

**TITLE:****DV280FBM-NB1  
Product Specification****Rev. 0**

|             |           |
|-------------|-----------|
| Approved by | 张周生       |
| Date        | 2018.1.16 |

HEFEI BOE OPTOELECTRONICS TECHNOLOGY



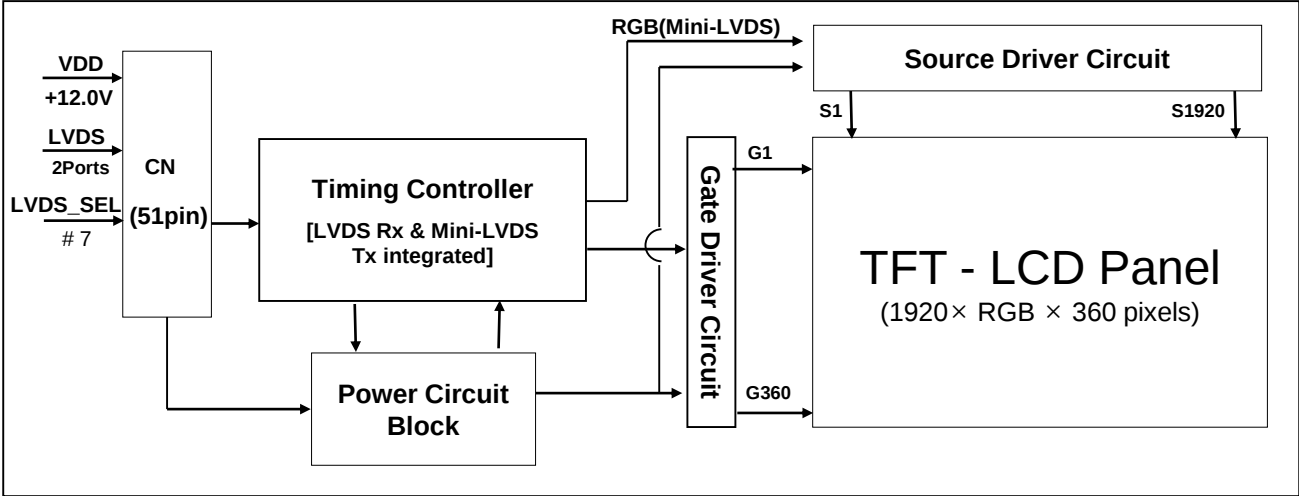
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|---------------------|----------------------------------------------------------------|------|------------|
| <div>BOE</div>      | PRODUCT GROUP                                                  | REV  | ISSUE DATE |
|                     | TFT LCD                                                        | 0    | 2018.1.16  |
| <div>Contents</div> |                                                                |      |            |
| No                  | ITEM                                                           | Page |            |
|                     | REVISIONS HISTORY                                              | 2    |            |
|                     | CONTENTS                                                       | 3    |            |
| 1                   | GENERAL DESCRIPTION                                            | 4    |            |
|                     | 1.1 Introduction                                               |      |            |
|                     | 1.2 Features                                                   |      |            |
|                     | 1.3 Applications                                               |      |            |
|                     | 1.4 General Specification                                      |      |            |
| 2                   | ABSOLUTE MAXIMUM RATINGS                                       | 6    |            |
| 3                   | ELECTRICAL SPECIFICATIONS                                      | 7    |            |
| 4                   | INTERFACE CONNECTION                                           | 9    |            |
|                     | 4.1 Open Cell Input Signal & Power                             |      |            |
|                     | 4.2 LVDS Interface                                             |      |            |
| 5                   | SIGNAL TIMING SPECIFICATIONS                                   | 13   |            |
|                     | 5.1 Timing Parameters                                          |      |            |
|                     | 5.2 Signal Timing Waveform                                     |      |            |
|                     | 5.3 Input Signals, Basic Display Colors & Cray Scale Of Colors |      |            |
|                     | 5.4 Power Sequence                                             |      |            |
| 6                   | OPTICAL SPECIFICATIONS                                         | 17   |            |
| 7                   | MECHANICAL CHARACTERISTICS                                     | 19   |            |
| 8                   | RELIABILITY                                                    | 20   |            |
| 9                   | PRODUCT SERIAL NUMBER                                          | 21   |            |
| 10                  | PACKING INFORMATION                                            | 22   |            |
| 11                  | HANDING & CAUTIONS                                             | 24   |            |
| 12                  | APPENDIX                                                       | 25   |            |
| SPEC. NUMBER        | SPEC. TITLE                                                    |      | PAGE       |
|                     | DV280FBM-NB1 Product Specification                             |      | 3 of 29    |

|                |               |     |            |
|----------------|---------------|-----|------------|
| <div>BOE</div> | PRODUCT GROUP | REV | ISSUE DATE |
|                | TFT LCD       | 0   | 2018.1.16  |

## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

DV280FBM-NB1 is a color active matrix TFT LCD Module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This Module has a 28inch diagonally measured active area with FHD resolutions (1920 horizontal by 360 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this Module is adapted for a low reflection and higher color type.



### 1.2 Features

- Cutting efficiency 90.5%,panel transmittance 6%;
- 4 shot normal design, High Response Time 8ms
- Matrix Vcom design(1/3);
- Lightweight design,Body 8.9mm , Depth 16.8mm
- Array process : 1+4mask, AT : 2G3D, Q-CT: 2G3D(S/B detection)
- RoHS compliant

|              |                                                   |                 |
|--------------|---------------------------------------------------|-----------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>4 of 29 |
|--------------|---------------------------------------------------|-----------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

### 1.3 Application

- TFT-LCD Display for transportation system and financial system
- Display Terminals for diversified information

### 1.4 General Specification

< Table 1. General Specifications >

| Parameter         | Specification                    | Unit   | Remarks |
|-------------------|----------------------------------|--------|---------|
| Active Area       | 699.84(H)*131.22(V)              | mm     |         |
| Number Of Pixels  | 1920(H)×360(V)                   | pixels |         |
| Pixel Pitch       | 121.5×364.5                      | um     |         |
| Pixel Arrangement | Pixels RGB stripe arrangement    |        |         |
| Display Colors    | 16.7M(8bits)                     | colors |         |
| Display Mode      | ADS                              |        |         |
| Brightness        | 700                              | nit    |         |
| MDL Outline       | 732(H)x165(V)                    | mm     |         |
| MDL Thickness     | 16.8                             | mm     |         |
| Power Consumption | 24.8 ( Logic : 4.2、 BLU : 20.6 ) | watt   |         |

|              |                                                   |                 |
|--------------|---------------------------------------------------|-----------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>5 of 29 |
|--------------|---------------------------------------------------|-----------------|

## 2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

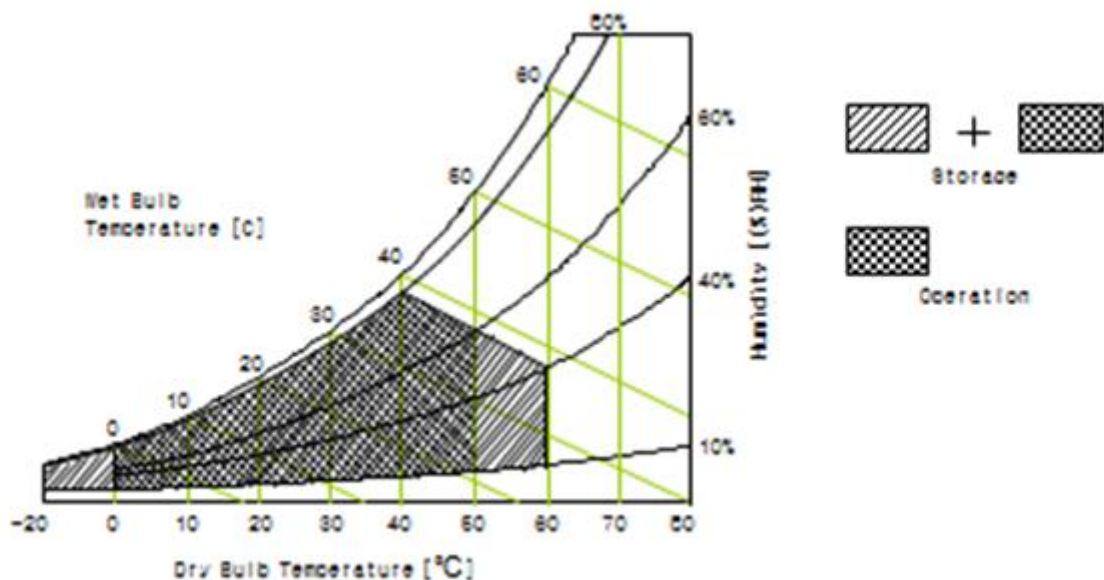
< Table 2. LCD Open Cell Electrical Specifications >

[VSS=GND=0V]

| Parameter                  | Symbol           | Min.    | Max. | Unit | Remark     |
|----------------------------|------------------|---------|------|------|------------|
| Power Supply Voltage       | VDD              | VSS-0.3 | 13.2 | V    | Ta = 25 °C |
| Operating Temperature      | T <sub>OP</sub>  | 0       | +50  | °C   | Note 1     |
|                            | T <sub>SUR</sub> | 0       | +60  | °C   |            |
| Storage Temperature        | T <sub>ST</sub>  | -20     | +60  | °C   |            |
| Operating Ambient Humidity | Hop              | 10      | 80   | %RH  |            |
| Storage Humidity           | Hst              | 10      | 80   | %RH  |            |

Note 1 : Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39 °C max. and no condensation of water.



|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

### 3.0 ELECTRICAL SPECIFICATIONS

#### 3.1 Electrical Specifications

< Table 3. LCD Open Cell Electrical Specifications > [Ta =25±2 °C]

| Parameter                   |                                           | Symbol | Values |      |      | Unit | Remark |
|-----------------------------|-------------------------------------------|--------|--------|------|------|------|--------|
|                             |                                           |        | Min    | Typ  | Max  |      |        |
| Power Supply Input Voltage  |                                           | VDD    | 10.8   | 12   | 13.2 | V    |        |
| Power Supply Ripple Voltage |                                           | VRP    |        |      | 500  | mV   |        |
| Power Supply Current        |                                           | IDD    | -      | 290  | 360  | mA   | Note 1 |
| Power Consumption           |                                           | PDD    |        | 3.48 | 4.4  | W    |        |
| LVDS Interface              | Differential Input High Threshold Voltage | VRTH   | +100   |      | +360 | mV   |        |
|                             | Differential Input Low Threshold Voltage  | VRTL   | -360   |      | -100 | mV   |        |
|                             | Common Input Voltage                      | VLVC   | 1.0    | 1.2  | 1.4  | V    |        |
| CMOS Interface              | Input High Threshold Voltage              | VIH    | 2.7    | -    | 3.3  | V    |        |
|                             | Input Low Threshold Voltage               | VIL    | 0      | -    | 0.6  | V    |        |

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=12.0V,

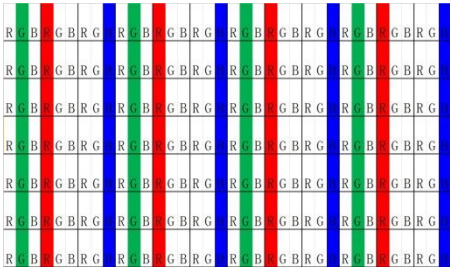
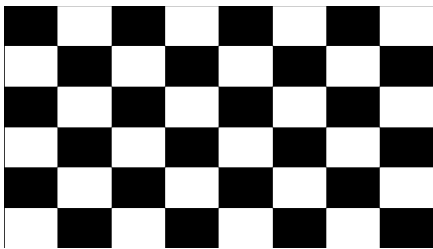
Frame rate f<sub>v</sub>=60Hz and Clock frequency = 75.4MHz.

Test Pattern of power supply current

a) Typ : Mosaic 8 x 8 Pattern\*)

b) Max : Vertical Line Sub Line255

(Only display 1/3) (L0/L255)



|              |                                                   |                 |
|--------------|---------------------------------------------------|-----------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>7 of 29 |
|--------------|---------------------------------------------------|-----------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

3.2 Backlight Unit

< Table 4. Backlight Input Pin Assignments>

| Pin No. | Symbol | Feature      | Wire Color |
|---------|--------|--------------|------------|
| 1       | CH1+   | VLED OUT CH1 | Red        |
| 2       | CH1-   | I Return CH1 | Blcak      |
| 3       | NC     | NC           | NC         |
| 4       | NC     | NC           | NC         |
| 5       | CH2+   | VLED OUT CH2 | Red        |
| 6       | CH2-   | I Return CH2 | Black      |

< Table 5. DC Input Specification> [Ta =25±2 ℃]

| Parameter             |      | Min. | Typ.  | Max. | Unit |
|-----------------------|------|------|-------|------|------|
| LED Forward Voltage   | VF   | 40.6 | 43.4  | 44.8 | V    |
| LED Forward Current   | IF   |      | 208   | 240  | mA   |
| LED Power Consumption | PLED |      | 18    |      | W    |
| LED Life-Time         | N/A  |      | 50000 |      | Hour |

Notes : The LED Life-time define as the estimated time to 50% degradation of initial luminous.

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|--------------|---------------------------------------------------|-----------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>8 of 29 |
|--------------|---------------------------------------------------|-----------------|

|            |                      |            |                   |
|------------|----------------------|------------|-------------------|
| <b>BOE</b> | <b>PRODUCT GROUP</b> | <b>REV</b> | <b>ISSUE DATE</b> |
|            | <b>TFT LCD</b>       | <b>0</b>   | <b>2018.1.16</b>  |

4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

- Connector : S050-C51B-C39-S or Equivalent.

< Table 4. Open Cell Input Connector Pin Configuration >

| Pin No | Symbol   | Description                | Pin No | Symbol   | Description             |
|--------|----------|----------------------------|--------|----------|-------------------------|
| 1      | N.C.     | No Connection              | 24     | N.C.     | No Connection           |
| 2      | SDA      | SDA                        | 25     | N.C.     | No Connection           |
| 3      | SCL      | SCL                        | 26     | GND      | Ground                  |
| 4      | WP       | Write Production           | 27     | GND      | Ground                  |
| 5      | N.C.     | No Connection              | 28     | CH2_0-   | LVDS Channel 2,Signal0- |
| 6      | N.C.     | No Connection              | 29     | CH2_0+   | LVDS Channel 2,Signal0+ |
| 7      | LVDS_SEL | ‘H’=JEIDA , ‘L’or NC= VESA | 30     | CH2_1-   | LVDS Channel 2,Signal1- |
| 8      | N.C.     | No Connection              | 31     | CH2_1+   | LVDS Channel 2,Signal1+ |
| 9      | N.C.     | No Connection              | 32     | CH2_2-   | LVDS Channel 2,Signal2- |
| 10     | GND      | Ground                     | 33     | CH2_2+   | LVDS Channel 2,Signal2+ |
| 11     | GND      | Ground                     | 34     | GND      | Ground                  |
| 12     | CH1_0-   | LVDS Channel 1,Signal0-    | 35     | CH2_CLK- | LVDS Channel 2,Clock-   |
| 13     | CH1_0+   | LVDS Channel 1,Signal0+    | 36     | CH2_CLK+ | LVDS Channel 2, Clock+  |
| 14     | CH1_1-   | LVDS Channel 1,Signal1-    | 37     | GND      | Ground                  |
| 15     | CH1_1+   | LVDS Channel 1,Signal1+    | 38     | CH2_3-   | LVDS Channel 2,Signal3- |
| 16     | CH1_2-   | LVDS Channel 1,Signal2-    | 39     | CH2_3+   | LVDS Channel 2,Signal3+ |
| 17     | CH1_2+   | LVDS Channel 1,Signal2+    | 40     | N.C.     | No Connection           |
| 18     | GND      | Ground                     | 41     | N.C.     | No Connection           |
| 19     | CH1_CLK- | LVDS Channel 1,Clock-      | 42     | GND      | Ground                  |
| 20     | CH1_CLK+ | LVDS Channel 1, Clock+     | 43     | GND      | Ground                  |
| 21     | GND      | Ground                     | 44     | GND      | Ground                  |
| 22     | CH1_3-   | LVDS Channel 1,Signal3-    | 45     | GND      | Ground                  |
| 23     | CH1_3+   | LVDS Channel 1,Signal3+    | 46     | GND      | Ground                  |

|              |                                                   |                 |
|--------------|---------------------------------------------------|-----------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>9 of 29 |
|--------------|---------------------------------------------------|-----------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

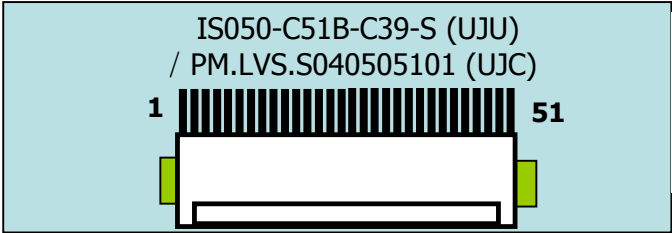
### 4.0 INTERFACE CONNECTION

| Pin No | Symbol | Description         | Pin No | Symbol | Description         |
|--------|--------|---------------------|--------|--------|---------------------|
| 47     | N.C.   | No Connection       | 50     | VDD    | Power Supply +12.0V |
| 48     | VDD    | Power Supply +12.0V | 51     | VDD    | Power Supply +12.0V |
| 49     | VDD    | Power Supply +12.0V |        |        |                     |

- Notes : 1. NC(Not Connected) : This pins are only used for BOE internal operations.
2. Input Level of LVDS signal is based on the EIA-644 Standard.
3. LVDS\_SEL : This pin is used for selecting LVDS signal data format.
- If this Pin : High (3.3V) → JEIDA LVDS format
- Otherwise : Low (GND) or Open (NC) → Normal NS LVDS format

#### Rear view of LCM

#### BIST Pattern



| PT1: Black<br>(2 sec) | PT1: White<br>(2 sec) | PT1: Red<br>(2 sec) | PT1: Green<br>(2 sec) | PT1: Blue<br>(2 sec) |
|-----------------------|-----------------------|---------------------|-----------------------|----------------------|
|                       |                       |                     |                       |                      |

#### Flicker Pattern

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| + | - | + | - | + | - | + | - | + | - |
| + | - | + | - | + | - | + | - | + | - |
| - | + | - | + | - | + | - | + | - | + |
| + | - | + | - | + | - | + | - | + | - |
| - | + | - | + | - | + | - | + | - | + |

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>10 of 29 |
|--------------|---------------------------------------------------|------------------|

|     |               |  |     |            |
|-----|---------------|--|-----|------------|
| BOE | PRODUCT GROUP |  | REV | ISSUE DATE |
|     | TFT LCD       |  | 0   | 2018.1.16  |

### 4.2 LVDS Interface

- LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data

< Table 5. Open Cell Input Connector Pin Configuration >

|             | LVDS Pin     | Vesa Data format | JEIDA Data format | Remark |
|-------------|--------------|------------------|-------------------|--------|
| TxOUT/RxIN0 | TxIN/RxOUT0  | Red0 [LSB]       | R2                |        |
|             | TxIN/RxOUT1  | Red1             | R3                |        |
|             | TxIN/RxOUT2  | Red2             | R4                |        |
|             | TxIN/RxOUT3  | Red3             | R5                |        |
|             | TxIN/RxOUT4  | Red4             | R6                |        |
|             | TxIN/RxOUT6  | Red5             | R7 [MSB]          |        |
|             | TxIN/RxOUT7  | Green0 [LSB]     | G2                |        |
| TxOUT/RxIN1 | TxIN/RxOUT8  | Green1           | G3                |        |
|             | TxIN/RxOUT9  | Green2           | G4                |        |
|             | TxIN/RxOUT12 | Green3           | G5                |        |
|             | TxIN/RxOUT13 | Green4           | G6                |        |
|             | TxIN/RxOUT14 | Green5           | G7 [MSB]          |        |
|             | TxIN/RxOUT15 | Blue0 [LSB]      | B2                |        |
|             | TxIN/RxOUT18 | Blue1            | B3                |        |
| TxOUT/RxIN2 | TxIN/RxOUT19 | Blue2            | B4                |        |
|             | TxIN/RxOUT20 | Blue3            | B5                |        |
|             | TxIN/RxOUT21 | Blue4            | B6                |        |
|             | TxIN/RxOUT22 | Blue5            | B7 [MSB]          |        |
|             | TxIN/RxOUT24 | HSYNC            | HSYNC             |        |
|             | TxIN/RxOUT25 | VSYNC            | VSYNC             |        |
|             | TxIN/RxOUT26 | DEN              | DEN               |        |
| TxOUT/RxIN3 | TxIN/RxOUT27 | Red6             | R0 [LSB]          |        |
|             | TxIN/RxOUT5  | Red7 [MSB]       | R1                |        |
|             | TxIN/RxOUT10 | Green6           | G0 [LSB]          |        |
|             | TxIN/RxOUT11 | Green7 [MSB]     | G1                |        |
|             | TxIN/RxOUT16 | Blue6            | B0 [LSB]          |        |
|             | TxIN/RxOUT17 | Blue7 [MSB]      | B1                |        |
|             | TxIN/RxOUT23 | Reserved         | Reserved          |        |

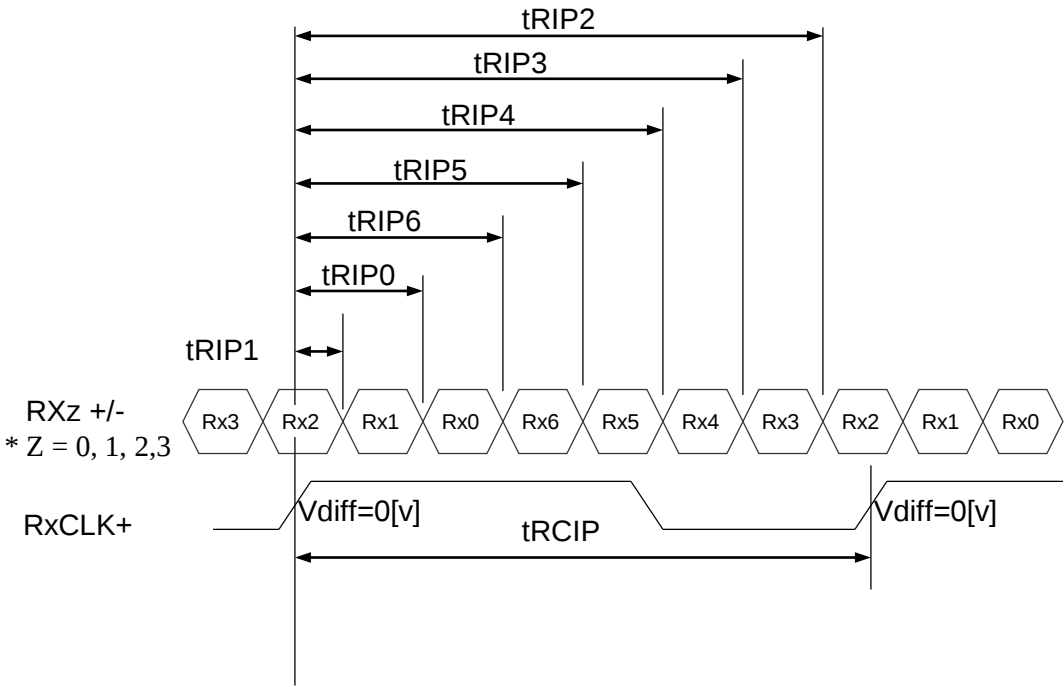
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|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>11 of 29 |
|--------------|---------------------------------------------------|------------------|

### 4.3 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 6.

<Table 6. LVDS Rx Interface Timing Specification>

| Item         | Symbol | Min             | Typ         | Max             | Unit | Remark |
|--------------|--------|-----------------|-------------|-----------------|------|--------|
| CLKIN Period | tRCIP  | 10.20           | 13.47       | 17.08           | nsec |        |
| Input Data 0 | tRIP1  | -0.4            | 0.0         | +0.4            | nsec |        |
| Input Data 1 | tRIP0  | tRCIP/7-0.4     | tRCIP/7     | tRCIP/7+0.4     | nsec |        |
| Input Data 2 | tRIP6  | 2 × tRCIP/7-0.4 | 2 × tRCIP/7 | 2 × tRCIP/7+0.4 | nsec |        |
| Input Data 3 | tRIP5  | 3 × tRCIP/7-0.4 | 3 × tRCIP/7 | 3 × tRCIP/7+0.4 | nsec |        |
| Input Data 4 | tRIP4  | 4 × tRCIP/7-0.4 | 4 × tRCIP/7 | 4 × tRCIP/7+0.4 | nsec |        |
| Input Data 5 | tRIP3  | 5 × tRCIP/7-0.4 | 5 × tRCIP/7 | 5 × tRCIP/7+0.4 | nsec |        |
| Input Data 6 | tRIP2  | 6 × tRCIP/7-0.4 | 6 × tRCIP/7 | 6 × tRCIP/7+0.4 | nsec |        |



\* Vdiff = (RXz+)-(RXz-),....,(RXCLK+)-(RXCLK-)

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ISSUE DATE

2018.1.16

5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters (DE only mode)

< Table 7. Timing Table >

| Item                           |           | Symbols | Min             | Typ   | Max  | Unit  |                  |
|--------------------------------|-----------|---------|-----------------|-------|------|-------|------------------|
| Clock                          | Frequency | 1/Tc    | 58              | 74.25 | 97   | MHz   |                  |
|                                | High Time | Tch     | -               | 4/7Tc | -    |       |                  |
|                                | Low Time  | Tcl     | -               | 4/7Tc | -    |       |                  |
| Frame Period                   |           | Tv      | 1100            | 1125  | 1149 | lines |                  |
|                                |           |         | 47              | 60    | 78   | Hz    |                  |
| Horizontal Active Display Term |           | Valid   | t <sub>HV</sub> | -     | 960  | -     | t <sub>CLK</sub> |
|                                |           | Total   | t <sub>HP</sub> | 1060  | 1100 | 1200  | t <sub>CLK</sub> |
| Vertical Active Display Term   |           | Valid   | t <sub>VV</sub> | -     | 1080 | -     | t <sub>HP</sub>  |
|                                |           | Total   | t <sub>VP</sub> | 1100  | 1125 | 1149  | t <sub>HP</sub>  |

Notes: This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

SPEC. NUMBER

SPEC. TITLE

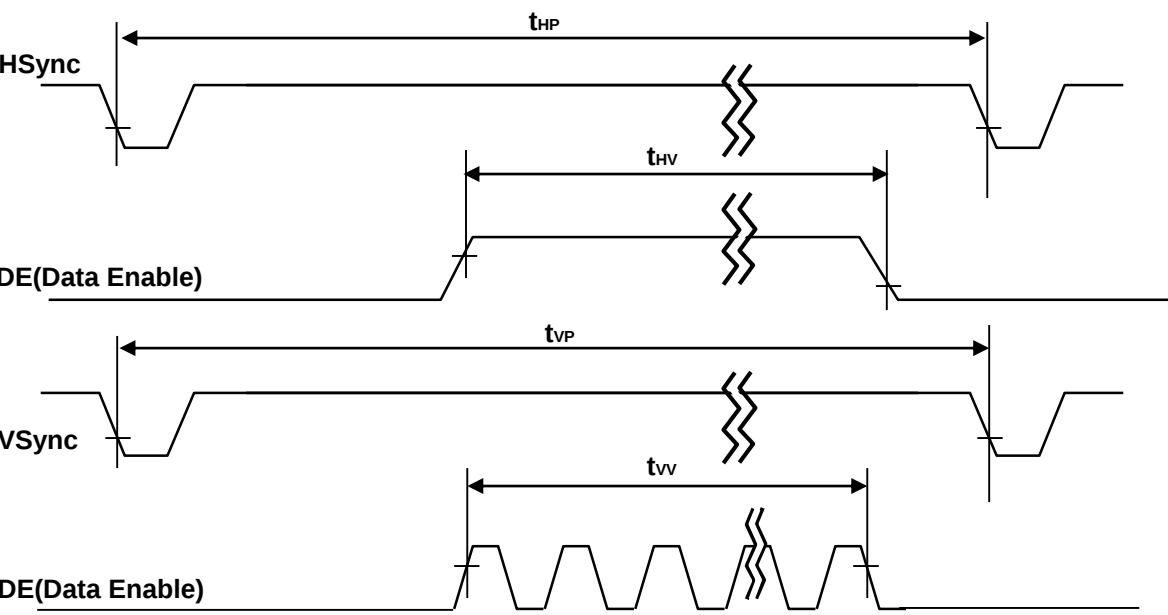
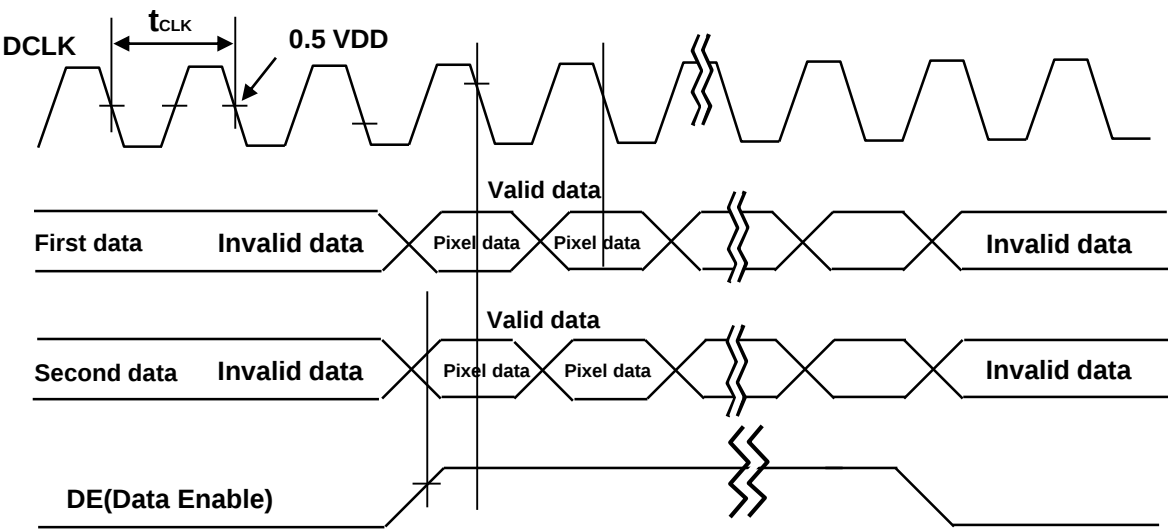
DV280FBM-NB1 Product Specification

PAGE

13 of 29

|                |               |     |            |
|----------------|---------------|-----|------------|
| <div>BOE</div> | PRODUCT GROUP | REV | ISSUE DATE |
|                | TFT LCD       | 0   | 2018.1.16  |

## 5.2 Signal Timing Waveform



|              |                                    |          |
|--------------|------------------------------------|----------|
| SPEC. NUMBER | SPEC. TITLE                        | PAGE     |
|              | DV280FBM-NB1 Product Specification | 14 of 29 |

## 5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

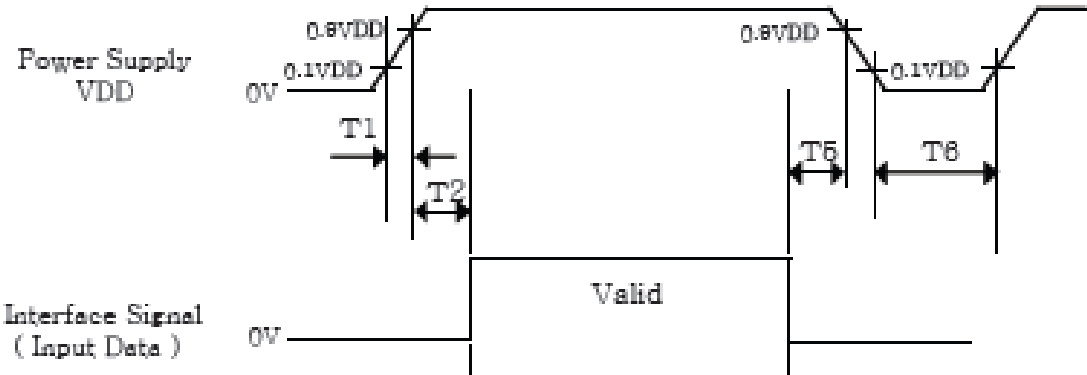
&lt; Table 8. Input Signal and Display Color Table &gt;

| Color & Gray Scale  |          | Input Data Signal |    |    |    |    |    |    |    |            |    |    |    |    |    |    |    |           |    |    |    |    |    |    |    |
|---------------------|----------|-------------------|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|
|                     |          | Red Data          |    |    |    |    |    |    |    | Green Data |    |    |    |    |    |    |    | Blue Data |    |    |    |    |    |    |    |
|                     |          | R7                | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7         | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7        | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue     | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Green    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Cyan     | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Red      | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Magenta  | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow   | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | White    | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale of Red   | Black    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker   | 0                 | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | ↑                 |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓                 |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 1                 | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ▽        | 1                 | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red      | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of Green | Black    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker   | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | ↑                 |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓                 |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ▽        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale of Blue  | Black    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
|                     | Darker   | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
|                     | △        | ↑                 |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓                 |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | ▽        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                     | Blue     | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale of White | Black    | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | △        | 0                 | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
|                     | Darker   | 0                 | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
|                     | △        | ↑                 |    |    |    |    |    |    |    | ↑          |    |    |    |    |    |    |    | ↑         |    |    |    |    |    |    |    |
|                     | ▽        | ↓                 |    |    |    |    |    |    |    | ↓          |    |    |    |    |    |    |    | ↓         |    |    |    |    |    |    |    |
|                     | Brighter | 1                 | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1          | 1  | 1  | 1  | 1  | 0  | 1  | 1  | 1         | 1  | 1  | 1  | 1  | 0  | 1  | 1  |
|                     | ▽        | 1                 | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                     | White    | 1                 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1  | 1  | 1  | 1  |

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|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

### 5.4 Power Sequence

To prevent a latch-up or DC operation of the Open Cell, the power on/off sequence shall be as shown in below.



< Table 9. Sequence Table >

| Parameter | Values |     |     | Units |
|-----------|--------|-----|-----|-------|
|           | Min    | Typ | Max |       |
| T1        | 0.5    | -   | 20  | ms    |
| T2        | 0      | -   | 50  | ms    |
| T5        | 0      | -   | 50  | ms    |
| T6        | 1      | -   | -   | s     |

- Notes: 1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.  
2. Back Light must be turn on after power for logic and interface signal are valid.

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>16 of 29 |
|--------------|---------------------------------------------------|------------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

6.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance≤1 lux and temperature=25±2℃) with the equipment of Luminance meter system (Goniometer system and PR730) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θ<sub>0=0</sub> (=θ<sub>3</sub>) as the 3 o’ clock direction (the “right” ), θ<sub>0=90</sub> (= θ<sub>12</sub>) as the 12 o’ clock direction ( “upward” ), θ<sub>0=180</sub> (= θ<sub>9</sub>) as the 9 o’ clock direction ( “left” ) and θ<sub>0=270</sub>(= θ<sub>6</sub>) as the 6 o’ clock direction ( “bottom” ). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V +/-10% at 25℃. Optimum viewing angle direction is 6 ’ clock.

< Table 10. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25±2 ℃]

| Parameter                  |            | Symbol        | Condition                                                    | Min   | Typ    | Max   | Unit | Remark                |
|----------------------------|------------|---------------|--------------------------------------------------------------|-------|--------|-------|------|-----------------------|
| Viewing Angle              | Horizontal | $\Theta_3$    | CR > 10                                                      | 80    | 89     | -     | Deg. | Note 1                |
|                            |            | $\Theta_9$    |                                                              | 80    | 89     | -     | Deg. |                       |
|                            | Vertical   | $\Theta_{12}$ |                                                              | 80    | 89     | -     | Deg. |                       |
|                            |            | $\Theta_6$    |                                                              | 80    | 89     | -     | Deg. |                       |
| Contrast ratio             |            | CR            | $\Theta = 0^\circ$<br>(Center)<br>Normal<br>Viewing<br>Angle |       | 1200:1 |       |      | Note 2                |
| Luminance of White         |            | $Y_w$         |                                                              |       | 700    |       | nit  | Note3                 |
| White luminance uniformity |            | $\Delta Y$    |                                                              | 75    | 80     |       | %    | Note4                 |
| Color Gamut                |            |               |                                                              |       | 72     |       | %    |                       |
| Reproduction of color      | White      | $W_x$         |                                                              | -0.03 | 0.280  | +0.03 |      | Note5<br>搭配YR<br>粉BLU |
|                            |            | $W_y$         |                                                              |       | 0.290  |       |      |                       |
|                            | Red        | $R_x$         |                                                              |       | 0.652  |       |      |                       |
|                            |            | $R_y$         |                                                              |       | 0.331  |       |      |                       |
|                            | Green      | $G_x$         |                                                              |       | 0.287  |       |      |                       |
|                            |            | $G_y$         |                                                              |       | 0.617  |       |      |                       |
|                            | Blue       | $B_x$         |                                                              |       | 0.147  |       |      |                       |
|                            |            | $B_y$         |                                                              |       | 0.084  |       |      |                       |
| Response Time              | G to G     | $T_g$         |                                                              | -     | 8      | 10    | ms   | Note 6                |
| Gamma Scale                |            |               |                                                              | 2.0   | 2.2    | 2.4   |      |                       |
| Cell Transmittance         |            |               |                                                              |       | 5.5    |       | %    |                       |

|              |                                    |          |
|--------------|------------------------------------|----------|
| SPEC. NUMBER | SPEC. TITLE                        | PAGE     |
|              | DV280FBM-NB1 Product Specification | 17 of 29 |

## Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of  $\theta = 0^\circ$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure 2 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as :  
 $\Delta Y = (\text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}) * 100$   
 (See Figure 2 shown in Appendix).
5. The color chromaticity coordinates specified in Table 10. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
6. Response time  $T_g$  is the average time required for display transition by switching the input signal as below table and is based on Frame rate  $f_v = 60\text{Hz}$  to optimize.

| Measured Response Time |     | Target |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|------------------------|-----|--------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                        |     | 0      | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |
| Start                  | 0   |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 15  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 31  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 47  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 63  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 79  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 95  |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 111 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 127 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 143 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 159 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 175 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 191 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 207 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 223 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|                        | 239 |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| 255                    |     |        |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |

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|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

## 7.0 MECHANICAL CHARACTERISTICS

### 7.1 Dimensional Requirements

Figure 4(located in Appendix) shows mechanical outlines for the model DVB280FBM-NB1  
 Other parameters are shown in Table 11.

< Table 11. Dimensional Parameters >

| Parameter           | Specification       | Unit   |
|---------------------|---------------------|--------|
| Dimensional outline | 732(H) × 165(V)     | mm     |
| Weight              | 2.4                 | Kg     |
| Active area         | 699.84(H)×131.22(V) | mm     |
| Pixel pitch         | 121.5×364.5         | um     |
| Number of pixels    | 1920(H) ×360(V)     | pixels |

### 7.2 Mounting

See Figure 4& Figure 5.(Shown in Appendix)

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>19 of 29 |
|--------------|---------------------------------------------------|------------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

### 8.0 Reliability Test Condition

< Table 12. Reliability Test Condition >

| Item         | Test Condition                                                                                   |
|--------------|--------------------------------------------------------------------------------------------------|
| High-Temp/OP | Ta = 60 °C, 240 hrs                                                                              |
| Low-Temp/OP  | Ta = 0 °C, 240 hrs                                                                               |
| Low-Temp/STG | Ta = -20 °C, 240hrs                                                                              |
| On/Off       | 30sec(on) / 30sec(off) , 12000times , 200hr                                                      |
| TST-2        | -40°C~80°C(Per 30min) , 100 cycle                                                                |
| Altitude     | 先5000ft后15000ft ; 0°C/24hr ; 25°C/24hr ; 50°C/24hr                                               |
| ESD          | Front/Left @ Center≤18dB , Rear/Inverter≤25dB<br>150pF 330Ω ±15KV(Air) / ±8kV(Contact), 100point |
| Module VIB   | Random : +X/+Y/+Z(30min) ; 1.5G ; 10~500HZ                                                       |
| Shock        | 50G 11msec ; Half sine ; ±X±Y±Z axis                                                             |

This test condition is based on BOE module.

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>20 of 29 |
|--------------|---------------------------------------------------|------------------|

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

9.0 PRODCUT SERIAL NUMBER




RoHS Compliant



DV280FBM-NB1



XXXXXXXXXXXXXXXXXXXX

Remark:

贴附位置: 背板

标签尺寸: 48mm × 12mm

1. FG-CODE

2. MDL ID ( 编码规则如下)

3. MDL ID 条形码

| 序列号 | 1     | 2 | 3  | 4  | 5 | 6 | 7 | 8          | 9 | 10 | 11 | 12  | 13 | 14 | 15 | 16 | 17 |
|-----|-------|---|----|----|---|---|---|------------|---|----|----|-----|----|----|----|----|----|
| 代码  | X     | X | P  | 3  | 1 | 2 | 7 | 3          | 8 | 5  | 0  | 0   | 0  | 1  | E  | E  | J  |
| 描述  | GBN代码 |   | 等级 | B3 | 年 | 周 |   | FG Code后四位 |   |    |    | 序列号 |    |    |    |    |    |

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>21 of 29 |
|--------------|---------------------------------------------------|------------------|

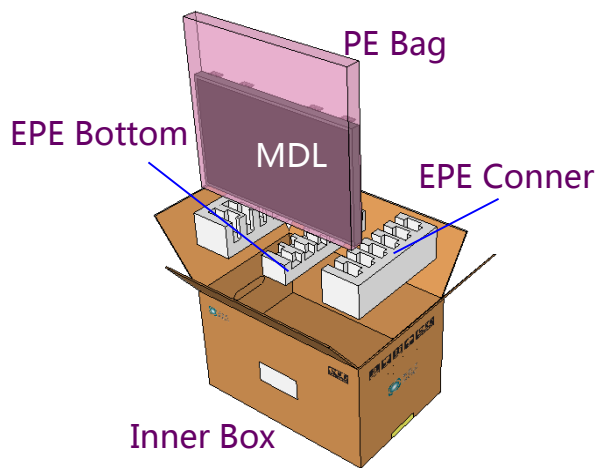
|     |               |     |            |
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| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

## 10.0 PACKING INFORMATION

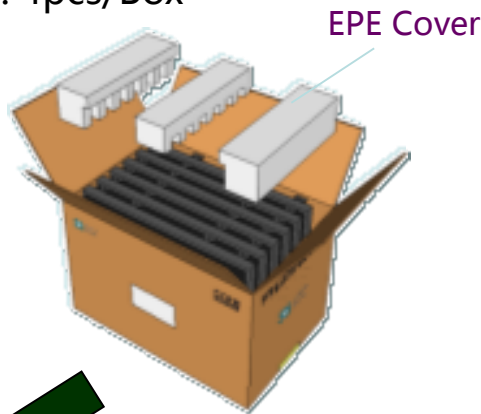
BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

### 10.1 Packing Order

- 将 EPE Conner & Bottom 放入Inner Box
- 将MDL 套入PE Bag 后PCB 向上竖直插入



- 将4pcs MDL 插入卡槽后
- EPE Cover 扣合
- 4pcs/Box



- 每个Pallet上放4层Box
- 1层4箱,共计16ea Box
- Pallet外进行缠膜包装
- 64pcs Panel / Pallet



|              |                                    |          |
|--------------|------------------------------------|----------|
| SPEC. NUMBER | SPEC. TITLE                        | PAGE     |
|              | DV280FBM-NB1 Product Specification | 22 of 29 |

|     |               |     |            |
|-----|---------------|-----|------------|
| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

10.2 Packing Note

- Box Dimension : 815mm(L) × 253mm (W) ×250mm (H)
- Package Quantity in one Box : 4pcs

10.3 Box Label

- Label Size : 110 mm (L) × 55 mm (W)
- Contents

1. FG-CODE
2. Box 产品数量
3. Box ID, 编码规则如下
4. Box Packing 日期
5. FG-CODE 后四位

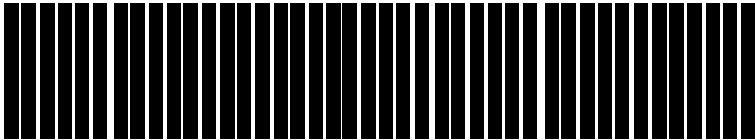
BOE BOE Technology Group Co., Ltd.

MODEL: XXXXXXXX-XXX①

QTY: XX ②

SERIAL NO: XXXXXXXXXXXXX ③

DATE: 20XX / XX/ XX④



XXXX ⑤



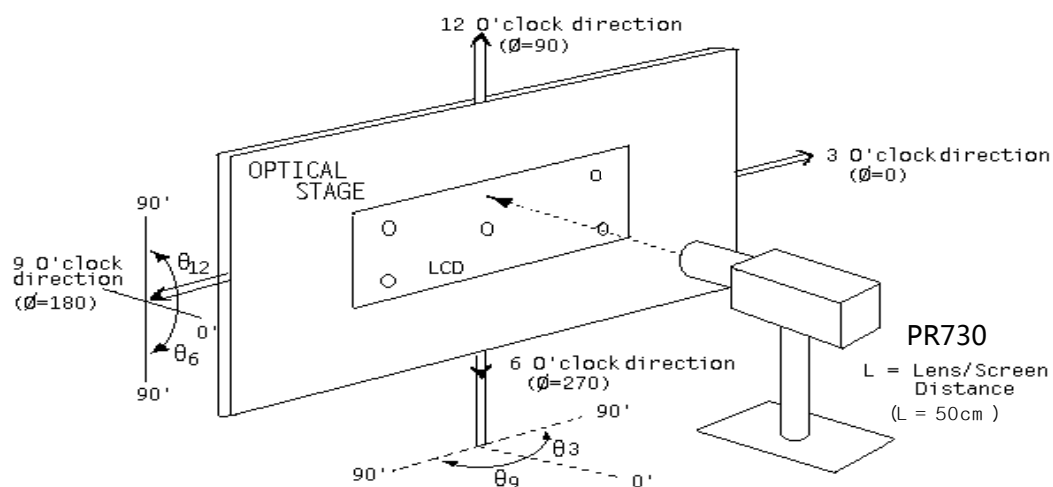
| 序号号 | 1     | 2 | 3  | 4  | 5  | 6 | 7 | 8   | 9   | 10 | 11 | 12 | 13 |
|-----|-------|---|----|----|----|---|---|-----|-----|----|----|----|----|
| 代码  | X     | X | P  | 3  | 1  | 5 | 7 | 0   | 0   | 0  | 1  | H  | D  |
| 描述  | GBN代码 |   | 等级 | B3 | 年份 |   | 月 | Rev | 序列号 |    |    |    |    |

|              |                                                   |                  |
|--------------|---------------------------------------------------|------------------|
| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>23 of 29 |
|--------------|---------------------------------------------------|------------------|

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| BOE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PRODUCT GROUP                                     | REV | ISSUE DATE       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TFT LCD                                           | 0   | 2018.1.16        |
| <p><b>11.0 HANDLING &amp; CAUTIONS</b></p> <p>(1) Cautions when taking out the module</p> <ul style="list-style-type: none"> <li>• Pick the pouch only, when taking out module from a shipping package.</li> </ul> <p>(2) Cautions for handling the module</p> <ul style="list-style-type: none"> <li>• As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.</li> <li>• As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.</li> <li>• As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.</li> <li>• Do not pull the interface connector in or out while the LCD module is operating.</li> <li>• Put the module display side down on a flat horizontal plane.</li> <li>• Handle connectors and cables with care.</li> </ul> <p>(3) Cautions for the operation</p> <ul style="list-style-type: none"> <li>• When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.</li> <li>• Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.</li> </ul> <p>(4) Cautions for the atmosphere</p> <ul style="list-style-type: none"> <li>• Dew drop atmosphere should be avoided.</li> <li>• Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.</li> </ul> <p>(5) Cautions for the module characteristics</p> <ul style="list-style-type: none"> <li>• Do not apply fixed pattern data signal to the LCD module at product aging.</li> <li>• Applying fixed pattern for a long time may cause image sticking.</li> </ul> <p>(6) Other cautions</p> <ul style="list-style-type: none"> <li>• Do not disassemble and/or re-assemble LCD module.</li> <li>• Do not re-adjust variable resistor or switch etc.</li> <li>• When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.</li> </ul> |                                                   |     |                  |
| SPEC. NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SPEC. TITLE<br>DV280FBM-NB1 Product Specification |     | PAGE<br>24 of 29 |

## 12.0 APPENDIX

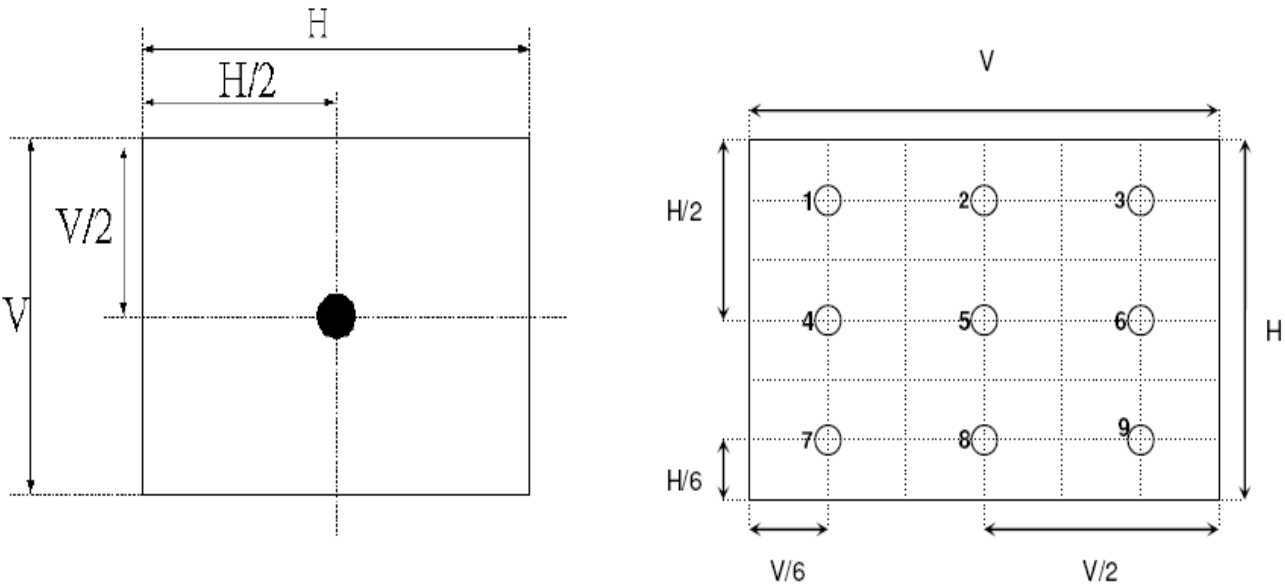
&lt; Figure 1. Measurement Set Up &gt;



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| <div>BOE</div> | PRODUCT GROUP | REV | ISSUE DATE |
|                | TFT LCD       | 0   | 2018.1.16  |

12.0 APPENDIX

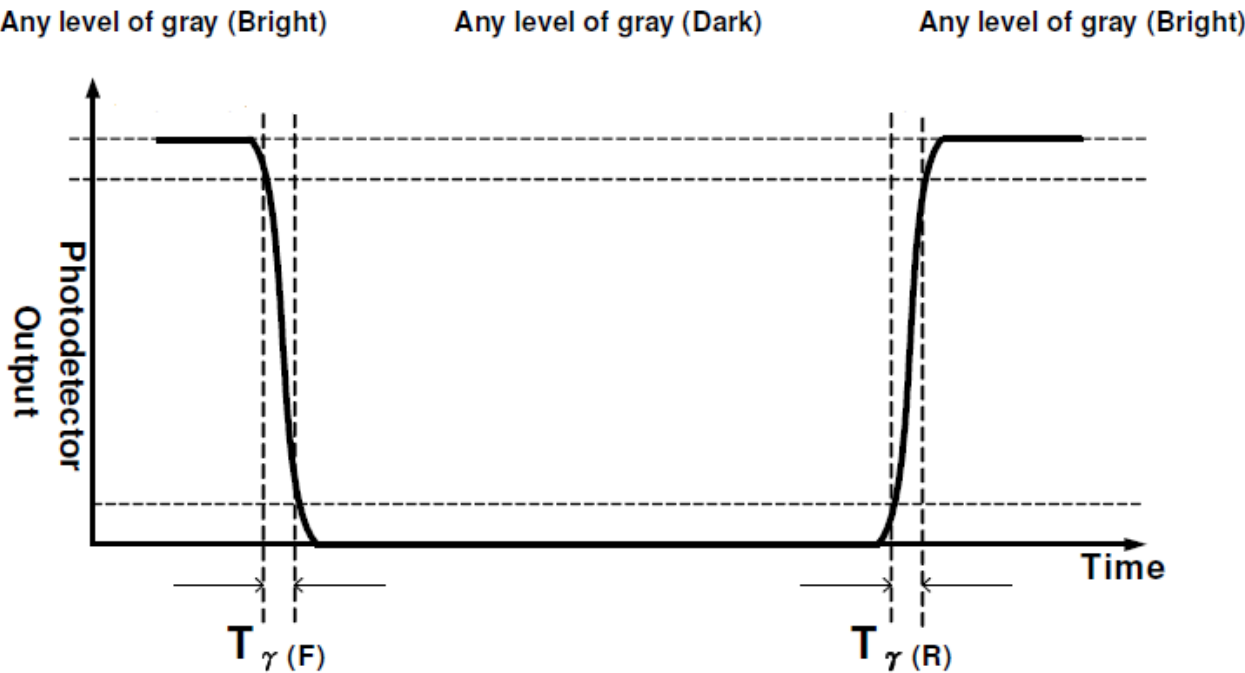
< Figure 2. White Luminance and Uniformity Measurement Locations >



|              |                                                   |                  |
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| SPEC. NUMBER | SPEC. TITLE<br>DV280FBM-NB1 Product Specification | PAGE<br>26 of 29 |
|--------------|---------------------------------------------------|------------------|

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| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

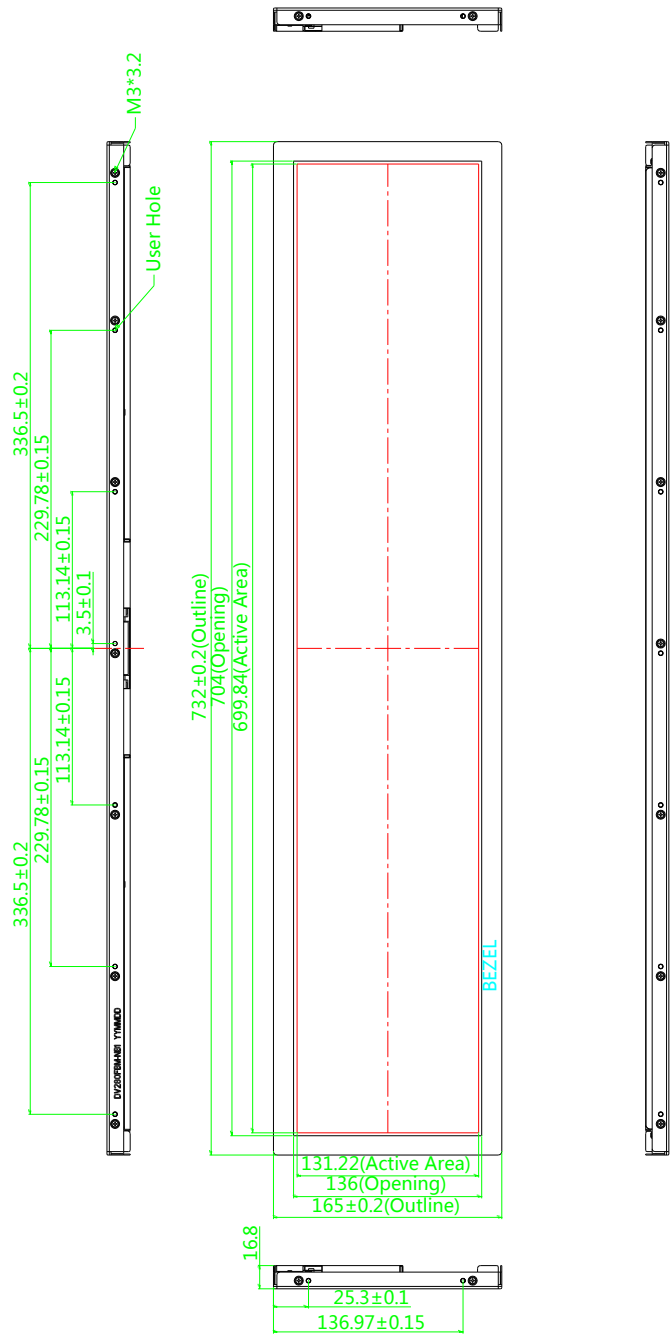
< Figure 3. Response Time Testing >



|                    |                                    |          |
|--------------------|------------------------------------|----------|
| SPEC. NUMBER       | SPEC. TITLE                        | PAGE     |
| B2010-8002-O (3/3) | DV280FBM-NB1 Product Specification | 27 of 29 |

|     |               |     |            |
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| BOE | PRODUCT GROUP | REV | ISSUE DATE |
|     | TFT LCD       | 0   | 2018.1.16  |

< Figure 4. TFT-LCD Module Outline Dimensions (Front View) >



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| SPEC. NUMBER       | SPEC. TITLE                        | PAGE     |
| B2010-8002-O (3/3) | DV280FBM-NB1 Product Specification | 28 of 29 |

|                                                                                           |                                    |     |            |
|-------------------------------------------------------------------------------------------|------------------------------------|-----|------------|
| <div>BOE</div>                                                                            | PRODUCT GROUP                      | REV | ISSUE DATE |
|                                                                                           | TFT LCD                            | 0   | 2018.1.16  |
| <div> <div>&lt; Figure 5. TFT-LCD Module Outline Dimensions (Rear View) &gt;</div> </div> |                                    |     |            |
| SPEC. NUMBER                                                                              | SPEC. TITLE                        |     | PAGE       |
| B2010-8002-O (3/3)                                                                        | DV280FBM-NB1 Product Specification |     | 29 of 29   |