

Confidential Document

## TFT Module Specification

ITEM NO.: TVT0570D1-V

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| Customer Companies | R&D Dept.                                                                           | Q.C. Dept.                                                                          | Eng. Dept.                                                                            | Prod. Dept.                                                                           |
|--------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                    |  |  |  |  |
| Approved by        | Version:                                                                            | Issued Date:                                                                        | Sheet Code:                                                                           | Total Pages:                                                                          |
|                    | B                                                                                   | 2007/11/28                                                                          |                                                                                       | 19                                                                                    |

## 2. RECORD OF REVISION

| Rev                | Date      | Item            | Page              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|-----------|-----------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                  | 7/FEB/07  |                 |                   | Initial preliminary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>TVT0570D1-V</b> |           |                 |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1                  | 7/JUN/07  | 4,5,6,7,8,9,15  | 3,4,5,6,7,9,10,18 | <ol style="list-style-type: none"> <li>1. P/N Change to TVT0570D1-V</li> <li>2. Change viewing angle direction from 6 o'clock to 12 o'clock.</li> <li>3. modify dimension 5.8(D) to 7Max.(T).</li> <li>4. Add absolute maximum ratings.</li> <li>5. modify electrical characteristics.</li> <li>6. modify block diagram.</li> <li>7. modify pin connections.</li> <li>8. modify input signal timing specification.</li> <li>9. modify optical characteristics.</li> <li>10. modify outline drawing ,change pin 4~6 from VCC to VLED.</li> <li>11. Change outline drawing.</li> </ol> |
| A                  | 9/AUG/07  | 4,6,9.2.1,10,15 | 3,6,10,12,18      | <ol style="list-style-type: none"> <li>1. Add Weight.</li> <li>2. Add Power Supply Current for LCD.</li> <li>3. Add Power Supply Current for LED.</li> <li>4. Add LED life time 25000 hours(typ.).</li> <li>5. modify Sync mode timing waveform.</li> <li>6. Add Chromaticity data.</li> <li>7. Change OUTLINE DRAWING.</li> </ol>                                                                                                                                                                                                                                                   |
| B                  | 28/NOV/07 | 6,15,16         | 3,18,19           | <ol style="list-style-type: none"> <li>1. Modify LED life time 25000hours to LED Dice life time 50000hours.</li> <li>2. Change Note1, ambient temperature: from 25°C to 22°C.</li> <li>3. Change OUTLINE DRAWING.</li> <li>4. Change PACKAGE INFORMATION.</li> </ol>                                                                                                                                                                                                                                                                                                                 |

### 3. APPLICATION

Digital equipments which need color display, such as P.O.S, medical equipments and industrial equipments.

### 4. GENERAL SPECIFICATIONS

| Parameter                                                   | Specifications                | Unit |
|-------------------------------------------------------------|-------------------------------|------|
| Display resolution                                          | (640X R.G.B) (W) x480(H)      | dot  |
| Active area                                                 | 115.2(W) x 86.4(H)            | mm   |
| Screen size                                                 | 5.7(Diagonal)                 | inch |
| Dot pitch                                                   | 0.06(W) x 0.18(H)             | mm   |
| Color configuration                                         | R.G.B. Stripe                 |      |
| Overall dimension                                           | 127 (W) x 98.43(H) x 7Max.(T) | mm   |
| Weight                                                      | 110                           | g    |
| Surface treatment                                           | Clear                         |      |
| View Angle direction                                        | 12 o'clock                    |      |
| Our components and processes are compliant to RoHS standard |                               |      |

### 5. ABSOLUTE MAXIMUM RATINGS

| Parameter             | Symbol          | MIN. | MAX.                 | Unit | Remark              |
|-----------------------|-----------------|------|----------------------|------|---------------------|
| Power supply voltage  | V <sub>CC</sub> | -0.3 | 5.0                  | V    |                     |
| Logic input voltage   | V <sub>I</sub>  | -0.3 | V <sub>CC</sub> +0.3 | V    |                     |
| Operating temperature | T <sub>OP</sub> | -20  | +70                  | °C   | Ambient temperature |
| Storage temperature   | T <sub>ST</sub> | -30  | +80                  | °C   | Ambient temperature |

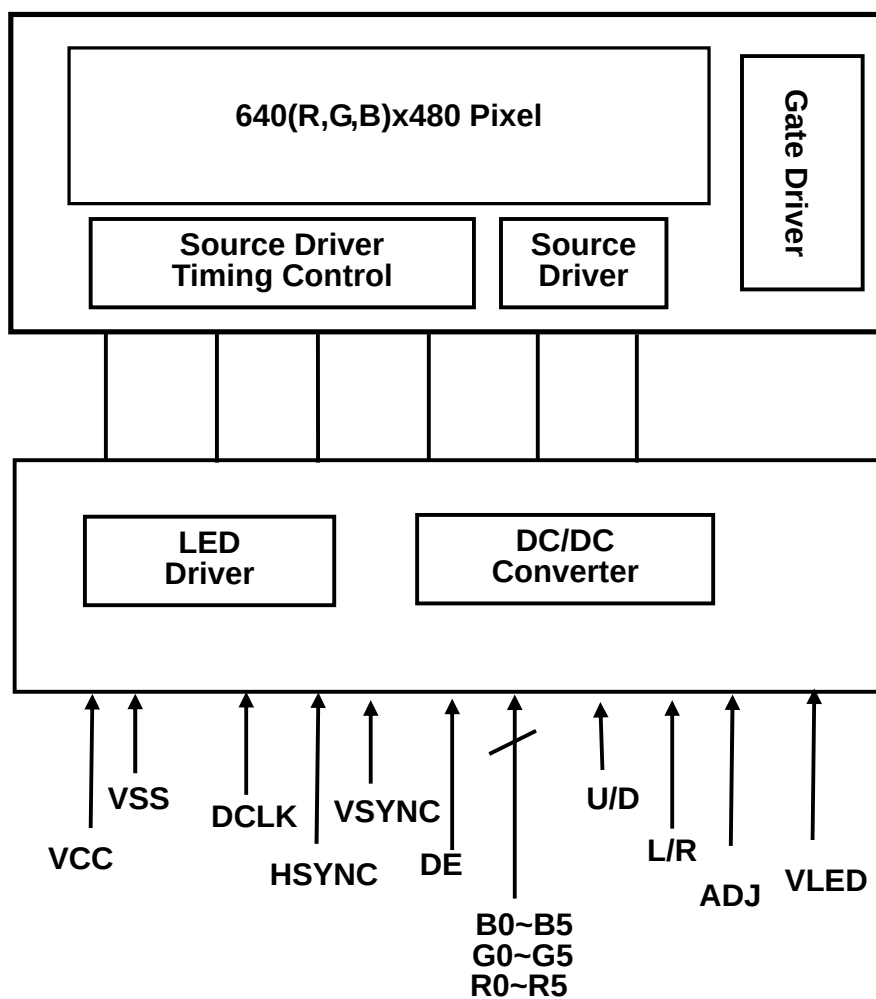
### 6. ELECTRICAL CHARACTERISTICS

V<sub>SS</sub>=0V, DCLK=25MHz, T<sub>a</sub>=25°C

| Parameter                       | Symbol           | MIN.               | Typ.  | MAX.               | Unit              | Remark                 |
|---------------------------------|------------------|--------------------|-------|--------------------|-------------------|------------------------|
| Power Supply voltage for LCD    | V <sub>CC</sub>  | +3.0               | +3.3  | +3.6               | V                 |                        |
| Power Supply Current for LCD    | I <sub>CC</sub>  |                    | 111   | 140                | mA                | V <sub>CC</sub> =3.3V  |
| Power Supply voltage for LED    | V <sub>LED</sub> | 4.5                | 5     | 5.5                | V                 |                        |
| Power Supply Current for LED    | I <sub>LED</sub> |                    | 333   | 400                | mA                | V <sub>LED</sub> =5.0V |
| Ripple voltage                  | V <sub>RF</sub>  | -                  | -     | 100                | mV <sub>P-P</sub> |                        |
| "H" level logical input voltage | V <sub>IH</sub>  | 0.7V <sub>CC</sub> | --    | V <sub>CC</sub>    | V                 |                        |
| "L" level logical input voltage | V <sub>IL</sub>  | 0                  | --    | 0.3V <sub>CC</sub> | V                 |                        |
| ADJ frequency                   |                  | 19K                | 20K   | 21K                | Hz                |                        |
| ADJ input voltage               | V <sub>IH</sub>  | 3.0                | -     | 3.3                | V                 |                        |
|                                 | V <sub>IL</sub>  | 0                  | -     | 0.3                | V                 |                        |
| LED Dice life time              |                  | --                 | 50000 | --                 | Hr                | Note 1                 |

Note 1: The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 22°C and LED dice current=20mA.

## 7. BLOCK DIAGRAM



## 8. PIN CONNECTIONS

| Pin NO. | SYMBOL          | DESCRIPTION                                    |
|---------|-----------------|------------------------------------------------|
| 1       | U/D             | Up or Down Display Control                     |
| 2       | NC              | No Connection                                  |
| 3       | Hsync           | Horizontal SYNC.                               |
| 4       | VLED            | Power Supply for LED Driver circuit            |
| 5       | VLED            | Power Supply for LED Driver circuit            |
| 6       | VLED            | Power Supply for LED Driver circuit            |
| 7       | V <sub>CC</sub> | Power Supply for LCD                           |
| 8       | Vsync           | Vertical SYNC.                                 |
| 9       | DE              | Data Enable                                    |
| 10      | VSS             | Power Ground                                   |
| 11      | VSS             | Power Ground                                   |
| 12      | ADJ             | Brightness control for LED B/L                 |
| 13      | B5              | Blue Data 5 (MSB)                              |
| 14      | B4              | Blue Data 4                                    |
| 15      | B3              | Blue Data 3                                    |
| 16      | V <sub>SS</sub> | Power Ground                                   |
| 17      | B2              | Blue Data 2                                    |
| 18      | B1              | Blue Data 1                                    |
| 19      | B0              | Blue Data 0 (LSB)                              |
| 20      | V <sub>SS</sub> | Power Ground                                   |
| 21      | G5              | Green Data 5 (MSB)                             |
| 22      | G4              | Green Data 4                                   |
| 23      | G3              | Green Data 3                                   |
| 24      | V <sub>SS</sub> | Power Ground                                   |
| 25      | G2              | Green Data 2                                   |
| 26      | G1              | Green Data 1                                   |
| 27      | G0              | Green Data 0 (LSB)                             |
| 28      | V <sub>SS</sub> | Power Ground                                   |
| 29      | R5              | Red Data 5 (MSB)                               |
| 30      | R4              | Red Data 4                                     |
| 31      | R3              | Red Data 3                                     |
| 32      | V <sub>SS</sub> | Power Ground                                   |
| 33      | R2              | Red Data 2                                     |
| 34      | R1              | Red Data 1                                     |
| 35      | R0              | Red Data 0                                     |
| 36      | VSS             | Power Ground                                   |
| 37      | VSS             | Power Ground                                   |
| 38      | DCLK            | Clock Signals ; Latch Data at the Falling Edge |
| 39      | V <sub>SS</sub> | Power Ground                                   |
| 40      | L/R             | Left or Right Display Control                  |

Remarks :

- 1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
- 2) ADJ signal is 0~3.3V. Operation frequency is 20KHz
- 3) VSS PIN must be grounding, can not be floating.

#### 4) U/D and L/R control Function

| L/R | U/D | Function                                      |
|-----|-----|-----------------------------------------------|
| 1   | 0   | Normally display                              |
| 0   | 0   | Left and Right opposite                       |
| 1   | 1   | Up and Down opposite                          |
| 0   | 1   | Left and Right opposite, Up and Down opposite |

5) If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

### 8.1 Power Signal Sequence

Remarks:

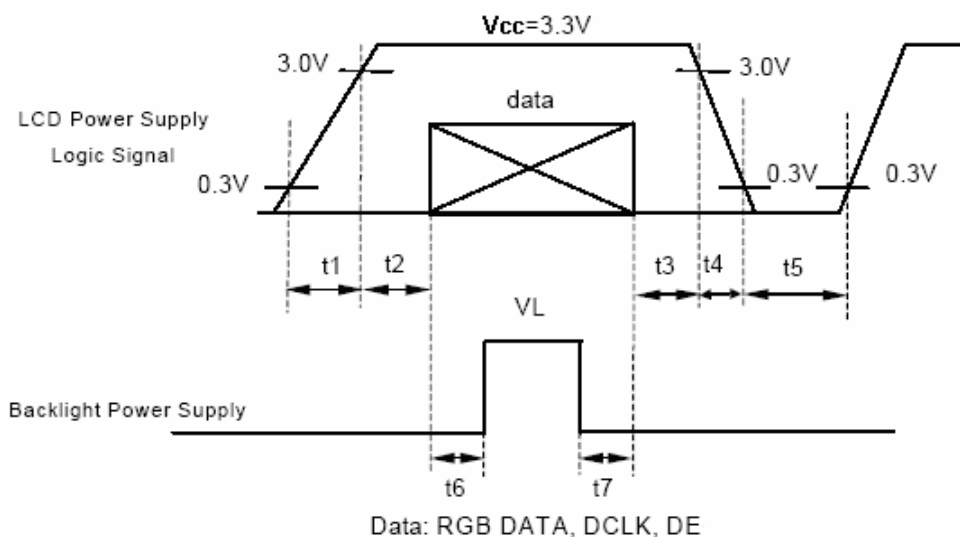
\*1) Power Signal sequence:

$t1 \leq 10\text{ms}$  :  $1 \text{ sec} \leq t5$

$50\text{ms} \leq t2$  :  $200\text{ms} \leq t6$

$0 < t3 \leq 50\text{ms}$  :  $200\text{ms} \leq t7$

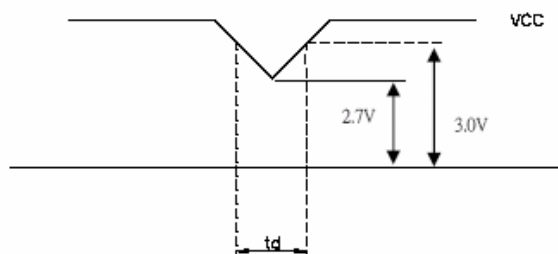
$0 < t4 \leq 10\text{ms}$



\*2) VCC-dip condition:

(1)  $2.7 \text{ V} \leq V_{CC} < 3.0\text{V}$ ,  $t_d \leq 10 \text{ ms}$

(2)  $V_{CC} > 3.0\text{V}$ , VCC-dip condition should be the same with VCC-turn-on condition.



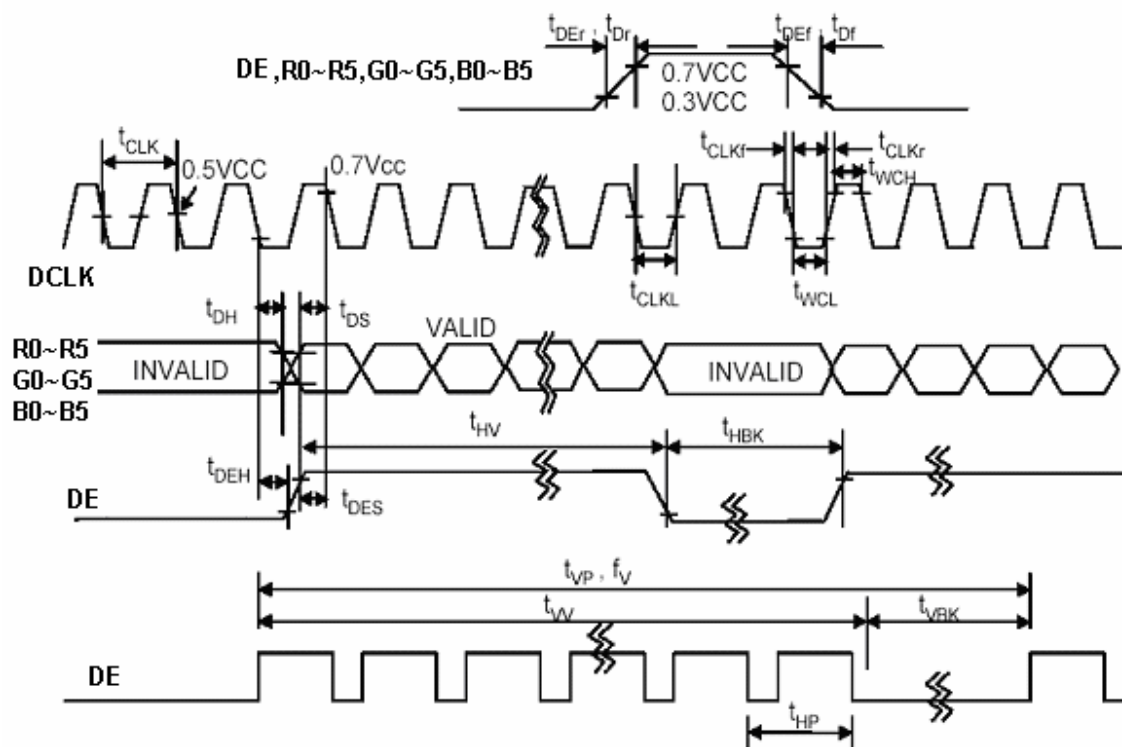
## 9. INTERFACE SPECIFICATIONS

### 9.1 DE mode Input signal characteristics

| Signal                 | Parameter              | Symbol               | MIN. | TYP. | MAX. | Unit      | Remarks |
|------------------------|------------------------|----------------------|------|------|------|-----------|---------|
| DCLK                   | Period                 | $t_{CLK}$            | 33   | 40   | 43   | ns        |         |
|                        | Frequency              | $f_{CLK}$            | 23   | 25   | 30   | MHz       |         |
|                        | Low Level Width        | $t_{WCL}$            | 6    | -    | -    | ns        |         |
|                        | High Level Width       | $t_{WCH}$            | 6    | -    | -    | ns        |         |
|                        | Rise, Fall Time<br>(1) | $t_{CLKr}, t_{CLKf}$ | -    | -    | 3    | ns        |         |
|                        | Duty                   | -                    | 0.45 | 0.50 | 0.55 | -         |         |
| DE<br>(Data<br>Enable) | Setup Time             | $t_{DES}$            | 5    | -    | -    | ns        |         |
|                        | Hold Time              | $t_{DEH}$            | 10   | -    | -    | ns        |         |
|                        | Rise, Fall Time        | $t_{DEr}, t_{DEf}$   | -    | -    | 16   | ns        |         |
|                        | Horizontal Period      | $t_{HP}$             | 750  | 800  | 900  | $t_{CLK}$ |         |
|                        | Horizontal Valid       | $t_{HV}$             | 640  | 640  | 640  | $t_{CLK}$ |         |
|                        | Horizontal Blank       | $t_{HBK}$            | 110  | 160  | 260  | $t_{CLK}$ |         |
|                        | Vertical Period        | $t_{VP}$             | 515  | 525  | 560  | $t_{HP}$  |         |
|                        | Vertical Valid         | $t_{VW}$             | 480  | 480  | 480  | $t_{HP}$  |         |
|                        | Vertical Blank         | $t_{VBK}$            | 35   | 45   | 80   | $t_{HP}$  |         |
|                        | Vertical Frequency     | $f_v$                | 55   | 60   | 65   | Hz        |         |
| Data<br>R,G,B          | Setup Time             | $t_{DS}$             | 5    | -    | -    | ns        |         |
|                        | Hold Time              | $t_{DH}$             | 10   | -    | -    | ns        |         |
|                        | Rise, Fall Time        | $t_{Dr}, t_{Df}$     | -    | -    | 3    | ns        |         |

Note: (1)  $t_{CLKL} / t_{CLK}$ .

### 9.1.1 DE mode timing waveform





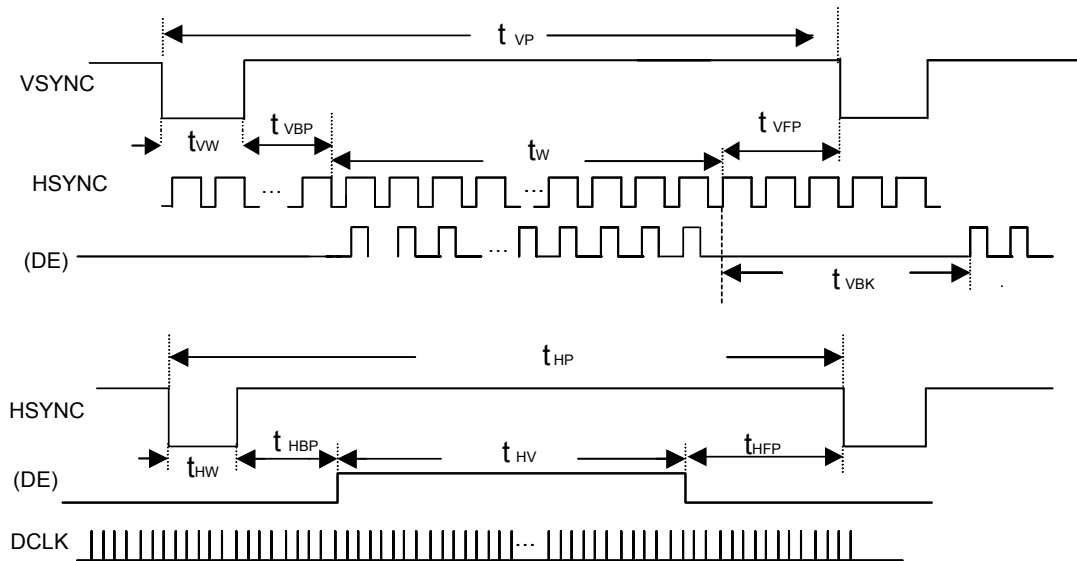
## 9.2 SYNC mode Input signal characteristics

| Parameter                | Symbol               | MIN. | TYP. | MAX. | Unit      | Remarks |
|--------------------------|----------------------|------|------|------|-----------|---------|
| Clock Period             | $t_{CLK}$            | 33   | 40   | 43   | ns        |         |
| Clock Frequency          | $f_{CLK}$            | 23   | 25   | 30   | MHz       |         |
| Clock Low Level Width    | $t_{WCL}$            | 6    | -    | -    | ns        |         |
| Clock High Level Width   | $t_{WCH}$            | 6    | -    | -    | ns        |         |
| Clock Rise, Fall Time    | $t_{CLKr}, t_{CLKf}$ | -    | -    | 3    | ns        |         |
| HSYNC Period             | $t_{HP}$             | 750  | 800  | 900  | $t_{CLK}$ |         |
| HSYNC Pulse Width        | $t_{HW}$             | 5    | 30   | -    | $t_{CLK}$ |         |
| HSYNC Front Porch        | $t_{HFP}$            | 1    | 16   | 116  | $t_{CLK}$ |         |
| HSYNC Back Porch         | $t_{HBP}$            | 1    | 114  | 139  | $t_{CLK}$ |         |
| HSYNC Width + Back Porch | $t_{HW} + t_{HBP}$   | 144  | 144  | 144  | $t_{CLK}$ |         |
| Horizontal Blank         | $t_{HBK}$            | 1    | 160  | 260  | $t_{CLK}$ |         |
| Horizontal Valid         | $t_{HV}$             | 640  | 640  | 640  | $t_{CLK}$ |         |
| VSYNC Period             | $t_{VP}$             | 515  | 525  | 560  | $t_{HP}$  |         |
| VSYNC Pulse Width        | $t_{VW}$             | 1    | 3    | 5    | $t_{HP}$  |         |
| VSYNC Front Porch        | $t_{VFP}$            | 1    | 10   | 45   | $t_{HP}$  |         |
| VSYNC Back Porch         | $t_{VBP}$            | 30   | 32   | 34   | $t_{HP}$  |         |
| VSYNC Width + Back Porch | $t_{VW} + t_{VBP}$   | 35   | 35   | 35   | $t_{CLK}$ |         |
| Vertical Blank           | $t_{VBK}$            | 35   | 45   | 80   | $t_{HP}$  |         |
| Vaild data Width         | $t_W$                | 480  | 480  | 480  | $t_{HP}$  |         |
| Data Setup Time          | $t_{DS}$             | 5    | -    | -    | ns        |         |
| Data Hold Time           | $t_{DH}$             | 10   | -    | -    | ns        |         |

Note: (1)  $t_{HBK} = t_{HFP} + t_{HW} + t_{HBP}$

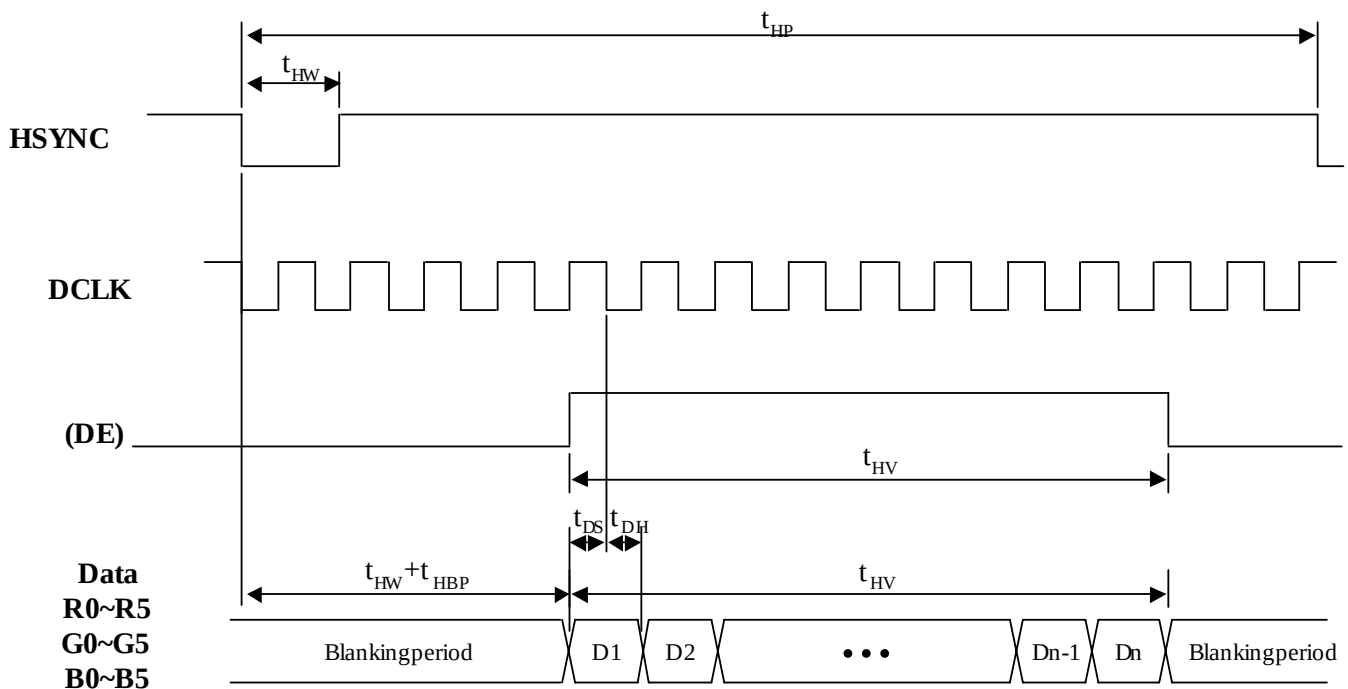
## 9.2.1 SYNC mode timing waveform

### 9.2.1.1 Input vertical timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

### 9.2.1.2 Input horizontal timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

### 9.3 Color Data Assignment

| COLOR       | INPUT     | R DATA |    |    |    |    |     | G DATA |    |    |    |    |     | B DATA |    |    |    |    |     |
|-------------|-----------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
|             | DATA      | R5     | R4 | R3 | R2 | R1 | R0  | G5     | G4 | G3 | G2 | G1 | G0  | B5     | B4 | B3 | B2 | B1 | B0  |
|             |           | MSB    |    |    |    |    | LSB | MSB    |    |    |    |    | LSB | MSB    |    |    |    |    | LSB |
| BASIC COLOR | BLACK     | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(63)   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63) | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | BLUE(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | CYAN      | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | MAGENTA   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | YELLOW    | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   | 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   |
| RED         | RED(0)    | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(1)    | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(2)    | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | RED(62)   | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(63)   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
| GREEN       | GREEN(0)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(1)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(2)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | GREEN(62) | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63) | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
| BLUE        | BLUE(0)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | BLUE(1)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   |
|             | BLUE(2)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | :         | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   | :      | :  | :  | :  | :  | :   |
|             | BLUE(62)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   |
|             | BLUE(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |

Remarks:(1) Definition of Gray Scale  
color(n):n is series of Gray Scale  
The more n value is, the bright Gray Scale.  
(2)Data:1-High,0-Low

#### Correspondence between Data and Display Position

|      |       |       |       |       |       |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|      | S0001 | S0002 | S0003 | S0004 | S0005 | S0006 | S0007 | S0008 | ----- | S1919 | S1920 |
| C001 | R001  | G001  | B001  | R002  | G002  | B002  | R003  | G003  |       | G640  | B640  |
|      |       |       |       |       |       |       |       |       |       |       |       |
|      |       |       |       |       |       |       |       |       |       |       |       |
| C480 | R001  | G001  | B001  | R002  | G002  | B002  | R003  | G003  |       | G640  | B640  |

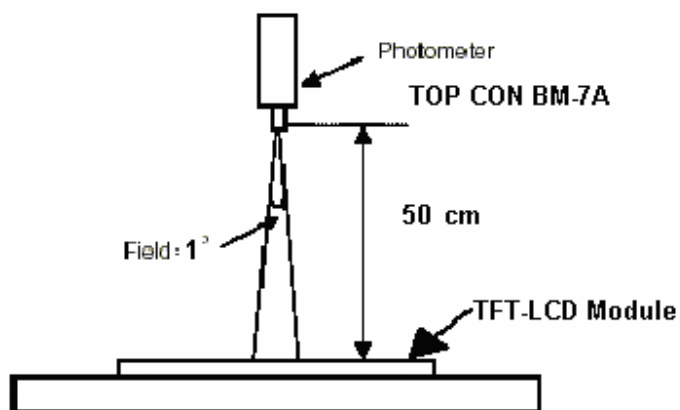
## 10. OPTICAL CHARACTERISTIC

### 10-1. Specification:

| Parameter      | Symbol     | Condition                                   | MIN.  | TYP.  | MAX.  | Unit              | Remarks  |
|----------------|------------|---------------------------------------------|-------|-------|-------|-------------------|----------|
| Viewing Angle  | Horizontal | $\theta_{x+}$                               | 60    | 70    | --    | deg               | Note 1,4 |
|                |            | $\theta_{x-}$                               | 60    | 70    | --    |                   |          |
|                | Vertical   | $\theta_{y+}$                               | 50    | 60    | --    |                   |          |
|                |            | $\theta_{y-}$                               | 30    | 40    | --    |                   |          |
| Contrast Ratio | CR         | at optimized viewing angle                  | 200   | 300   |       |                   | Note 1,3 |
| Response time  | Rise       | Tr                                          | -     | 15    |       | ms                | Note 1,6 |
|                | Fall       | Tf                                          | -     | 35    |       | ms                |          |
| Uniformity     | B-uni      | $\theta x = \theta y = 0^\circ$             | 70    | 80    | --    | %                 | Note 1,5 |
| Brightness     | L          | $\theta x = \theta y = 0^\circ$<br>ADJ=3.3V | 360   | 400   | --    | cd/m <sup>2</sup> | Note 1,2 |
| Chromaticity   | $x_W$      | Center<br>$\theta x = \theta y = 0^\circ$   | 0.259 | 0.309 | 0.359 |                   | Note 1,7 |
|                | $y_W$      |                                             | 0.270 | 0.320 | 0.370 |                   |          |
|                | $x_R$      |                                             | 0.565 | 0.615 | 0.665 |                   |          |
|                | $y_R$      |                                             | 0.310 | 0.360 | 0.410 |                   |          |
|                | $x_G$      |                                             | 0.295 | 0.345 | 0.395 |                   |          |
|                | $y_G$      |                                             | 0.490 | 0.540 | 0.590 |                   |          |
|                | $x_B$      |                                             | 0.098 | 0.148 | 0.198 |                   |          |
|                | $y_B$      |                                             | 0.056 | 0.106 | 0.156 |                   |          |
| Image sticking | tis        | 2 hours                                     |       |       | 2     | Sec               | Note 8   |

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance  $\leq 1$  lux, and at room temperature). The operation temperature is  $25^\circ\text{C} \pm 2^\circ\text{C}$ . The measurement method is shown in Note 1.

Note 1: The method of optical measurement:

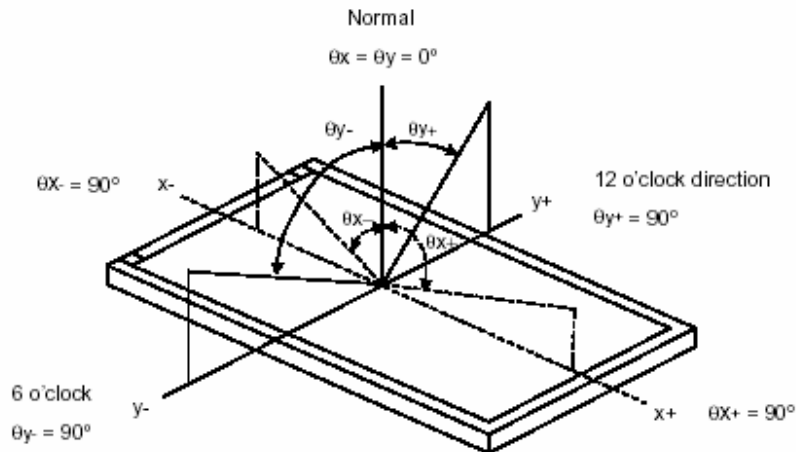


Note2: Measured at the center area of the panel and at the viewing angle of the  $\theta_x=\theta_y=0^\circ$

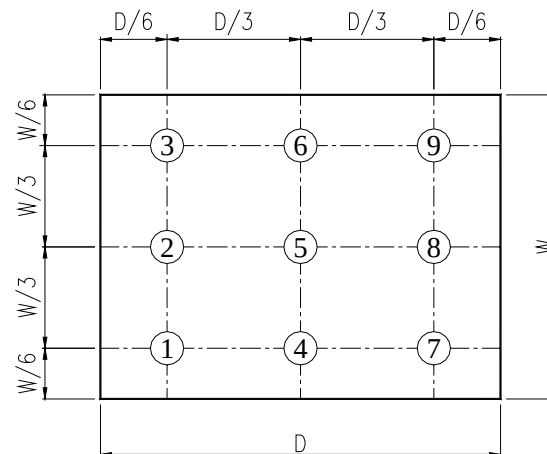
Note3: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

#### Note4: Definition of Viewing Angle



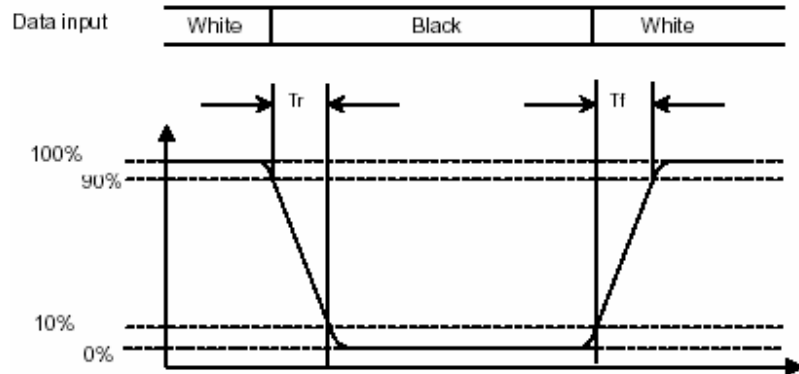
Note 5: Definition of Brightness Uniformity (B-uni):



$$B_{uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9 points}} \quad (\text{Note 5}).$$

Note6: Definition of Response Time:

The Response Time is set initially by defining the "Rising Time ( $T_r$ )" and the "Falling Time ( $T_f$ )" respectively.  $T_r$  and  $T_f$  are defined as following figure.



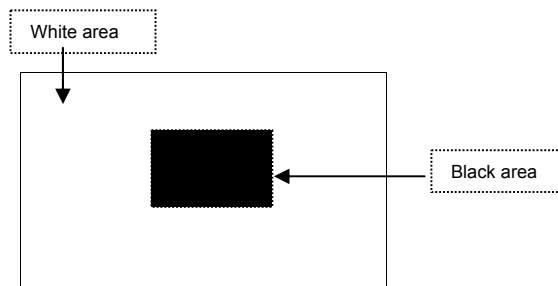
Note 7: Definition of Chromaticity:

The color coordinates  $(x_w, y_w)$ ,  $(x_r, y_r)$ ,  $(x_g, y_g)$ , and  $(x_b, y_b)$  are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C

Image sticking pattern



## 11. QUALITY ASSURANCE

### 11.1 Test Condition

#### 11.1.1 Temperature and Humidity(Ambient Temperature)

Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65 \pm 5\%$

#### 11.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

#### 11.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

#### 11.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

#### 11.1.5 Test Method

| No. | Reliability Test Item & Level                     | Test Level                                                                                                   |
|-----|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 1   | High Temperature Storage Test                     | T=80°C,240hrs                                                                                                |
| 2   | Low Temperature Storage Test                      | T=-30°C,240hrs                                                                                               |
| 3   | High Temperature Operation Test                   | T=70°C,240hrs                                                                                                |
| 4   | Low Temperature Operation Test                    | T=-20°C,240hrs                                                                                               |
| 5   | High Temperature and High Humidity Operation Test | T=60°C,90% RH,240hrs                                                                                         |
| 6   | Thermal Cycling Test<br>(No operation)            | -30°C → +25°C → +80°C,200 Cycles<br>30 min 5min 30 min                                                       |
| 7   | Vibration Test<br>(No operation)                  | Frequency:0 ~ 55 Hz Amplitude:1.5 mm<br>Sweep Time:11min<br>Test Period:6 Cycles for each Direction of X,Y,Z |
| 8   | Electrostatic Discharge Test<br>(No operation)    | 150pF,330Ω<br>Air:± 12KV;Contact: ±6KV<br>10 times/point;4 points/panel face                                 |

**12. LOT NUMBERING SYSTEM**

|   |   |   |   |
|---|---|---|---|
| 9 | 7 | 4 | 2 |
|---|---|---|---|

Production week number

Production year

**13. LCM NUMBERING SYSTEM**

TV T 0570 D1 - V

Model type

TV – Topovision Factory

T – TFT Production

0570 – 5.7 Inch

D1 – Version Serial Number of Product



## 14. PRECAUTION FOR USING LCM

### 1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handling,

- (1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.
- (2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.
- (3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.
- (4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.
- (5). Do not drive LCD with DC voltage.

### 2. Liquid Crystal Display Modules

#### 2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

- (1). Do not tamper in any way with the tabs on the metal frame.
- (2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
- (3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).
- (4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
- (5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

#### 2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

- (1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- (2). The modules should be kept in antistatic bags or other containers resistant to static for storage.
- (3). Only properly grounded soldering irons should be used.
- (4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

#### 2.3 Soldering

- (1). Solder only to the I/O terminals.
- (2). Use only soldering irons with proper grounding and no leakage.
- (3). Soldering temperature :  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- (4). Soldering time: 3 to 4 sec.
- (5). Use eutectic solder with resin flux fill.
- (6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

#### 2.4 Operation

- (1). The viewing angle can be adjusted by varying the LCD driving voltage  $V_0$ .
- (2). Driving voltage should be kept within specified range; excess voltage shortens display life.
- (3). Response time increases with decrease in temperature.
- (4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
- (5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

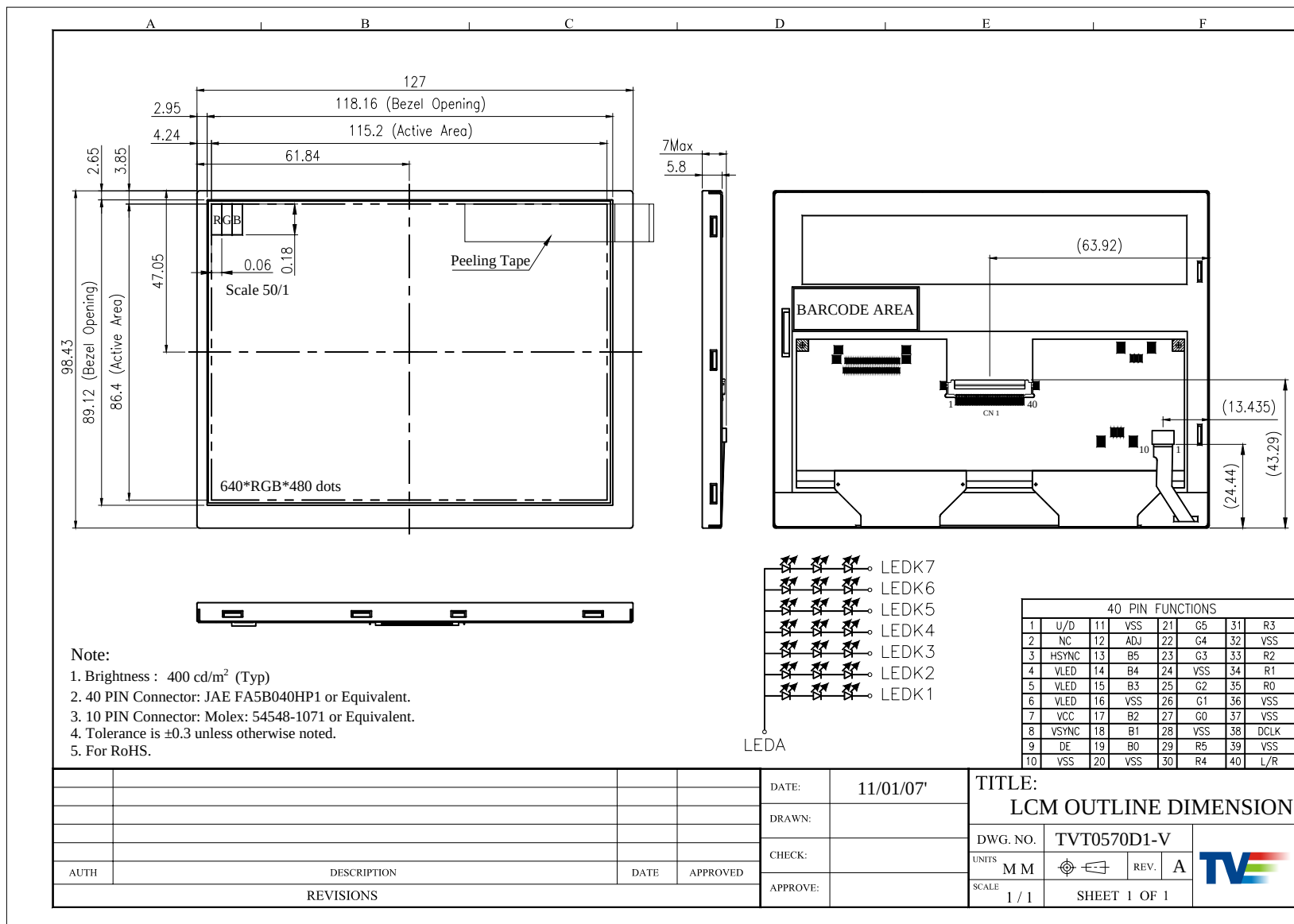
#### 2.5 Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

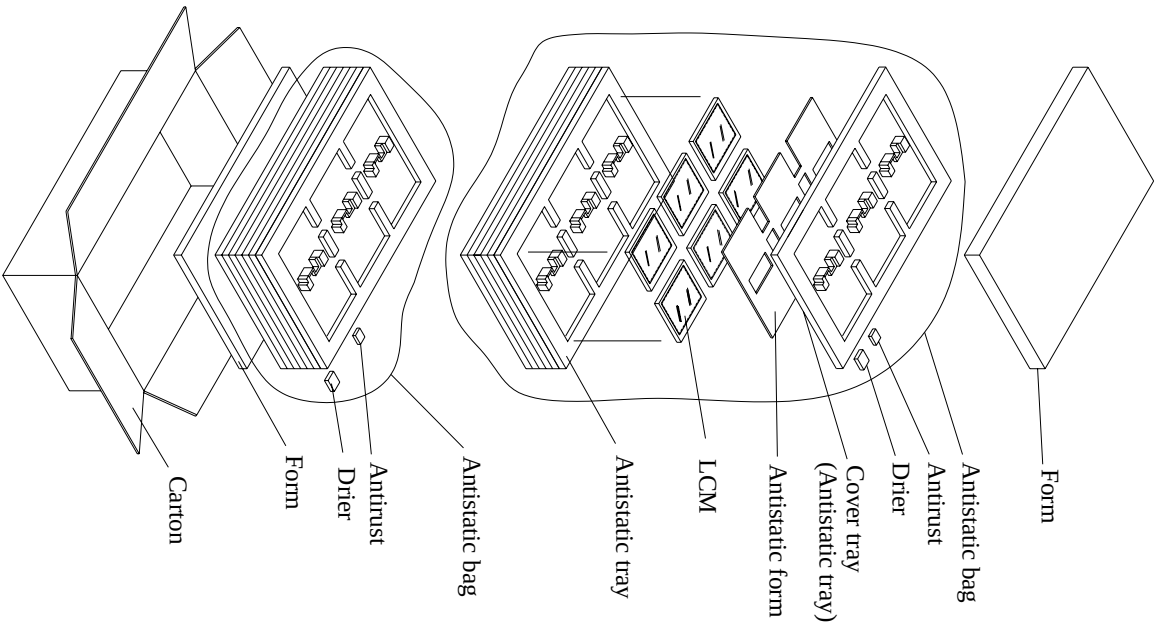
#### 2.6 Limited Warranty

Unless otherwise agreed between Topovision and customer, Topovision will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with Topovision acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Topovision is limited to repair and/or replacement on the terms set forth above. Topovision will not be responsible for any subsequent or consequential events.

Confidential Document  
15. OUTLINE DRAWING



Confidential Document  
**16.PACKAGE INFORMATION**



**Material**

1 Carton + 2 Anti-static bag + 1 Form(35mm) + 1 Form(15mm)  
 + 14 Anti-static tray + 2 Drier + 2 Antirust

**Total pcs**

1 Antistatic tray = 6 pcs

1 Anti-static bag = 6 Anti-static tray + cover tray =  $6 \times 6 + 1 \times 0 = 36$  pcs

1 Carton = 2 Anti-static bag =  $2 \times 36 = 72$  pcs

1 Carton = 72pcs

Carton size : 482L x 282W x 279H (mm)

Total Weight ÷ 11 kgw

**TVT0570D1-V TFT LCM PACKING**