

Product Specification

SPECIFICATION FOR APPROVAL

- () Preliminary Specification
- () Final Specification

| | |
|--------------|--|
| Title | 3.5" (320 X RGB X 240) TFT- LCD |
|--------------|--|

| | |
|-------|--|
| BUYER | |
| MODEL | |

| | |
|-----------------|-------------------------|
| SUPPLIER | LG.Philips LCD CO.,Ltd. |
| MODEL | LB035Q02 |
| SUFFIX | TD01 |

| SIGNATURE | DATE |
|-----------|-------|
| / | _____ |
| / | _____ |
| / | _____ |

| APPROVED BY | DATE |
|--------------------------|-------|
| C. S. Kyeong /G. Manager | _____ |
| REVIEWED BY | |
| S. H. Kim / Manager | _____ |
| PREPARED BY | |
| H. S. Woo / Engineer | _____ |

**Product Engineering Dept.
LG. Philips LCD Co., Ltd**

Product Specification

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RECORD OF REVISIONS

| Revision No | Revision Date | Page | Description | Note |
|-------------|---------------------------------------|-------|---|------|
| 0.0 | Feb. 11. 2007 | - | First Draft (Preliminary) | |
| 0.1 | Mar. 02. 2007 | 7 | Interface Connection (Pin Number 52~54) | |
| | | 8 | Stabilization Capacitor (Recommend) | |
| 0.2 | April. 02. 2007 | 6~7 | Interface Connection | |
| | | 8 | Stabilization Capacitor & Diode (System) | |
| | | 9 | Stabilization Capacitor (FPC) | |
| | | 15 | Bezel Area changed | |
| | | 27 | TSP PAD Pitch (1.0mm → 1.25mm) | |
| 0.3 | April. 06. 2007 | 26 | Add Dimensions to The Front View | |
| 0.4 | May. 31. 2007 | 12~13 | TSP Specifications | |
| 0.5 | July. 03. 2007 | 25 | Initial Code | |
| | | 28 | Insulator Tape | |
| 0.6 | July. 05. 2007 | 13 | TSP Dimensions | |
| | | 26 | Initial Code (H05 : FFC0 → F7C0) | |
| | | 27 | Reliability Test | |
| | | 28 | Add Insulation tape to The Front View | |
| | | 28 | Delete ID Label from the Rear View | |
| | | 30 | Delete 12-1. Designation of Lot Mark | |
| | | 30 | a) Package quantity in one box : 180 pcs → 135 pcs c) 1Box=tray20+1 tray(dummy, top) = 21 tray → 1Box=tray15+1 tray(dummy, top) = 16 tray | |
| 30 | No.6 Label Art Paper 100x100 → 100x70 | | | |
| | | 31 | Delete 13. Marking & Others | |

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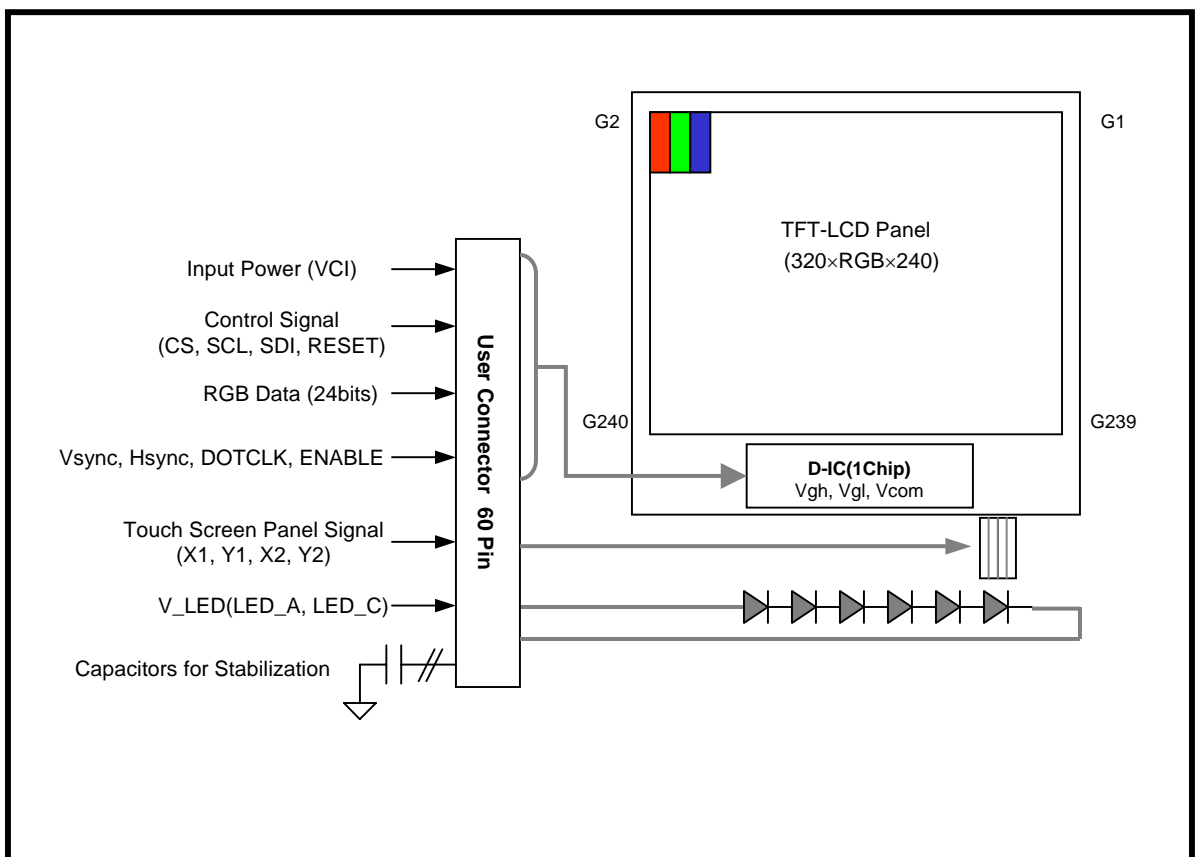
1. General Description

1-1. Description

The LB035Q02 is a Color Active Matrix Liquid Crystal Display with a white LED backlight assembly. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This module is a diagonal 3.5 inch with the Landscape typed QVGA resolution.

The LB035Q02 is intended to support displays. [PND(Portable Navigation Device), PMP(Portable Multimedia Player) and others]

1-2. Block Diagram



Product Specification

1-3. Features

| PARAMETER | SPECIFICATION | REMARK |
|--------------------|---|------------------------------|
| Active Screen Size | 3.5 inches | Diagonal |
| Outline Dimension | 76.9[H] x 63.9[V] x 3.15t[D] (4.25t with Touch Panel) | [mm] |
| Active Area | 70.08[H] x 52.56[V] | [mm] |
| Number of dots | 320[H] x RGB x 240[V] | - |
| Dot Pitch | 0.073 x 0.219 | [mm] |
| Pixel Arrangement | Stripe type | - |
| Display Mode | TN / Transmissive / Normally White | - |
| Display Color | Pseudo-16.7M | colors |
| Viewing Direction | 6 o'clock | 12 o'clock (good viewing) |
| Color Filter Array | RGB Vertical Stripe | - |
| Signal Interface | Digital RGB + SPI Interface | - |
| Weight | 41g | - |
| Backlight | 6 LEDs | Serial Type |

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2. Interface Connections

This LCD employs one interface connection for the operation of module, LED B/L and TSP.
The pin configuration for the connector is shown in the table below.

(LCD Connector: FPC(60Pin 0.5mm pitch), Mating Connector: LD09T4-60NB(LS Cable) or equivalent

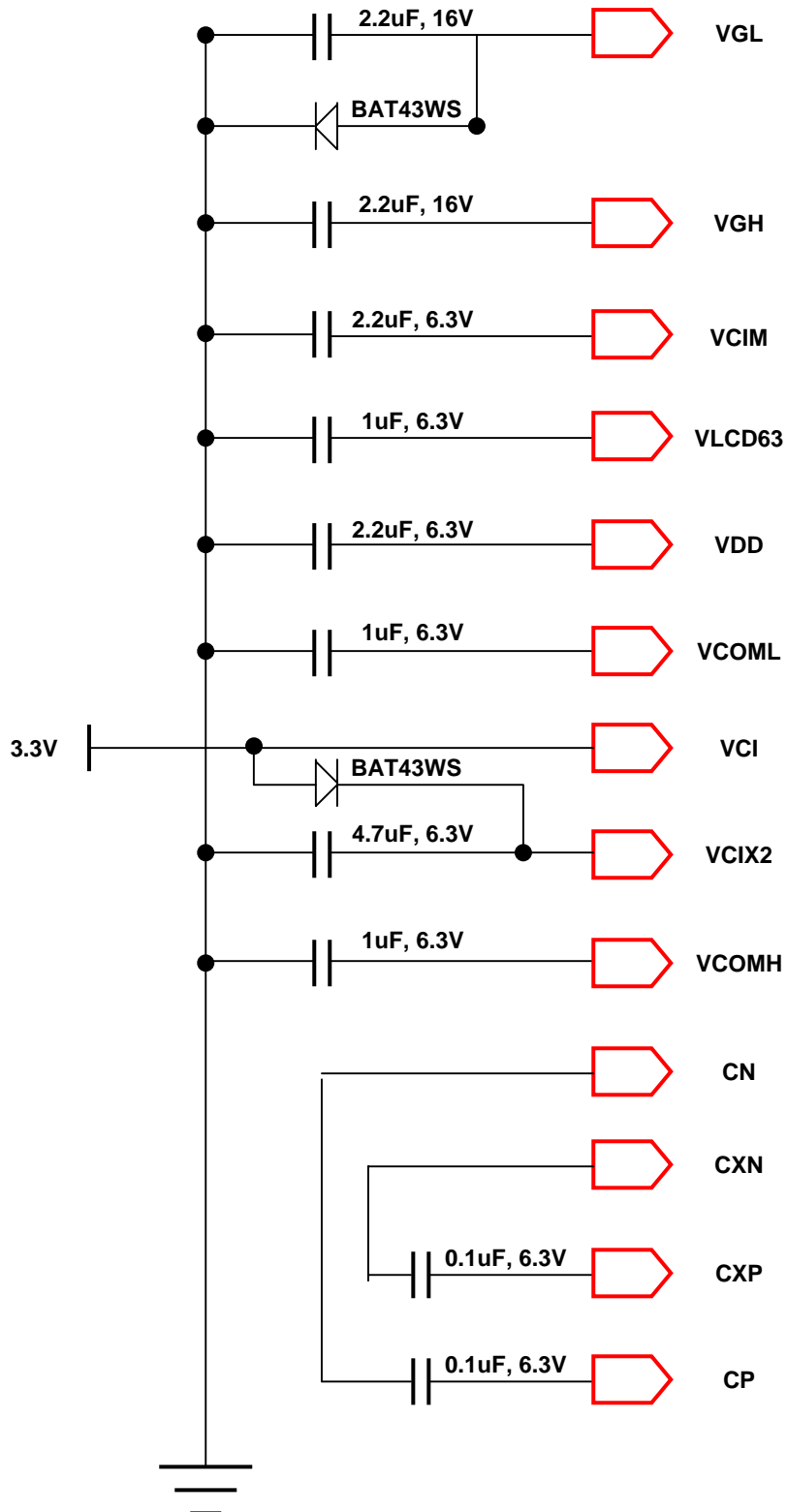
| Pin | Symbol | Description | I/O | Remark |
|-----|--------|--|-----|--------|
| 1 | LED_C | LED_Cathode | I | |
| 2 | LED_A | LED_Anode | I | |
| 3 | GND | Ground | I | |
| 4 | X1 | Touch Panel Position X | I | |
| 5 | Y1 | Touch Panel Position Y | I | |
| 6 | X2 | Touch Panel Position X | I | |
| 7 | Y2 | Touch Panel Position Y | I | |
| 8 | GND | Ground | I | |
| 9 | NC | No Connect | - | |
| 10 | VGL | Gate Low Voltage, Stabilization Cap. + Diode | O | |
| 11 | VGH | Gate High Voltage, Stabilization Capacitor | O | |
| 12 | NC | No Connect | - | |
| 13 | GND | Ground | I | |
| 14 | RESET | System Reset | I | |
| 15 | CS | Chip Select | I | |
| 16 | SCL | Serial Clock Line | I | |
| 17 | SDI | Serial Data Input | I | |
| 18 | PD0 | BB0, Blue Data [LSB] | I | |
| 19 | PD1 | BB1, Blue Data | I | |
| 20 | PD2 | BB2, Blue Data | I | |
| 21 | PD3 | BB3, Blue Data | I | |
| 22 | PD4 | BB4, Blue Data | I | |
| 23 | PD5 | BB5, Blue Data | I | |
| 24 | PD6 | BB6, Blue Data | I | |
| 25 | PD7 | BB7, Blue Data [MSB] | I | |
| 26 | PD8 | GG0, Green Data [LSB] | I | |
| 27 | PD9 | GG1, Green Data | I | |
| 28 | PD10 | GG2, Green Data | I | |
| 29 | PD11 | GG3, Green Data | I | |
| 30 | PD12 | GG4, Green Data | I | |
| 31 | PD13 | GG5, Green Data | I | |
| 32 | PD14 | GG6, Green Data | I | |
| 33 | PD15 | GG7, Green Data [MSB] | I | |

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| Pin | Symbol | Description | I/O | Remark |
|-----|----------|-----------------------------|-----|--------|
| 34 | PD16 | RR0, Red Data [LSB] | I | |
| 35 | PD17 | RR1, Red Data | I | |
| 36 | PD18 | RR2, Red Data | I | |
| 37 | PD19 | RR3, Red Data | I | |
| 38 | PD20 | RR4, Red Data | I | |
| 39 | PD21 | RR5, Red Data | I | |
| 40 | PD22 | RR6, Red Data | I | |
| 41 | PD23 | RR7, Red Data [MSB] | I | |
| 42 | DOTCLK | Dot clock | I | |
| 43 | ENABLE | Data Enable | I | |
| 44 | HSYNC | Horizontal Sync Signal | I | |
| 45 | VSYNC | Vertical Sync Signal | I | |
| 46 | VCI | Power | I | |
| 47 | NC | No Connect | - | |
| 48 | VCI | Power | I | |
| 49 | VCIM | Stabilization Capacitor | O | |
| 50 | VLCD63 | Stabilization Capacitor | O | |
| 51 | NC | No Connect | - | |
| 52 | VDD | Stabilization Capacitor | O | |
| 53 | VCOML | Stabilization Capacitor | O | |
| 54 | VCIX2(J) | Stabilization Cap. + Diode | O | |
| 55 | VCOMH | Stabilization Capacitor | O | |
| 56 | CN | Stabilization Capacitor (N) | O | |
| 57 | CXN | Stabilization Capacitor (N) | O | |
| 58 | CXP | Stabilization Capacitor (P) | O | |
| 59 | CP | Stabilization Capacitor (P) | O | |
| 60 | GND | Ground | I | |

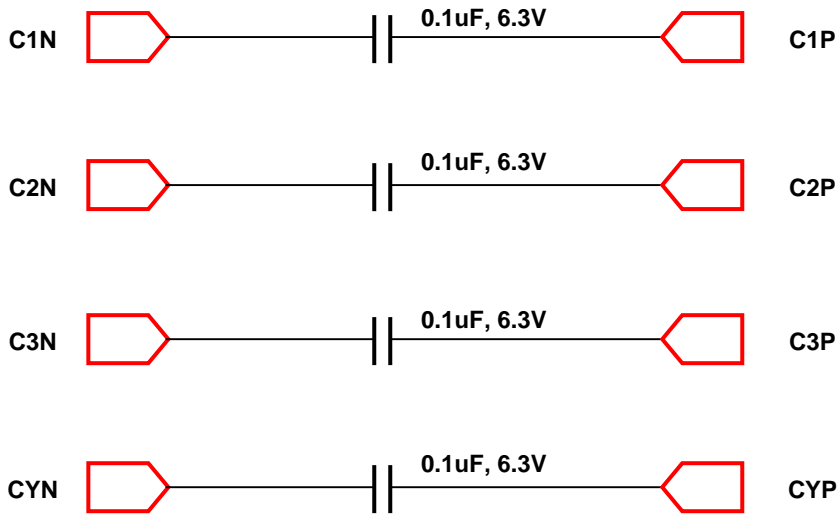
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2-1. System



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2-2. FPC



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3. Absolute Maximum Ratings

If used the beyond absolute maximum ratings, this device can permanently be damaged.
It is strongly recommended to use this device at a condition for normal operation.

| PARAMETER | SYMBOL | CONDITION | MIN. | MAX. | UNIT | REMARK |
|-----------------------|-----------------|--------------------|------|------|------|------------|
| Power Supply Voltage | V _{CI} | T _a =25 | -0.3 | 5.0 | V | - |
| LED Forward Current | I _f | T _a =25 | - | 25 | mA | [Note 3-1] |
| Operating Temperature | T _{OP} | - | -20 | 70 | | [Note 3-2] |
| Storage Temperature | T _{ST} | - | -30 | 80 | | [Note 3-2] |
| Humidity | H _{OP} | - | 5 | 95 | %RH | [Note 3-2] |

[Note 3-1] Applies for each LED individually

[Note 3-2] Humidity: 95% RH Max, no condensation > 40

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4. Electrical Characteristics

4-1. TFT LCD Module

$T_a = 25^\circ C$

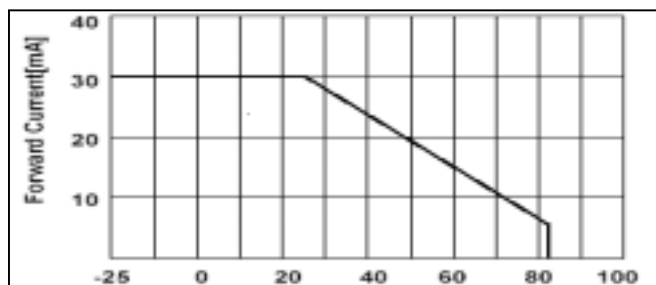
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|------------------------|-------------|------|------|------|---------|------------|
| Power Supply Voltage | VCI | 2.5 | 3.3 | 3.6 | V | |
| Gate On Voltage | V_{GH} | 10 | 13 | 15 | V | |
| Gate Off Voltage | V_{GL} | -7 | -9 | -11 | V | |
| Frame Frequency | f_{FRAME} | - | 70 | | Hz | |
| Dot Clock | DOTCLK | - | 6.5 | 10 | MHz | |
| Serial Clock | SCL | 100 | - | - | ns | See. 7-2-2 |
| Input Leakage Current | I_{IL} | -1.0 | - | 3.0 | μA | |
| Output Leakage Current | I_{OL} | 3.0 | - | 4.5 | μA | |

4-2. Backlight Unit

$T_a = 25^\circ C$

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|---------------------|----------|------|------|------|------|-----------|
| LED forward Current | I_f | - | 20 | - | mA | [Note4-1] |
| Power Consumption | P_{BL} | - | 400 | - | mW | |

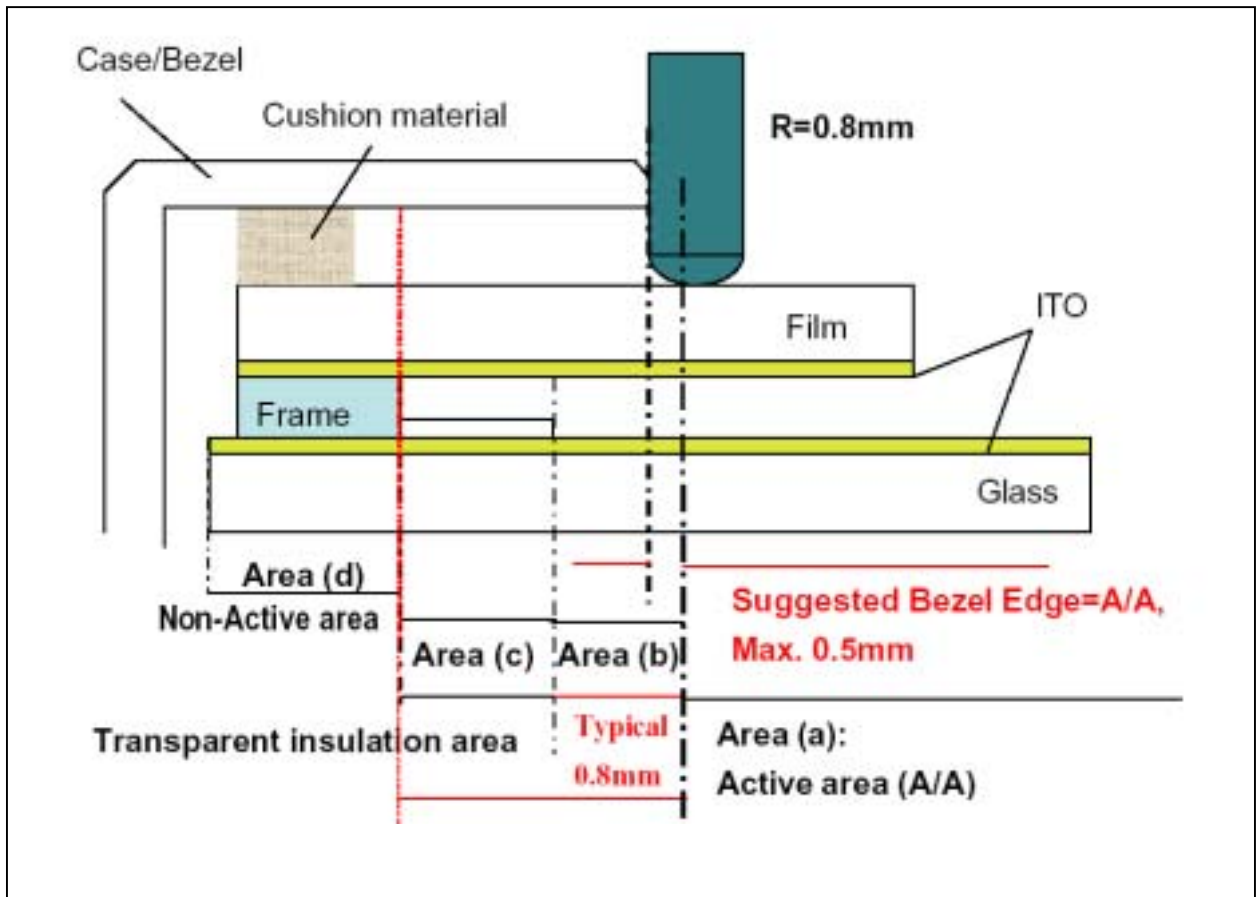
[Note4-1] The permissible forward current of LED vary with environmental temperature.



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5. Touch Screen Panel Specifications

5-1. TSP Design Guide



- Use a cushion material between the touch panel and the bezel.
- Do not overlap and contact between the Case/Bezel and the TSP active area

[Note]

Area(a): Active area

The active area is guaranteed the position data detectable precision, operation force and other operations. It is strongly recommended to place the operation button or menu keys within the active area.

Area(b): Operation non-guaranteed area

This area does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability.

Area(c): Pressing prohibition area

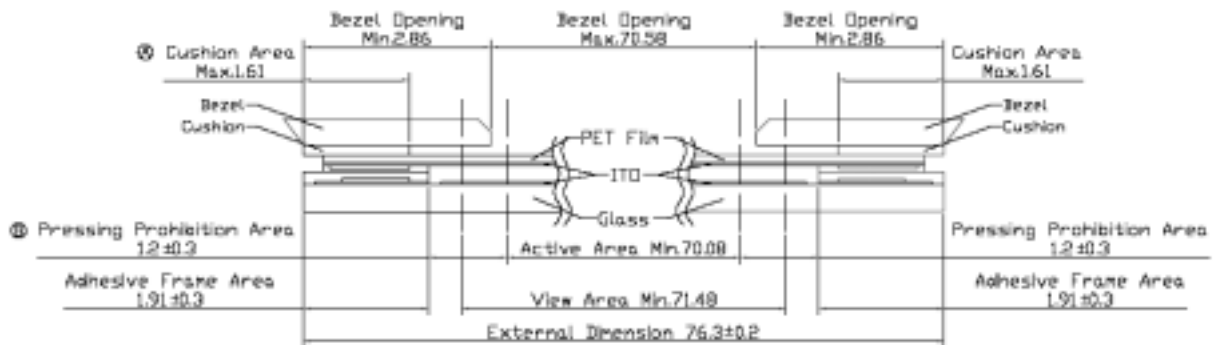
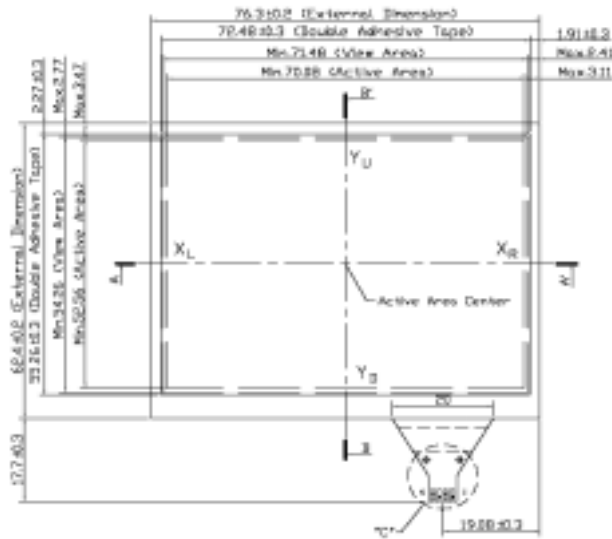
The area which forbids pressing, because an excessive load is applied to a transparent electrode(ITO) and a serious damage is given to a touch panel function by pressing

Area(d): Non-Active area

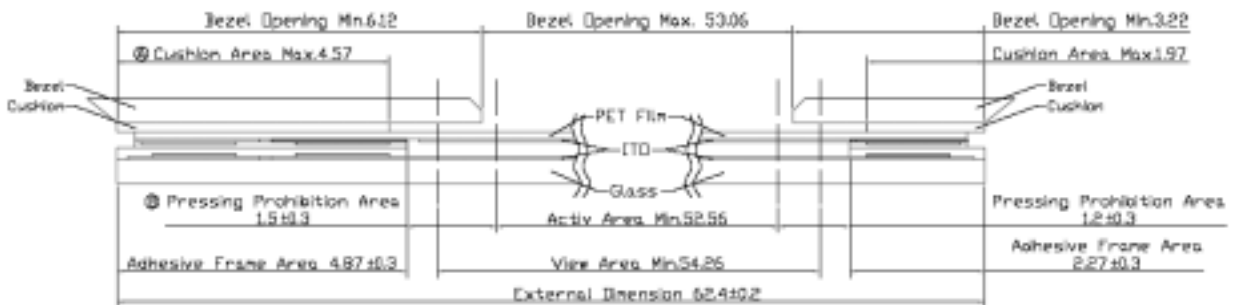
The area does not activate even if pressed

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5-2. TSP Dimensions



A-A' CROSS SECTION



B-B' CROSS SECTION

Product Specification

5-3. Electrical Characteristics

($T_a = 25^{\circ}C$)

| PARAMETER | MIN. | TYP. | MAX. | UNIT | REMARK |
|-----------------------|------|------|------|------|-------------------------|
| Linearity | 1.5 | - | 1.5 | % | Analog X & Y Directions |
| Terminal Resistance | 200 | - | 900 | | X-axis |
| | 200 | - | 900 | | Y-axis |
| Insulation Resistance | 25 | - | - | MΩ | DC 25V |
| Voltage | - | - | 7 | V | DC |
| Chattering | - | - | 10 | ms | |
| Transparency | - | 80 | - | % | |

5-4. Mechanical & Reliability Characteristics

| PARAMETER | MIN. | TYP. | MAX. | UNIT | REMARK |
|------------------------------------|------------------|------|------|------------|---------------------------------|
| Activation force | - | - | 100 | g | R0.8mm polyacetal Pen or Finger |
| Durability (Surface scratching) | Write 100,000 | | | Characters | [Note] |
| Durability (Surface pitting) | 1,000,000 | | | Touches | [Note] |
| Surface hardness | 3 | - | - | H | Judgment ref.JIS-K5600 |

[Note]

- (1) Measurement for Surface area
 - Force : 250gf
 - Speed : 60m/sec
 - Stylus : R0.8 polyacetal tip
- (2) Pit 1,000,000 times on the Film with a R8.0 silicon rubber
 - Force : 250gf
 - Speed : 2times/sec

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6. Optical Characteristics

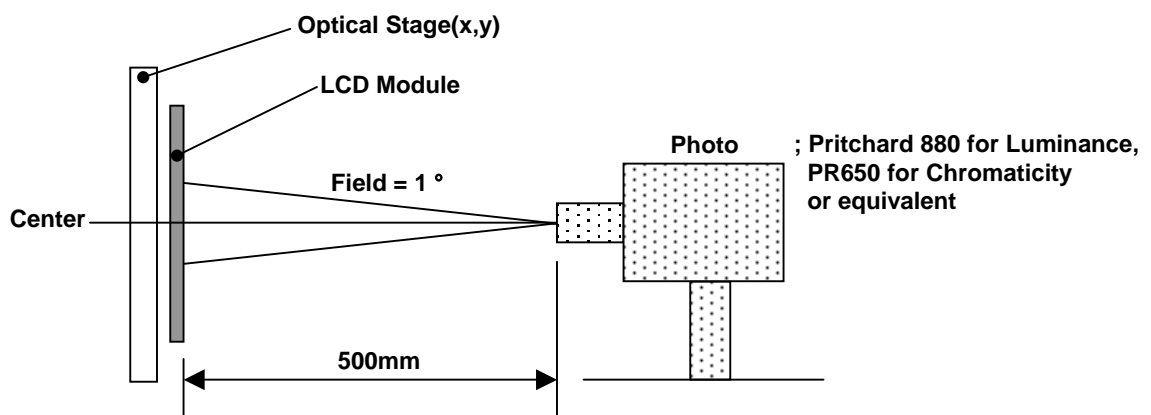
6-1. TFT LCD Module

$T_a = 25^\circ C$

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REMARK | |
|---------------------------------|---------|-----------------|--------------------|------|------|-------------------|---------------------|----------------------------------|
| Luminance (with Touch Panel) | Y | $I_{BL} = 20mA$ | - | 300 | - | cd/m ² | [Note5-1] | |
| Contrast Ratio | CR | Center Point | - | 400 | - | - | [Note5-2] | |
| White color Chromaticity | W_x | $I_{BL} = 20mA$ | 0.26 | 0.31 | 0.36 | - | [Note5-1] PR-650 | |
| | W_y | | 0.28 | 0.33 | 0.38 | - | | |
| Viewing Angle | Hor. | CR > 10 | θ_L | - | 65 | - | Degrees | [Note5-2] [Note5-3] PR-880 |
| | | | θ_R | - | 65 | - | | |
| | Ver. | | θ_U | - | 50 | - | | |
| | | | θ_D | - | 60 | - | | |
| Response Time | Rising | $T_r + T_f$ | $\theta = 0^\circ$ | - | 25 | 30 | msec | [Note5-4] PR-880 |
| | Falling | | | | | | | |
| Luminance Uniformity | U | $I_{BL} = 20mA$ | - | 1.20 | 1.40 | - | [Note5-5] | |

- Measurement condition : Refer to the below "Test Equipment Set Up" and next two pages

[Test Equipment Set Up]



- Measuring Condition ;
 - Measuring surroundings : Dark Room
 - Measuring temperature : $T_a = 25$
 - Adjust operating voltage to get optimum contrast at the center of the display.
 - Measured value at the center point of LCD panel after more than 10 minutes while backlight turning on.

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[Note 6-1]

Measured on the center area of the panel by PHOTO RESEARCH photometer PR-880&PR650 or Equivalent

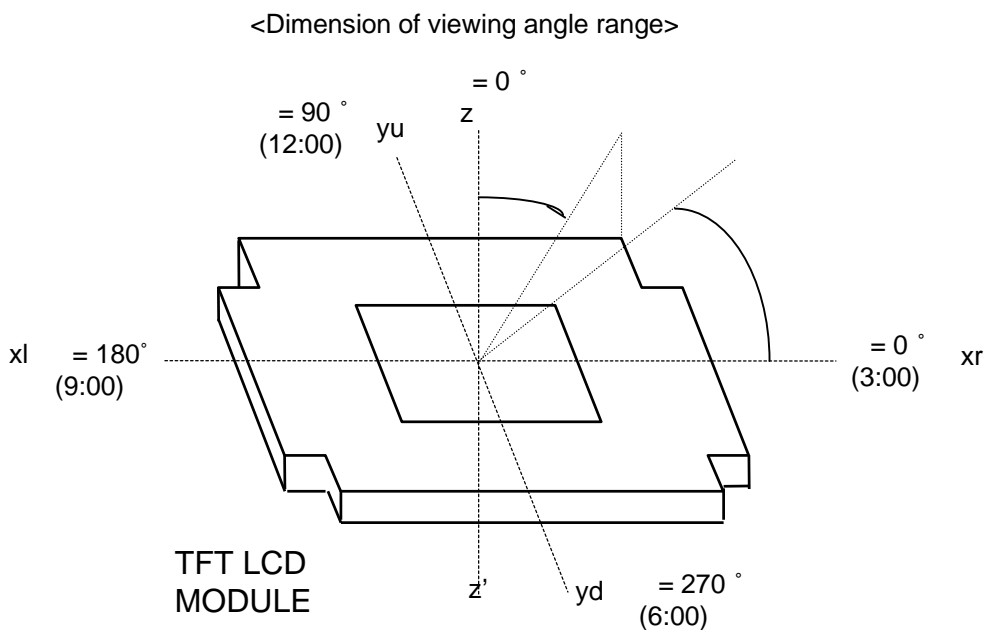
[Note 6-2]

Contrast ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"}}{\text{Photo detector output with LCD being "black"}}$$

[Note 6-3]

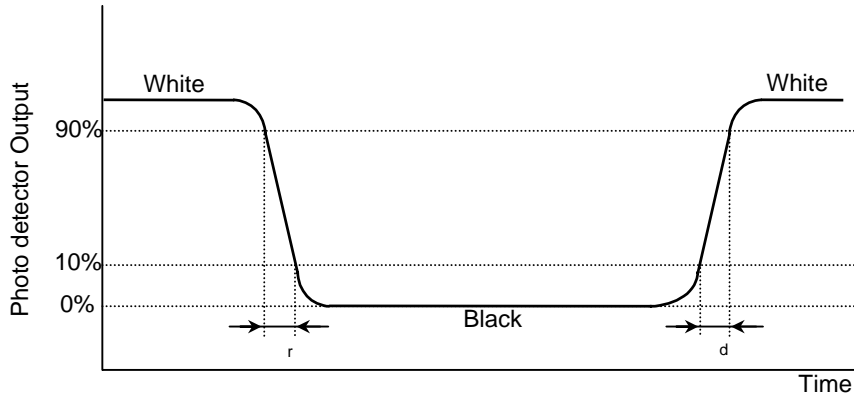
Viewing angle range is defined as follows [PR-880];



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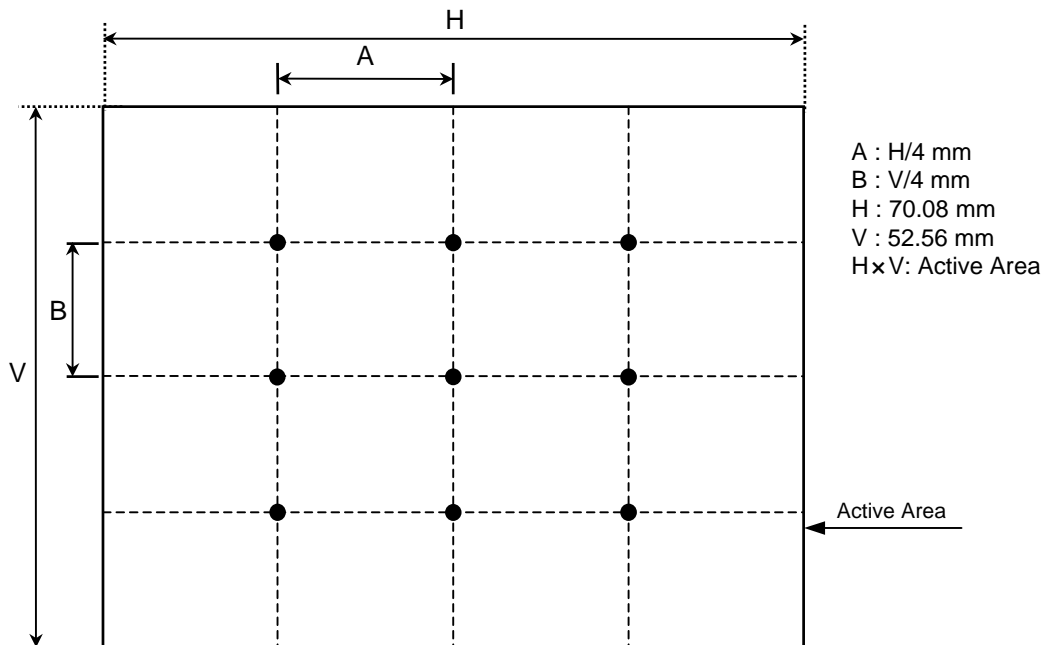
[Note 6-4]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".



[Note 6-5]

Luminance Uniformity = Maximum of 9points (~) / Minimum of 9points (~)
 Luminance Uniformity(%) = Minimum of 9points (~) / Maximum of 9points (~) x 100



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7. Mechanical Characteristics

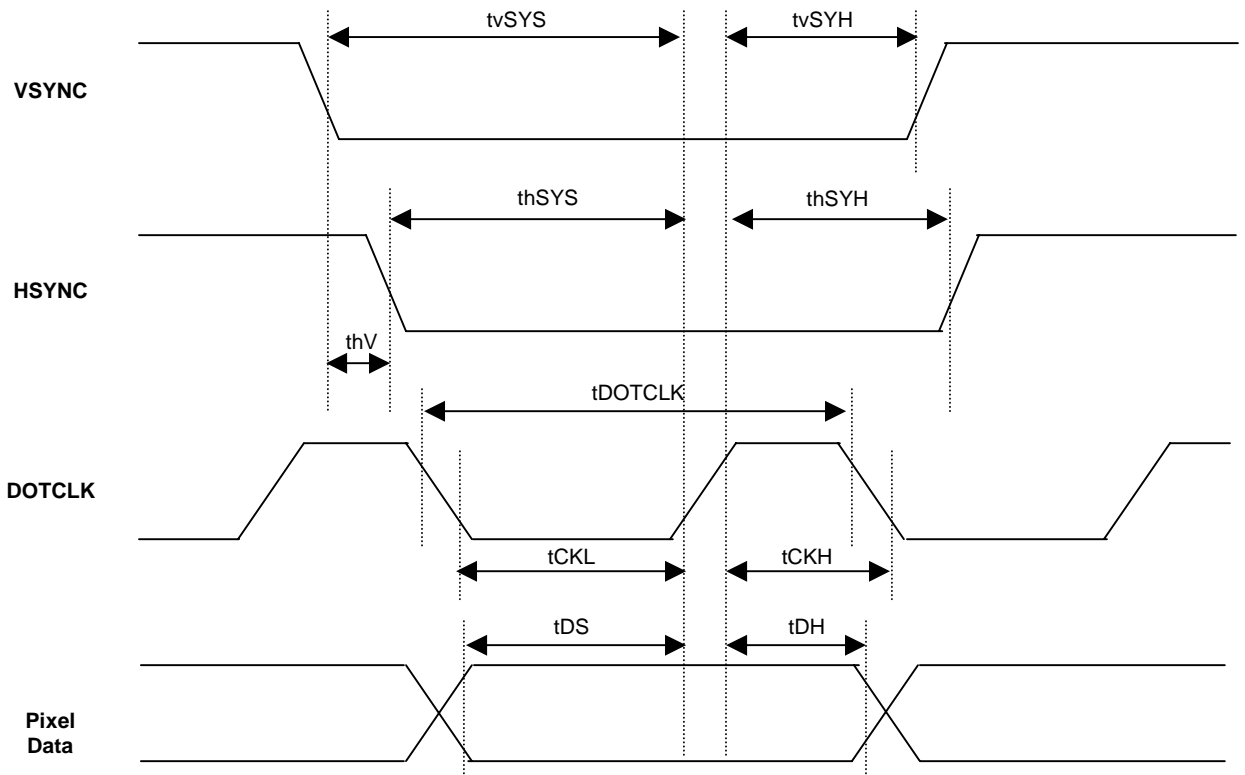
| PARAMETER | SPECIFICATION | | UNIT | REMARK |
|-------------------|----------------------------------|---------------------------------------|------|--------|
| Outline Dimension | Width | 76.9 | mm | - |
| | Height | 63.9 | mm | |
| | Depth | 3.15 (without TSP) 4.25 (with TSP) | mm | |
| Bezel Area | Width | 72.48 | mm | |
| | Height | 55.26 | mm | |
| Weight | 41 (Typ.) | | g | |
| Surface Treatment | Clear Hard Coating(3H) Treatment | | | |

Product Specification

8. Operation Specifications

8-1. RGB Data Interface

8-1-1. RGB Data Interface Timing Characteristics

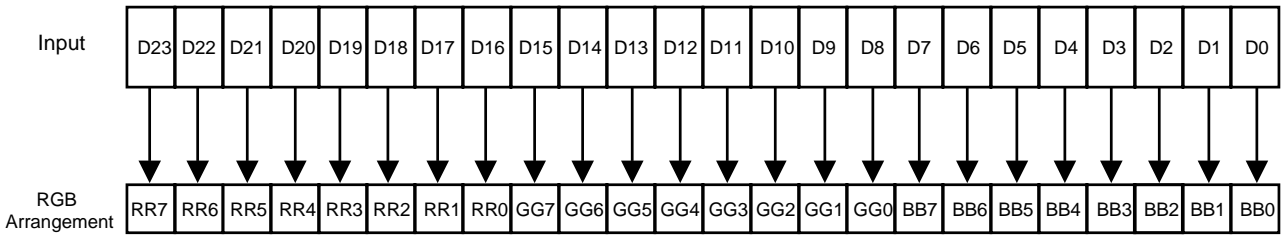


| PARAMETER | SYMBOL | 24bit Interface | | 8 bit Interface | | Unit |
|----------------------------|---------|-----------------|------|-----------------|------|------|
| | | Min. | Max. | Min. | Max. | |
| DOTCLK Period | tDOTCLK | 100 | - | 33.3 | - | ns |
| DOTCLK Low Period | tCKL | 50 | - | 15 | - | ns |
| DOTCLK High Period | tCKH | 50 | - | 15 | - | ns |
| DOTCLK Frequency | tDOTCLK | 10 | - | 30 | - | ns |
| Vertical Sync Setup Time | tvSYS | 20 | - | 10 | - | ns |
| Vertical Sync Hold Time | tvSYH | 20 | - | 10 | - | ns |
| Horizontal Sync Setup Time | thSYS | 20 | - | 10 | - | ns |
| Horizontal Sync Hold Time | thSYH | 20 | - | 10 | - | ns |
| Data Setup Time | tDS | 12 | - | 10 | - | ns |
| Data Hold Time | tDH | 12 | - | 10 | - | ns |

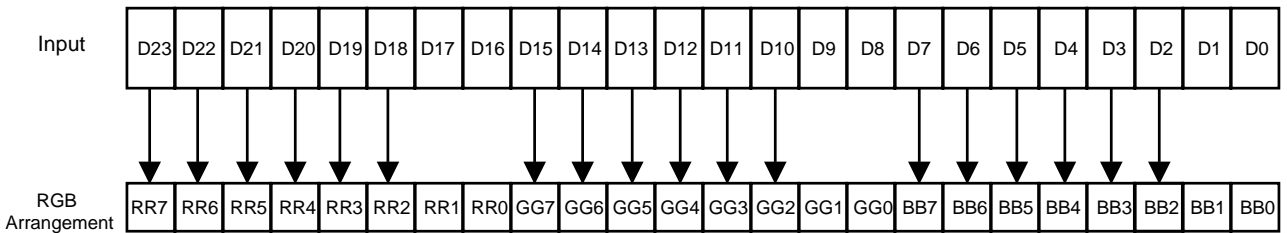
[Note] External clock source must be provided to LCM.
The LCM will not operate if absent of the clocking signal.

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8-1-2. Data Format for 24 bit RGB Data Interface

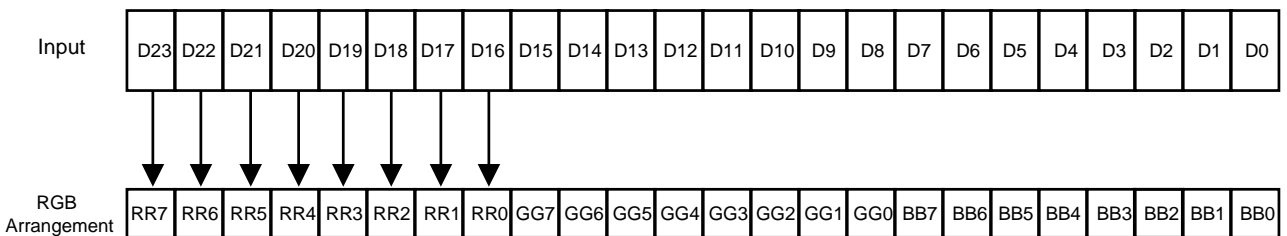


8-1-3. Data Format for 18 bit RGB Data Interface



[Note] LSB 2bits are connected to VSS or floating.

8-1-4. Data Format for 8 bit RGB Data Interface

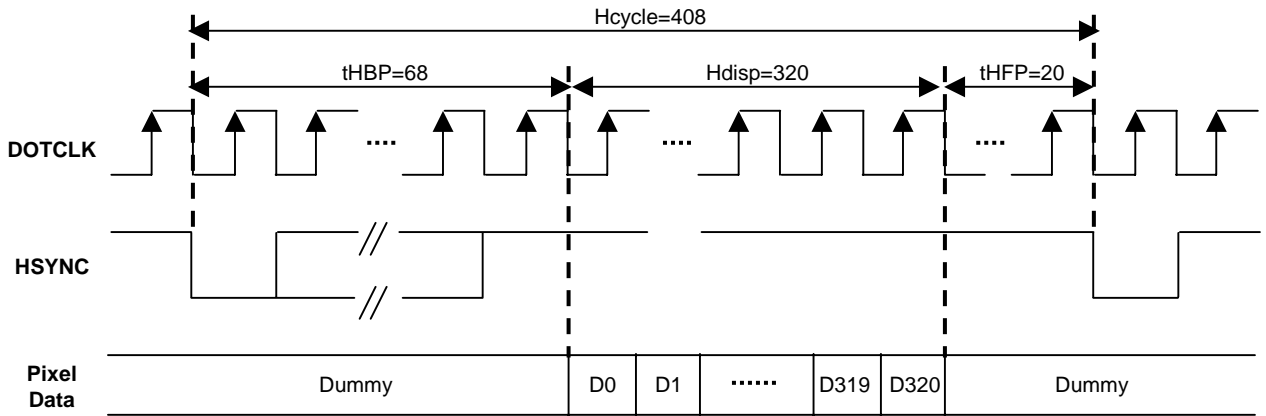


[Note] For 8 bit interface, only RR[7:0] are used.
 For unused pins, please connect to GND or floating.

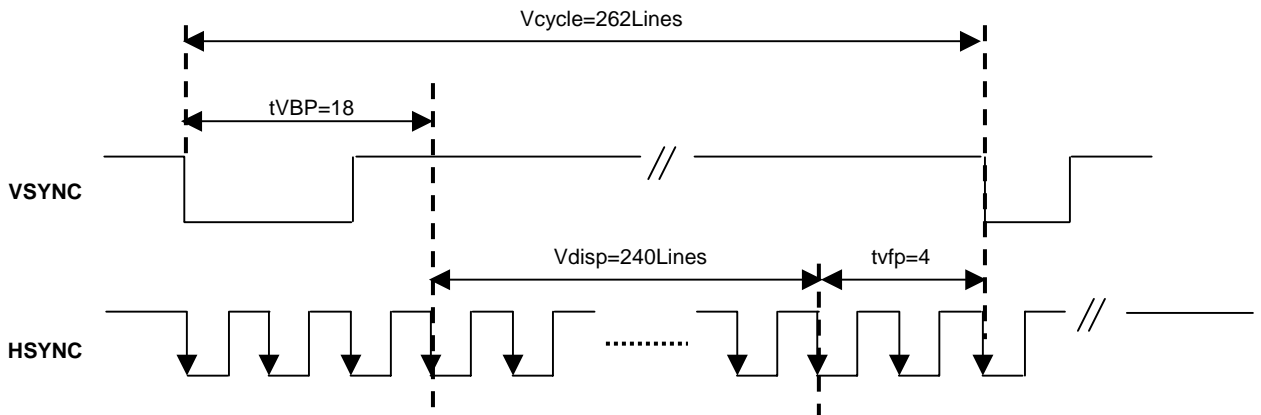
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8-1-3. 24 Bit RGB Interface Timing

8-1-3-1. Sync Mode



a) Horizontal Data Transaction Timing



b) Vertical Data Transaction Timing

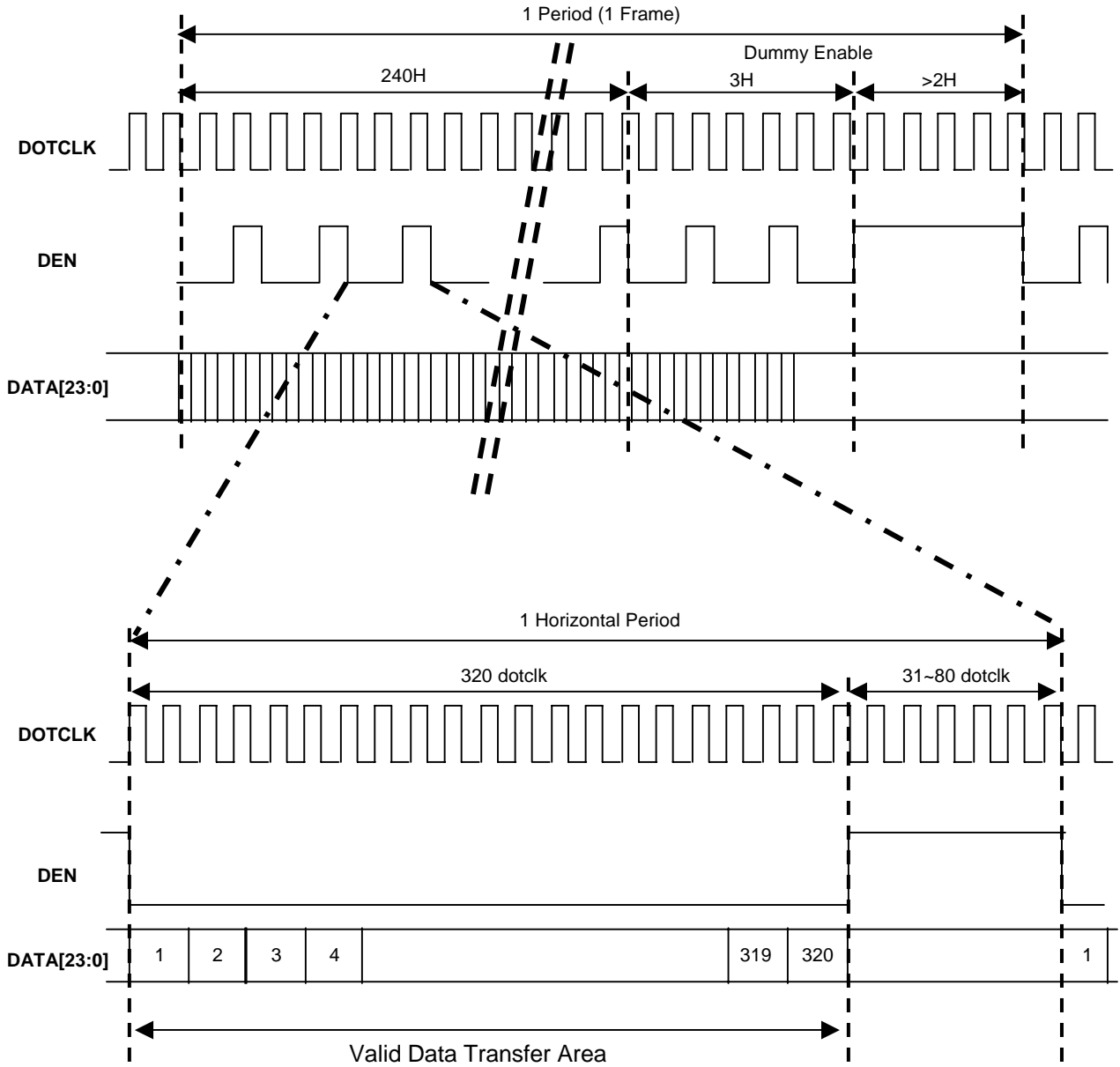
| PARAMETER | SYMBOL | Typ. | | Unit |
|-----------------------------|---------|-------|------|---------|
| | | 24bit | 8bit | |
| DOTCLK Frequency | fDOTCLK | 6.5 | 19.5 | MHz |
| DOTCLK Period | tDOTCLK | 154 | 51.3 | ns |
| Horizontal Frequency(Line) | fH | 14.9 | 14.9 | kHz |
| Vertical Frequency(Refresh) | fV | 60 | 60 | Hz |
| Horizontal Back porch | tHBP | 68 | 204 | tDOTCLK |
| Horizontal Front porch | tHFP | 20 | 60 | tDOTCLK |
| Vertical Back porch | tVBP | 18 | 18 | Lines |
| Vertical Front porch | tVFP | 4 | 4 | Lines |
| Vertical Display Area | tDISP | 240 | 240 | Lines |

[Note] The rising edge of DOTCLK is used to fetch display data PD bus.
The Delay amount of the source output must be larger than the Hsync Low Pulse Width.

Product Specification

8-1-3. 24 Bit RGB Interface Timing

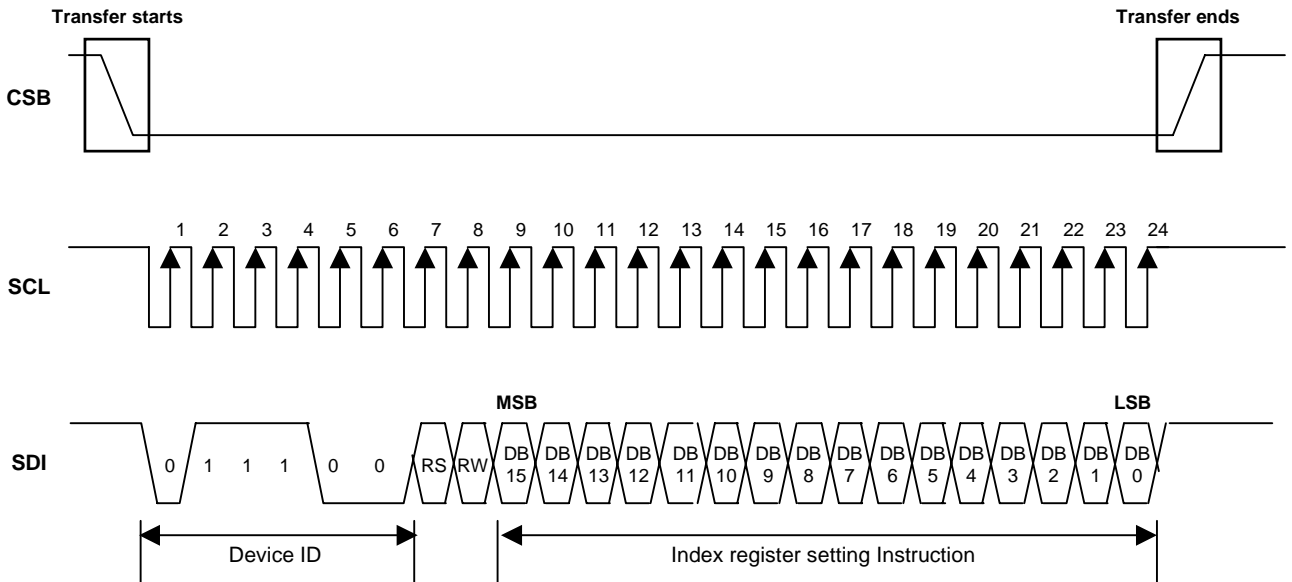
8-1-3-2. DE Mode



Product Specification

8-2. Serial Peripheral Interface

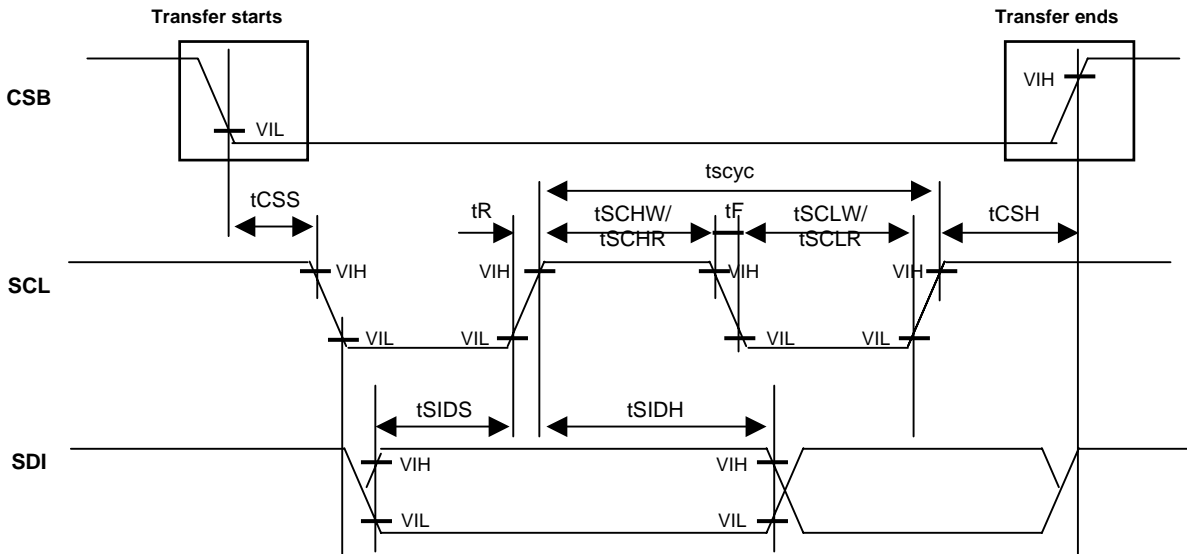
8-2-1. Serial Peripheral Interface Timing



[Note] RS="0" [Index], RS="1" [Instruction]

Product Specification

8-2-2. Clock Synchronized Serial Mode Characteristics

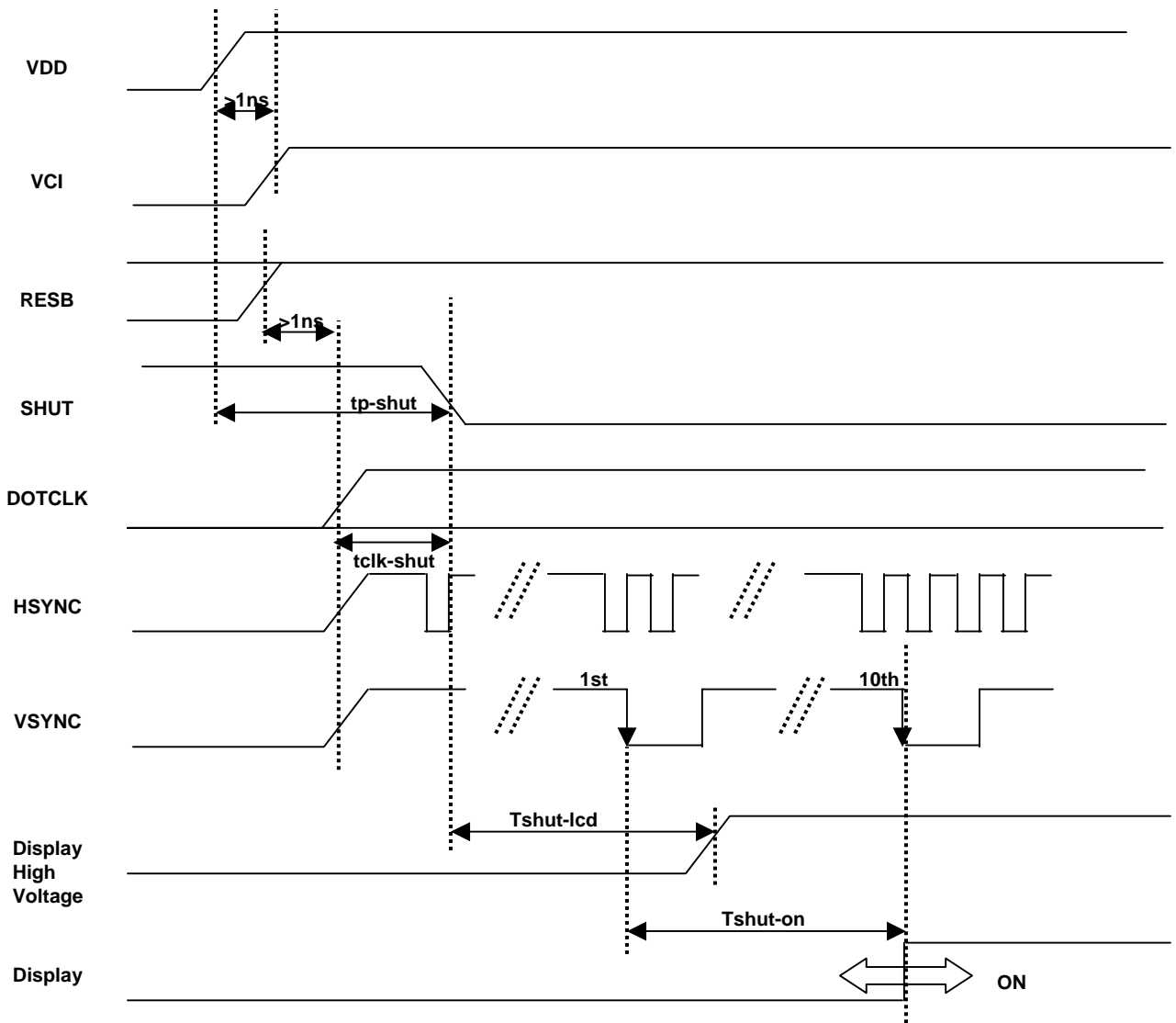


| PARAMETER | SYMBOL | MIN. | MAX. | UNIT |
|------------------------------|--------|------|------|------|
| Serial Clock Cycle Time | tscyc | 100 | - | ns |
| Serial Clock Rise/Fall Time | tR,tF | - | 2 | |
| Pulse Width High For Write | tSCHW | 30 | - | |
| Pulse Width High For Read | tSCHR | 50 | - | |
| Pulse Width Low For Write | tSCLW | 30 | - | |
| Pulse Width Low For Read | tSCLR | 50 | - | |
| Chip Select Setup Time | tCSS | 20 | - | |
| Chip Select Hold Time | tCSH | 50 | - | |
| Serial Input Data Setup Time | tSIDS | 30 | - | |
| Serial Input Data Hold Time | tSIDH | 30 | - | |

Product Specification

9. Power On/Off Sequence

9-1. Power On Sequence



| Characteristics | SYMBOL | MIN. | Typ. | MAX. | Units |
|--|-----------|------|------|------|-------|
| VDD on to falling edge of SHUT | tp-shut | 1 | - | - | us |
| DOTCLK | tclk-shut | 1 | - | - | clk |
| Falling edge of SHUT to LCD power on | tshut-lcd | - | - | 128 | ms |
| Falling edge of SHUT to display start - 1 line : 408 clk - 1 frame : 262 line - DOTCLK = 6.5MHz | tshut-on | - | - | 10 | frame |
| | | - | 166 | - | ms |

[Note] It is necessary to input DOTCLK before the falling edge of SHUT.
Display starts at 10th falling edge of VSYNC after the falling edge of SHUT.

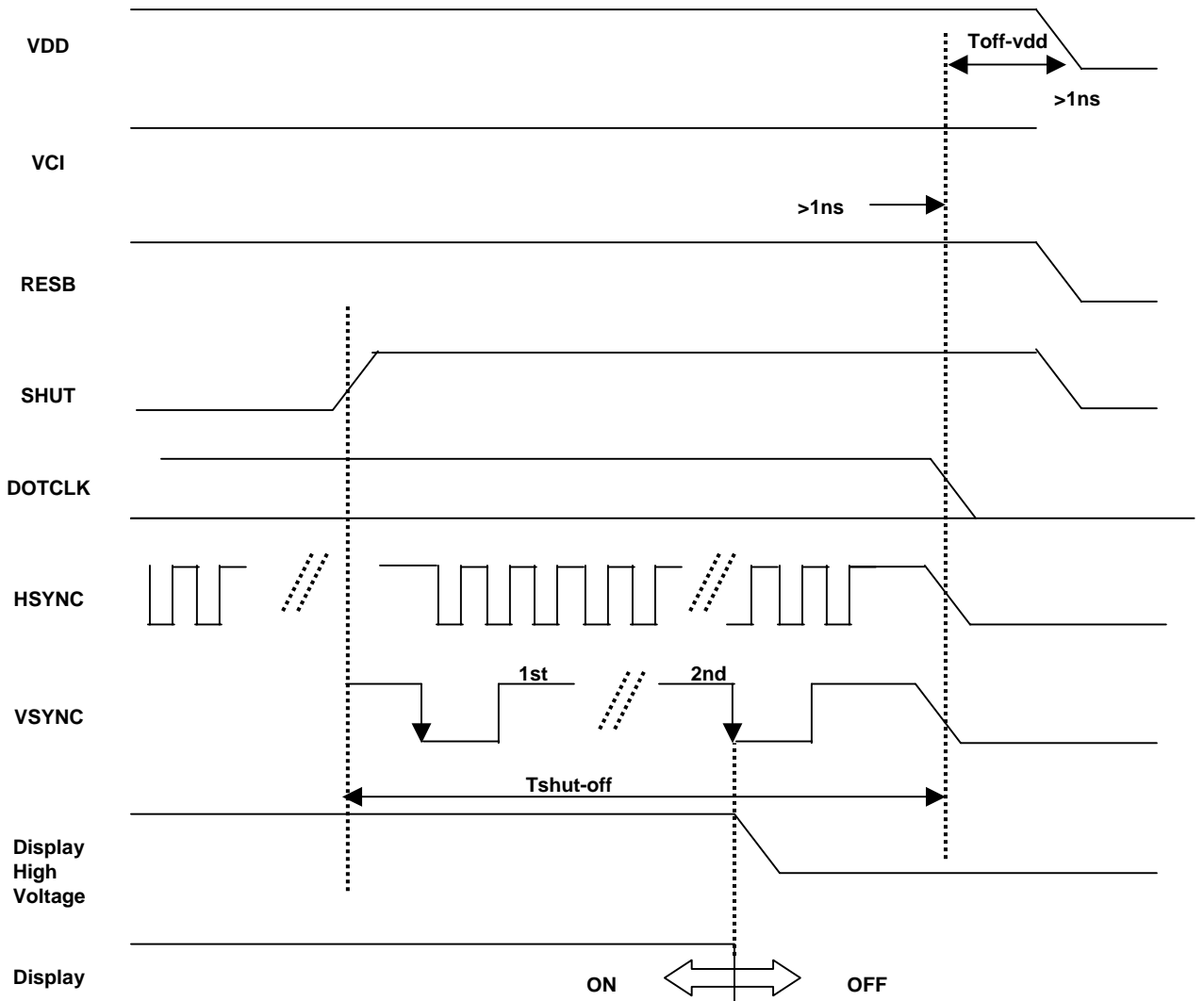
Product Specification

9-2. Initial Code

| No. | Register | Value | Contents |
|------------------|----------|-------|-------------------------------|
| 1 | H01 | 6300 | Driver Output |
| 2 | H02 | 0200 | LCD Driving Waveform Control |
| 3 | H03 | 0117 | Power Control 1 |
| 4 | H04 | 04C7 | Input Data & C/F Control |
| 5 | H05 | F7C0 | Function Control |
| 6 | H06 | E806 | - |
| 7 | H0A | 4008 | Contrast / Brightness Control |
| 8 | H0B | 0000 | Frame Cycle Control |
| 9 | H0D | 0030 | Power Control 2 |
| 10 | H0E | 2800 | Power Control 3 |
| 11 | H0F | 0000 | Gate Scan Position |
| Porch | | | |
| 12 | H16 | 9F80 | Horizon Porch |
| 13 | H17 | 0A0F | Vertical Porch |
| 14 | H1E | 00BD | Power Control 4 |
| Gamma Collection | | | |
| 15 | H30 | 0300 | - |
| 16 | H31 | 0107 | - |
| 17 | H32 | 0000 | - |
| 18 | H33 | 0000 | - |
| 19 | H34 | 0707 | - |
| 20 | H35 | 0004 | - |
| 21 | H36 | 0302 | - |
| 22 | H37 | 0202 | - |
| 23 | H3A | 0A0D | - |
| 24 | H3B | 0806 | - |

Product Specification

9-3. Power Off Sequence



| Characteristics | SYMBOL | MIN. | Typ. | MAX. | Units |
|---|-----------|------|------|------|-------|
| Rising edge of SHUT to display off - 1 line : 408 clk -1 frame : 262 line - DOTCLK =6.5MHz | tshut-off | 2 | - | - | frame |
| | | 33.4 | - | - | ms |
| Input-signal-off to VDD off | tshut-vdd | 1 | - | - | us |

[Note] DOTCLK must be maintained at least 2 frames after the rising edge of SHUT.
 Display become off at the 2nd falling edge of VSYNC after the falling edge of SHUT.
 If RESET signal is necessary for power down, provide it after the 2-frame-cycle of the SHUT period.

Product Specification

10. Reliability Test

| NO | TEST ITEMS | CONDITION | REMARK |
|----|---|----------------------------------|--------|
| 1 | High Temperature Storage Test | Ta = 80 240h | - |
| 2 | Low Temperature Storage Test | Ta = -30 240h | - |
| 3 | High Temperature Operation Test | Ta = 70 240h | - |
| 4 | Low Temperature Operation Test | Ta = -20 240h | - |
| 5 | High Temperature and High Humidity Operation Test | Ta = 60 90%RH 240h | - |
| 6 | Thermal Shock Test | -30 (0.5h) ~ 80 (0.5h) / 10cycle | - |

[Note]

T_a= Ambient Temperature

In the standard condition, there shall be no practical problems that may affect the display function.

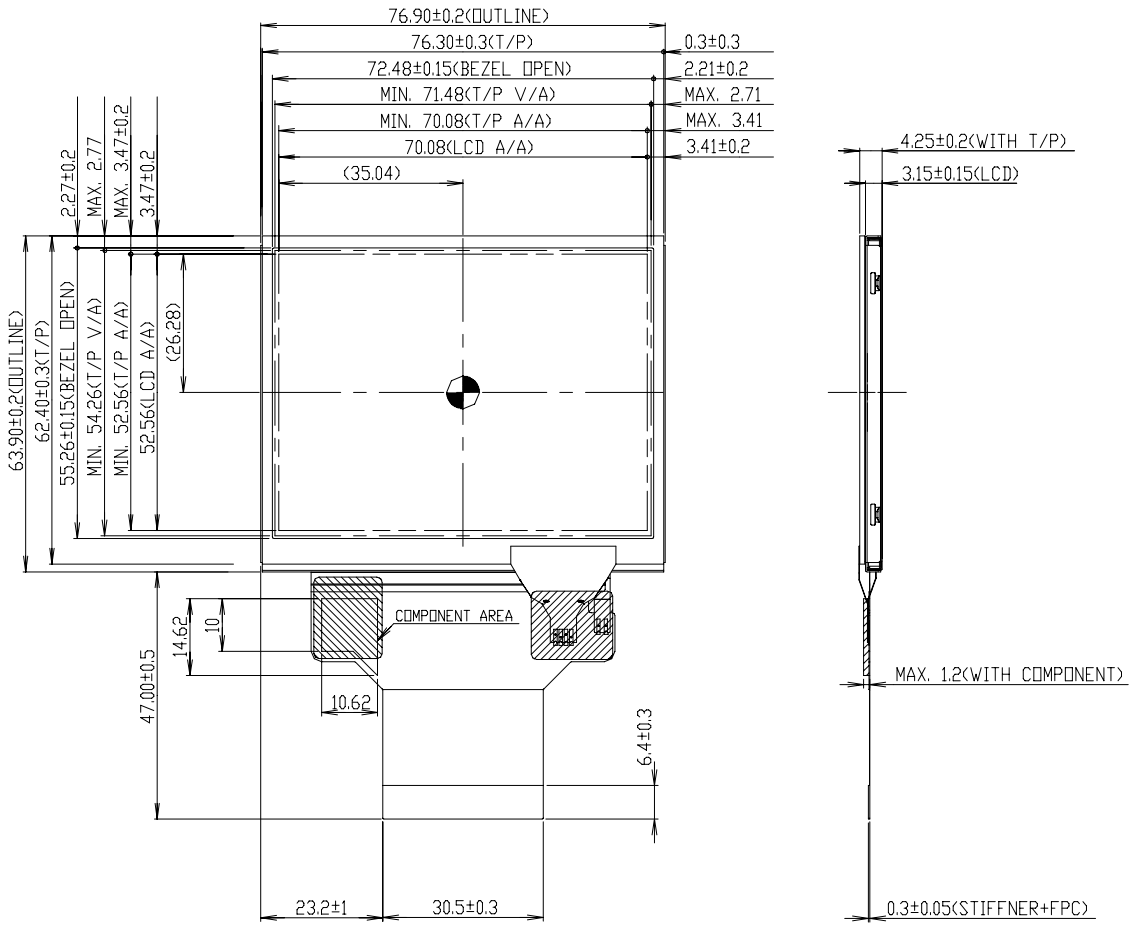
Result Evaluation Criteria

TFT- LCD Module should be at room temperature for 2 hours when the display quality test is over. There should be no particular change which might affect the practical display function and the display quality test should be conducted under normal operating condition.

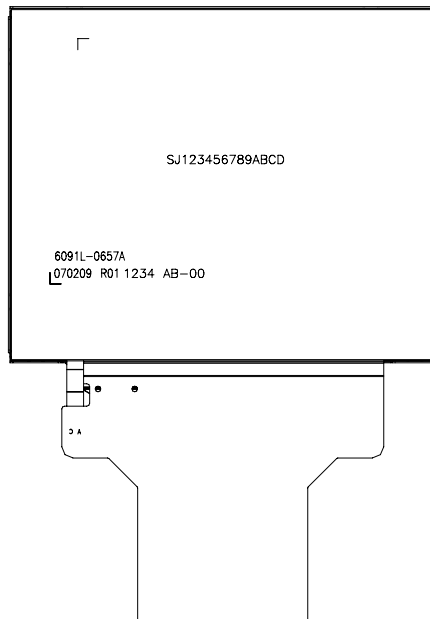
Product Specification

11. Outline Dimension

11-1. Front View

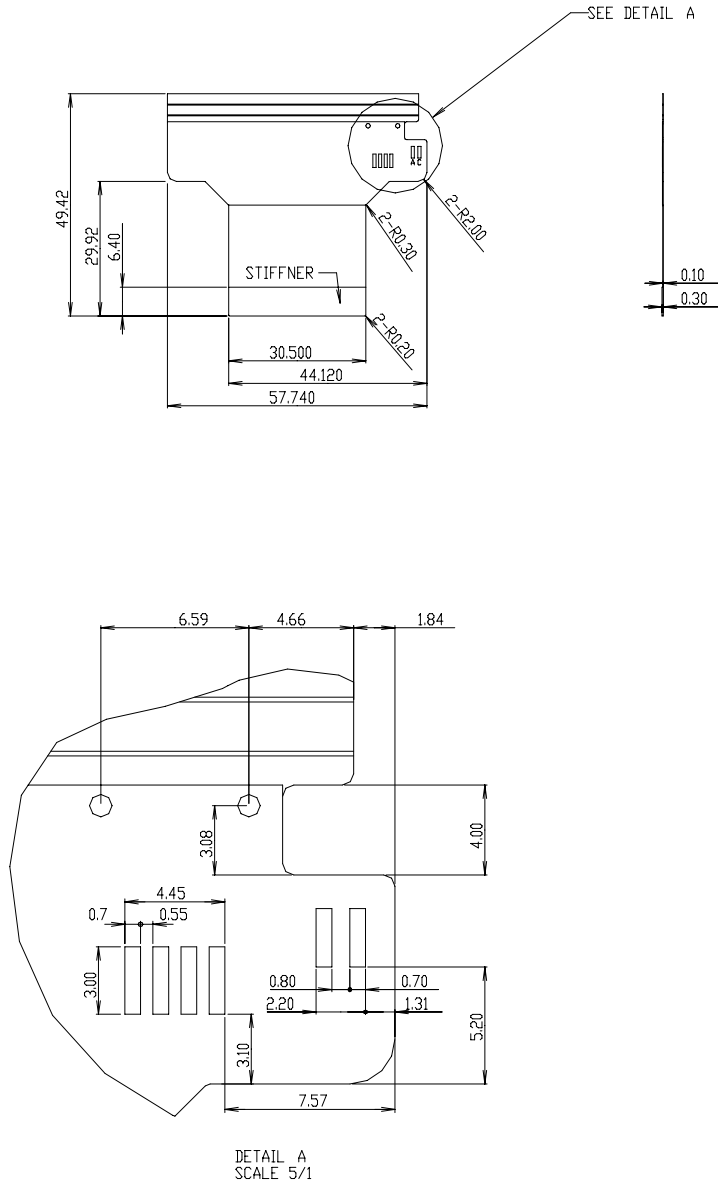


11-2. Rear View



Product Specification

11-3. FPC (Front View)

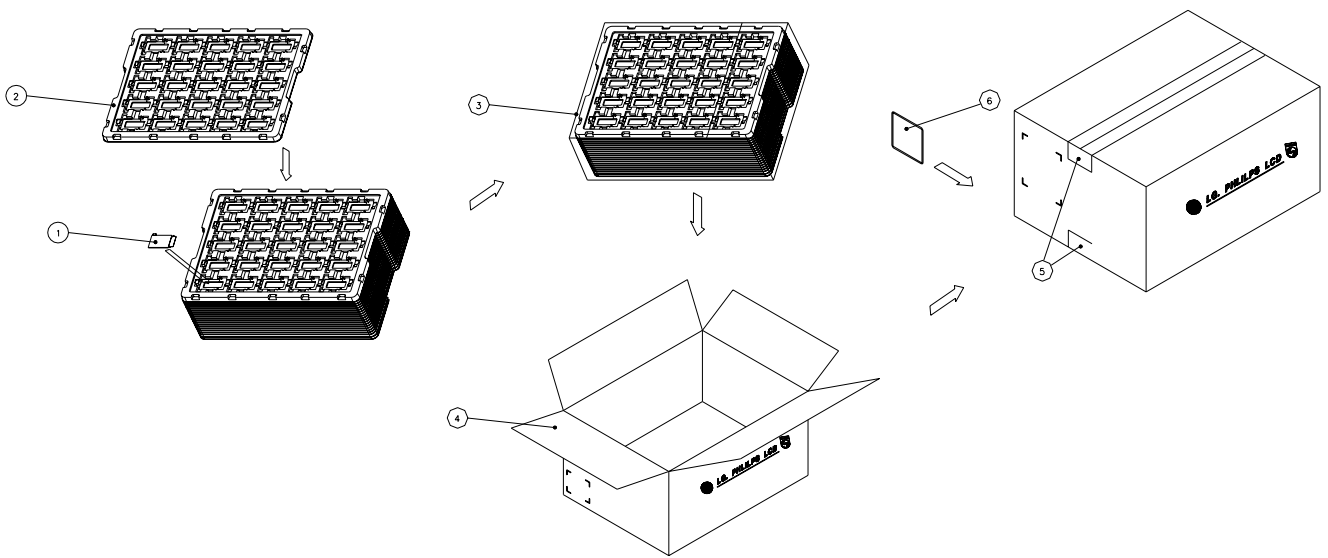


Product Specification

12. Packing

12-1. Packing Form

- a) Package quantity in one box : 135 pcs
- b) Box Size : 475mm × 348mm × 210mm
- c) 1Box = tray 15 + 1 tray(dummy , top) = 16 tray



| NO. | Description | Material |
|-----|---------------|------------------|
| 1 | Module | |
| 2 | Packing, Tray | PET(0.8t) |
| 3 | Bag | PE 560x 830 |
| 4 | Box | SWR4 378x324x112 |
| 5 | Tape | OPP 70MMx300m |
| 6 | Label | Art Paper 100x70 |

Product Specification

14. Precautions

Please pay attention to the following when you use this TFT LCD module.

14-1. Mounting Precautions

- <1> You may mount a module using four corner sides.
- <2> You should consider the mounting structure so that uneven force(ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- <3> Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to resist external force.
- <4> You should adopt radiation structure to satisfy the temperature specification.
- <5> Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- <6> Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
- <7> When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone and toluene because they cause chemical damage to the polarizer.
- <7> Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- <8> Do not open the case because inside circuits do not have sufficient strength.
- <9> The metal case of a module should be contacted to electrical ground of your system.

14-2. Operating Precautions

- <1> The spike noise causes the disoperation of circuits. It should be lower than following voltage
 $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- <2> Response time depends on the temperature.(In lower temperature, it becomes longer.)
- <3> Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
- <4> Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- <5> When fixed patterns are displayed for a long time, remnant image is likely to occur.
- <6> Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

Product Specification

14-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

14-4. Precautions For Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

14-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

- <1> Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- <2> The polarizer surface should not come in contact with any other object.
- <3> The warranty for storage of the color TFT-LCD module shall be in compliance with the Incoming Inspection standard.

14-6. Handling Precautions For Protection Film

- <1> When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- <2> The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
- <3> When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- <4> You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

15. Production Center

- <1> Panel : LG Philips LCD (Gumi, Korea)
- <2> Module Assembly : LPL NJ (Nanjing, China)
- <3> Shipping Place : LG Philips LCD(Gumi, Korea)