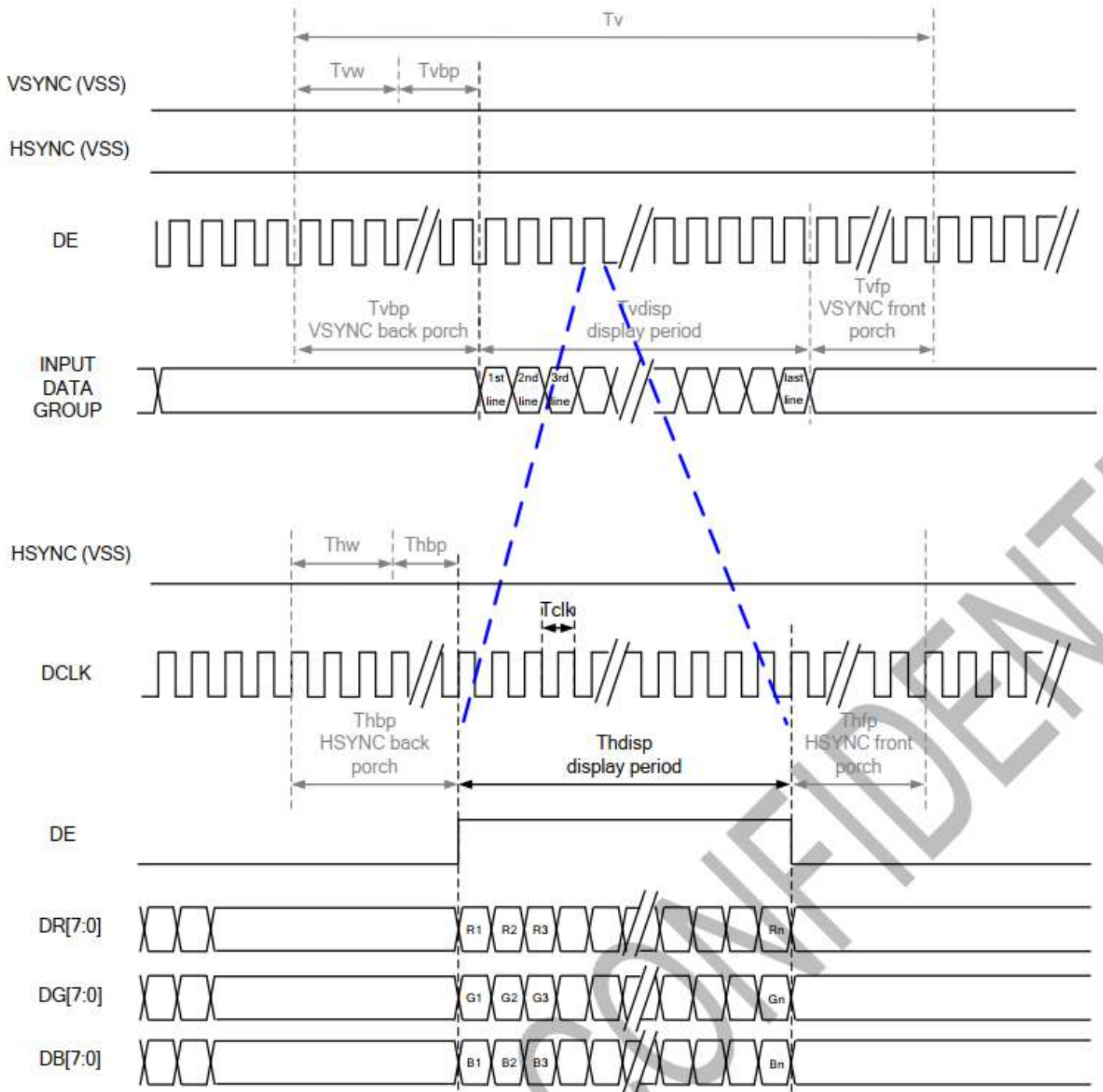




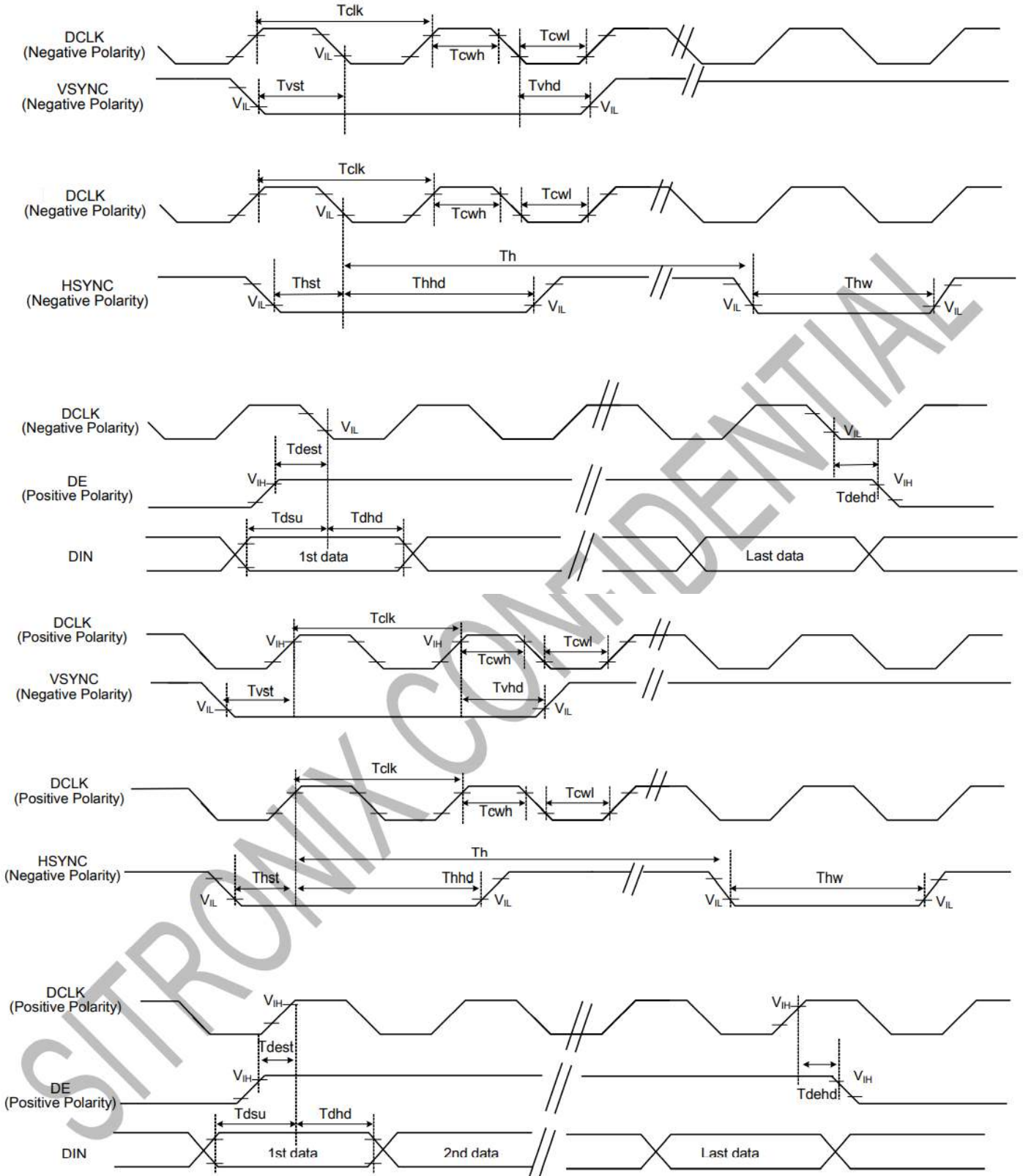
**SYNC-DE Mode**



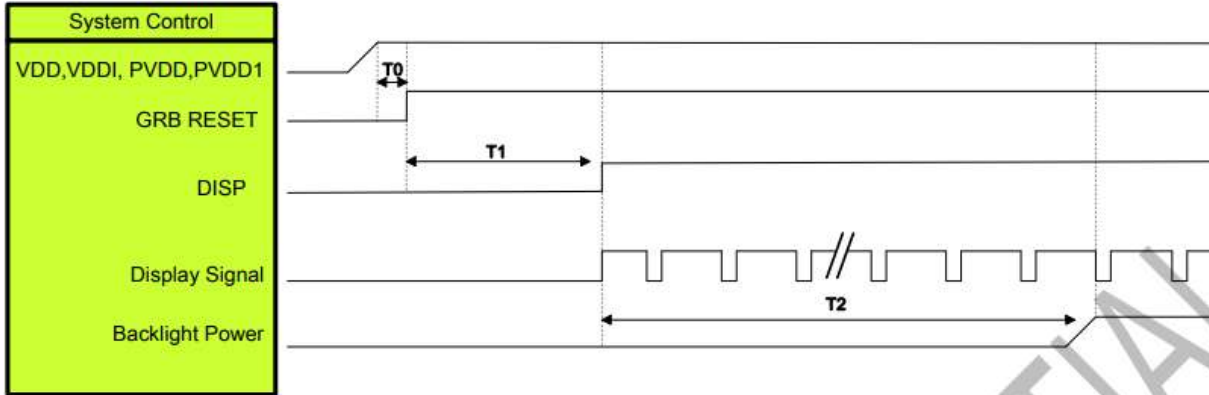
**DE Mode**



### System Bus Timing for RGB Interface



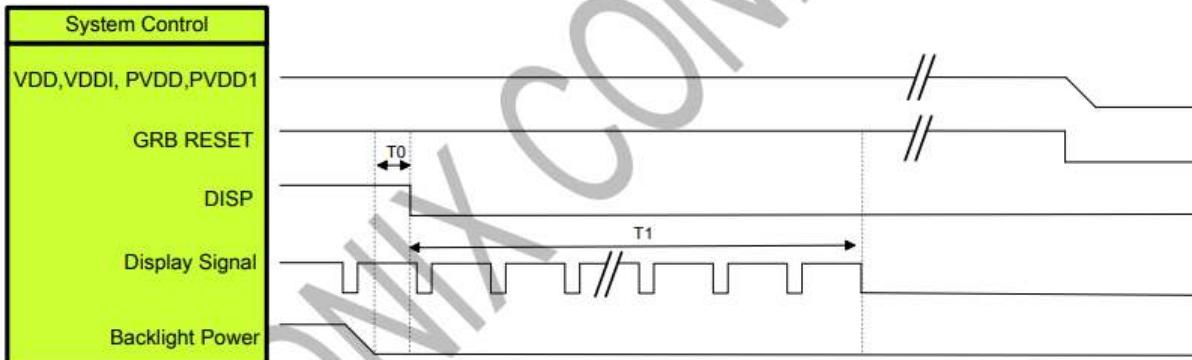
## Power On Sequence



| Symbol | Description                                 | Min. Time | Unit |
|--------|---|-----------|------|
| T0     | System power stability to GRB RESET signal  | 0         | ms   |
| T1     | GRB RESET= "High" to DISP="High"            | 10        | ms   |
| T2     | Display Signal output to Backlight Power on | 250       | ms   |

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

## Power Off Sequence



| Symbol | Description  | Min. Time | Unit |
|--------|--|-----------|------|
| T0     | Backlight Power off to DISP="Low"                    | 5         | ms   |
| T1     | DISP="Low" to IC internal voltage discharge complete | 100       | ms   |

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

## Quality Information

| Test Item                           | Content of Test   | Test Condition  | Note |
|-------------------------------------|---|---|------|
| High Temperature storage            | Endurance test applying the high storage temperature for a long time.   | +80°C , 240hrs  | 2    |
| Low Temperature storage             | Endurance test applying the low storage temperature for a long time.  | -30°C , 240hrs  | 1,2  |
| High Temperature Operation          | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.                    | +70°C 120hrs  | 2    |
| Low Temperature Operation           | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.                     | -20°C , 120hrs  | 1,2  |
| High Temperature / Humidity Storage | Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time. | +50°C , 90-95% RH , 120hrs                                    | 1,2  |
| Thermal Shock resistance            | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.                  | -30°C,30min -> 25°C,5min -> 80°C,30min = 1 cycle<br>10 cycles |      |
| Vibration test                      | Endurance test applying vibration to simulate transportation and use.   | Frequency: 250 r/min<br>Amplitude: 1 inch<br>Time: 45 min     | 3    |
| Static electricity test             | Endurance test applying electric static discharge.  | Air: ±8kV ; Contact: ±4kV<br>For 5 times each.                |      |

**Note 1:** No condensation to be observed.

**Note 2:** Conducted after 4 hours of storage at 25°C, 0%RH.

**Note 3:** Test performed on product itself, not inside a container.