

# **LCD Unit Specification**

## **FLC26VGC3W**

---

### **1. APPLICATIONS**

This specification is applied to the wide-viewing angle, 10.4 type VGA supported TFT-LCD unit.

### **2. PRODUCT NAME AND MODEL NUMBER**

#### **2-1 Product Name**

LCD unit

#### **2-2 Model Name**

FLC 26 VGC 3W

### **3. OVERVIEW**

This LCD unit has a TFT active matrix type liquid crystal panel of  $640 \times 3$  (RGB)  $\times 480$  dots, and a diagonal size of 26 cm (10.4 inches). This unit supports  $640 \times 480$  VGA mode (non-interlace).

This LCD has a digital RGB interface and can display 512 colors.

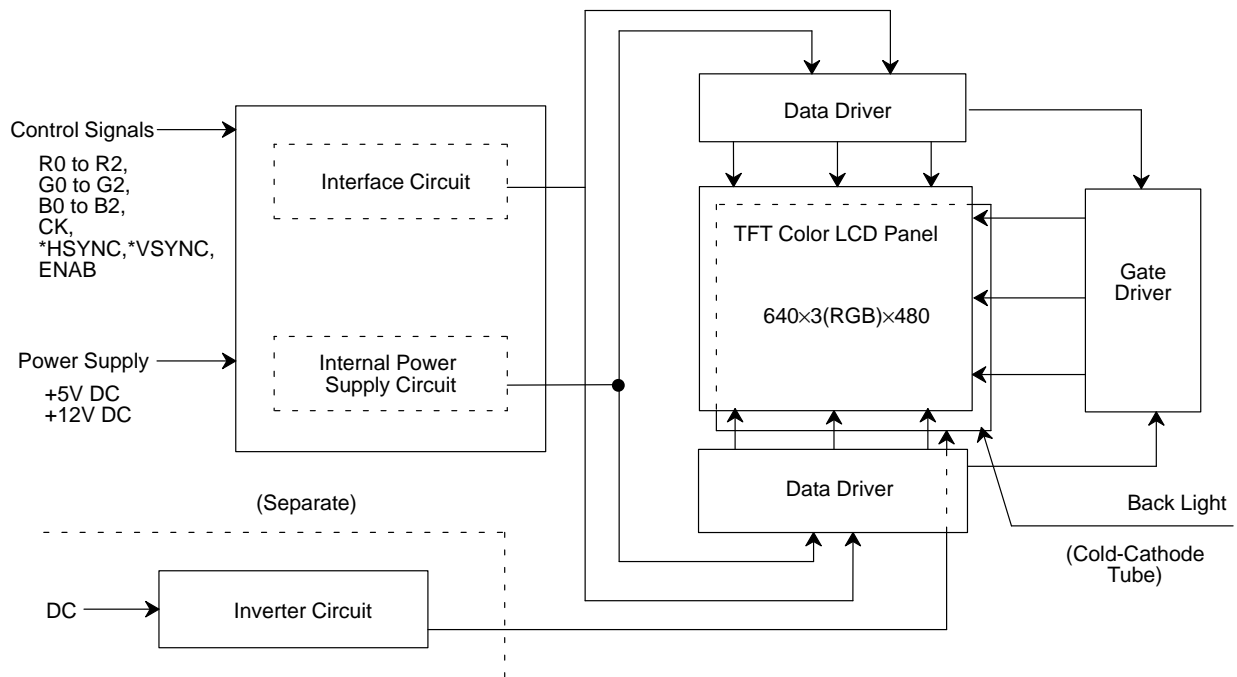
This LCD unit includes a back light, to which power is supplied from a dedicated external inverter. The back light is replaceable.

The power supply of this LCD unit is +5V DC and +12 VDC.

### **4. CONFIGURATION**

This LCD unit consists of a color TFT-LCD panel, which includes a printed board to which ICs to drive this panel are mounted, a cold-cathode tube back light, and an RGB interface printed board. The inverter for the back light is not included.

Figure 4-1 shows a block diagram of this LCD unit.



**Figure 4-1. Block Diagram**

## 5. ABSOLUTE MAXIMUM RATING

Table 5-1 shows the absolute maximum rating of this LCD unit.

**Table 5-1 Absolute Maximum Rating**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage for logic	$V_{CC}$	$T_a=25\text{ }^{\circ}\text{C}$	-0.3	—	7.0	V
Supply voltage for driving liquid crystal	$V_{DD}$	$T_a=25\text{ }^{\circ}\text{C}$	-0.3	—	16.0	V
Input voltage	$V_{IN}$	$T_a=25\text{ }^{\circ}\text{C}$	$V_{SS}-0.3$	—	$V_{CC}+0.3$	V

## 6. RECOMMENDED OPERATING CONDITIONS

Table 6-1 shows the recommended operating conditions of this LCD unit.

**Table 6-1 Recommended Operating Conditions**

Item		Symbol	Min.	Typ.	Max.	Unit
Supply voltage for logic		V <sub>CC</sub>	4.74	5.0	5.25	V
Supply voltage for driving liquid crystal		V <sub>DD</sub>	11.40	12.0	12.60	V
Ripple voltage	V <sub>CC</sub>	V <sub>RP1</sub>	—	—	50	mV
	V <sub>DD</sub>	V <sub>RP2</sub>	—	—	100	mV

## 7. ELECTRICAL SPECIFICATIONS

Table 7-1 shows the electrical specifications of this LCD unit. Figure 7-2 shows the equivalent circuit of the logic signal input area. Figure 7-3 shows the equivalent circuit of the supply voltage input area.

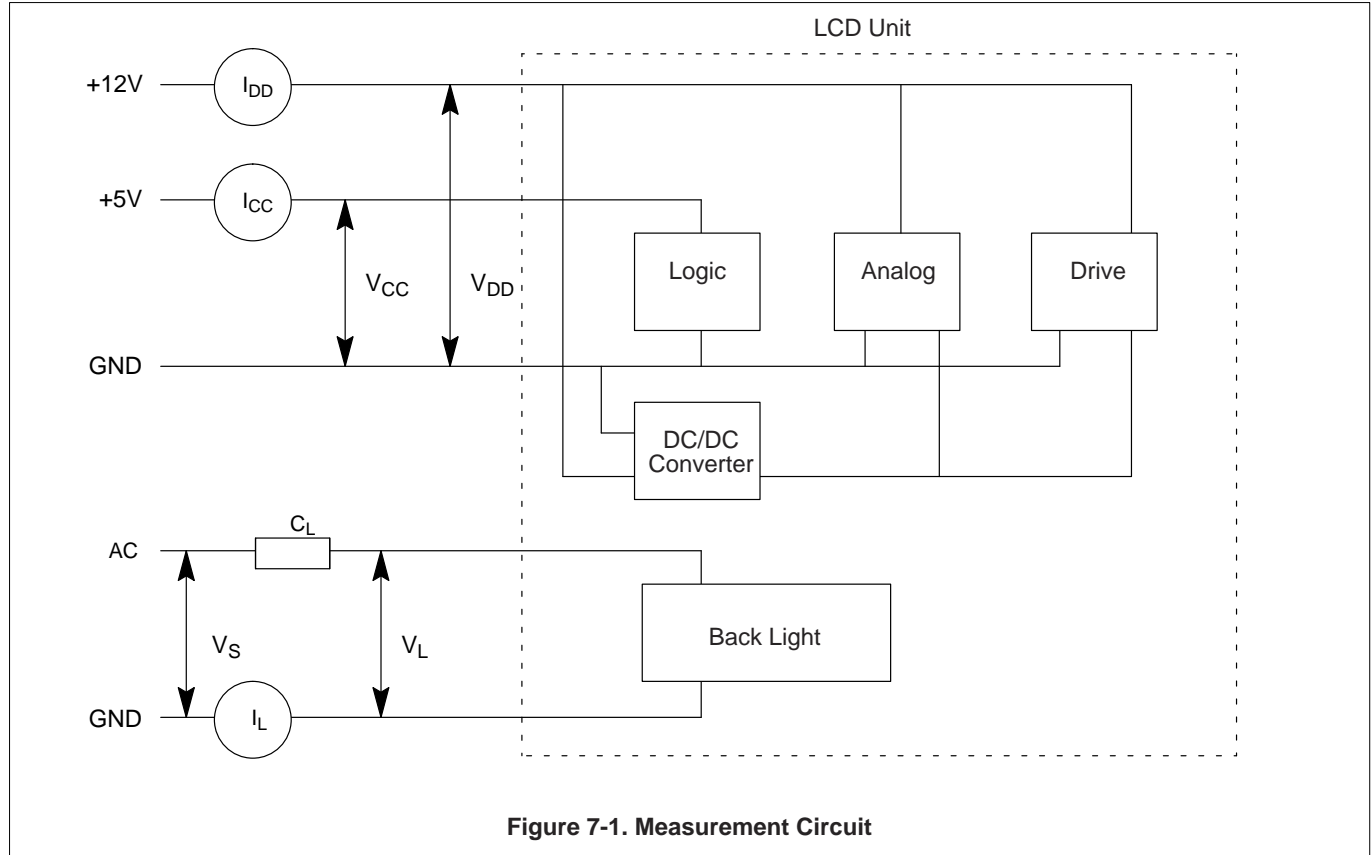
**Table 7-1 Electrical Specifications**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply current for logic	$I_{CC}$	$V_{CC}=+5 \pm 0.25V$ $V_{DD}=+12 \pm 0.6V$ $V_{SS}=0V$ $T_a=25^\circ C$ $CLK=25.175 MHz$	25	48	195	mA
Supply current for driving liquid crystal	$I_{DD}$		20	50	120	mA
"H" level logic input voltage	$V_{IH}$		2.0	—	$V_{CC}$	V
"L" level logic input voltage	$V_{IL}$		0	—	0.8	V
Supply rush current for $V_{DD}$ <sup>1</sup>	$I_{SDD}$		—	—	0.6	A
Supply rush current for duration for $V_{DD}$ (exceeding 1A) <sup>1</sup>	$T_{SDD}$		—	—	3.0	ms
Back light	Breakdown voltage	$V_S$	$f_L=30 kHz$	1000	—	Vrms
	Lighting voltage	$V_L$	$f_L=30 kHz$	540	570	Vrms
	Lighting frequency	$f_L$	$V_L=570Vrms$	25	30	kHz
	Tube current <sup>2</sup>	$I_L$	$V_L=570Vrms$ $f_L=30 kHz$	4.0	5.0	mA

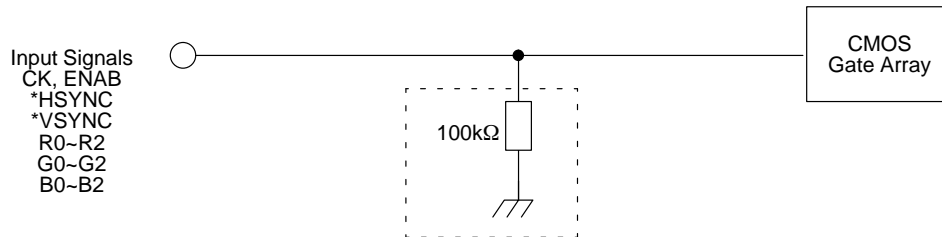
### NOTES:

1. Rush current is specified when internal power supply starts to operate. [Excluding charge current to capacitor of  $V_{CC}$  line.]
2. Current value per tube is indicated. (4 tubes/unit)

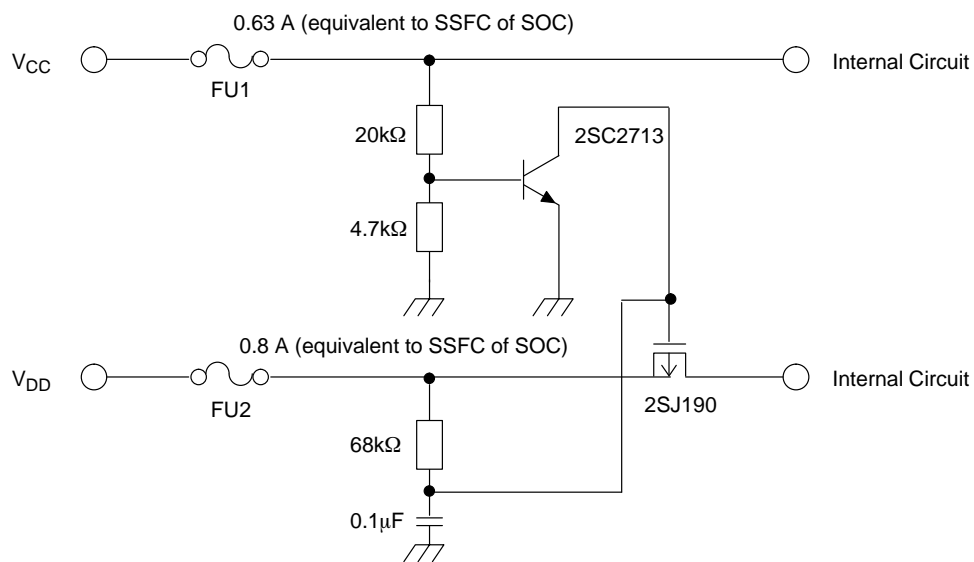
Measurement circuit is based on Figure 7-1.



**Figure 7-1. Measurement Circuit**



**Figure 7-2. Equivalent Circuit of Logic Signal Input**



**Figure 7-3. Equivalent Circuit of Supply Voltage Input**

## 8. MECHANICAL SPECIFICATIONS

Table 8-1 shows the mechanical specifications of this LCD unit.

**Table 8-1 Mechanical Specifications**

Item	Specification	Unit	Remarks
Dimension	283 ± 1.0 × 216 ± 1.0 × 20 max	mm	Edge type back light is used. (Ø3×4 tubes) Excluding inverter For details on dimensions, see Dimensional Outline Drawing (page 24)
Display capacity	(640×3)×480	—	
Display dot area	211.18×158.38	mm	
Dot pitch	0.11×0.33	mm	
Aspect ratio	1:1	—	
Weight	1100 max	g	

## 9. OPTICAL SPECIFICATIONS

Table 9-1 shows the optical specifications of this unit.

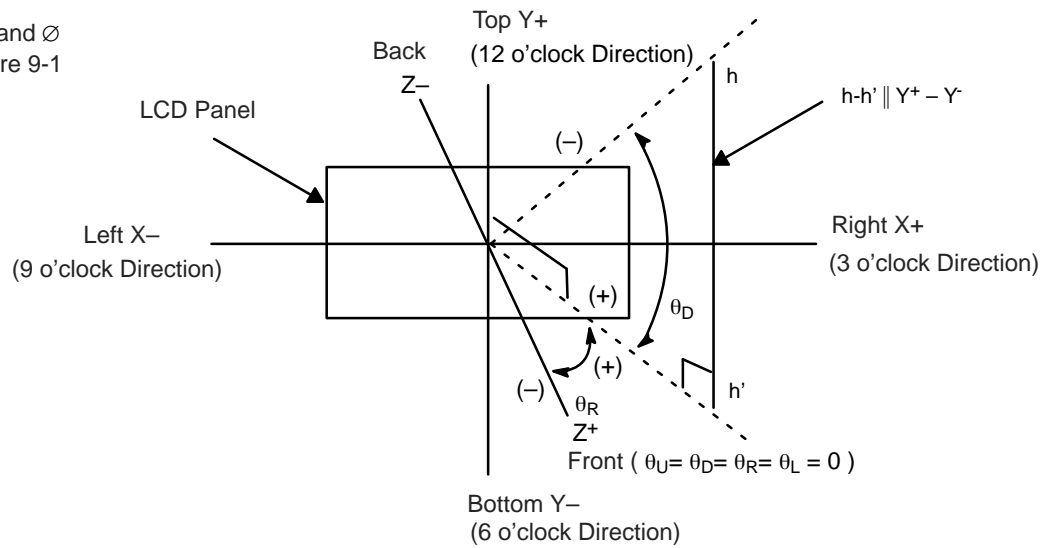
**Table 9-1 Optical Specifications**

Item	Symbol	Condition		Specifications			Unit	Remark	Note
				Min.	Typ.	Max.			
Visual angle	$\theta_V$	$CR \geq 10$ $T_a=25\text{ }^{\circ}\text{C}$	$\theta_R=0^{\circ}$	120	—	—	deg	Vertical	1, 2, 4, 5, 6
	$\theta_H$		$\varnothing_U=0^{\circ}$	60	—	—	deg	Horizontal	
Contrast ratio	CR	$\theta_U=0^{\circ}, \theta_R=0^{\circ}$ $T_a=25\text{ }^{\circ}\text{C}$		30	—	—	—	White/ Black <sup>1</sup>	1, 2, 5
ON response time (black → white)	$t_{on}$	$\theta_U=0^{\circ}$ $\theta_R=0^{\circ}$	$T_a=25\text{ }^{\circ}\text{C}$	—	15	50	ms		1, 3, 5
			$T_a=0\text{ }^{\circ}\text{C}$	—	50	150	ms		
OFF response time (white → black)	$t_{off}$	$\theta_U=0^{\circ}$ $\theta_R=0^{\circ}$	$T_a=25\text{ }^{\circ}\text{C}$	—	30	50	ms		
			$T_a=0\text{ }^{\circ}\text{C}$	—	100	150	ms		
Brightness	L	$\theta_U=0^{\circ}, \theta_R=0^{\circ}$ $T_a=25\text{ }^{\circ}\text{C},$ $V_{CC}=5V,$ $V_{DD}=12V,$ $V_L=570V_{rms},$ $f_L=30kHz,$ $I_f=5mA/tube$		170	200	—	cd/m <sup>2</sup>	White	1, 5
Brightness uniformity	$\Delta L$			—	—	15	%		1, 7
Chromaticity (white)	x			0.285	0.320	0.355	—		1, 5
	y			0.310	0.350	0.390	—		
Chromaticity (black)	x			0.200	0.250	0.300	—	1, 5	
	y			0.190	0.275	0.360	—		
LCD panel type			TFT color						
Display type			Normal black						
Display colors			512 colors						
Color of non-display area			Black						
Surface treatment			Anti-glare process (haze value: 5~13%)						

**Notes:**

- Contrast ratio is measured with ø20 spot diameter.
- Value at 30 minutes after lighting on and 5mA of back-light tube current.

Note 1: Definition of  $\theta$  and  $\varnothing$   
 Based on Figure 9-1



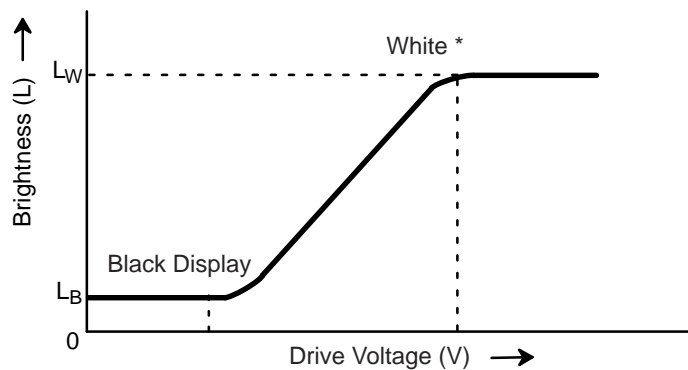
**Figure 9-1. Definition of  $\theta$**

Note 2: Definition of Contrast Ratio (CR)

Determined by formula (1) based on Figure 9-2 Voltage – Brightness Characteristics

$$CR = \frac{L_W \text{ (Brightness at white)}}{L_B \text{ (Brightness at black)}}$$

----- (1)



**Figure 9-2. Voltage - Brightness Characteristics**

Note 3: Definition of response  
Based on Figure 9-3.

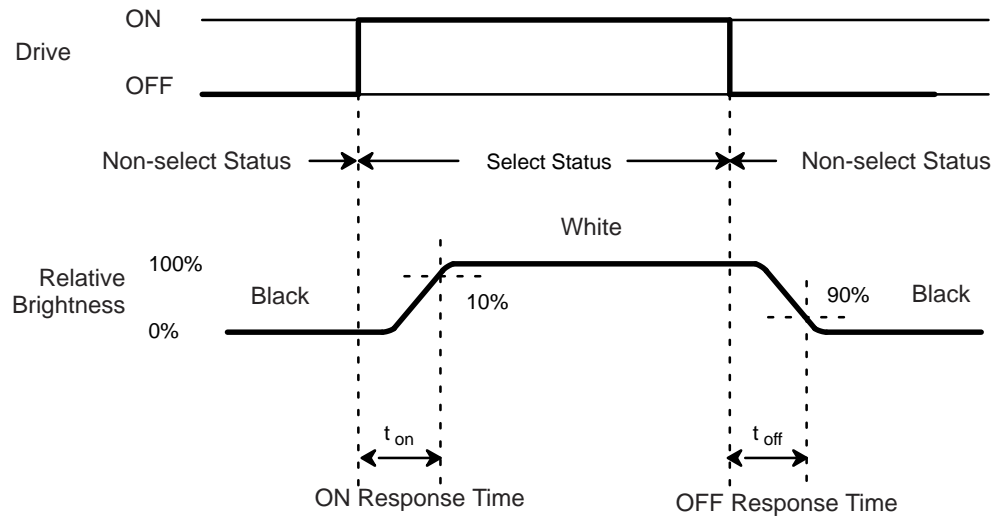


Figure 9-3. Definition of Response

Note 4: Definition of viewing angle  
Based on Figure 9-4.

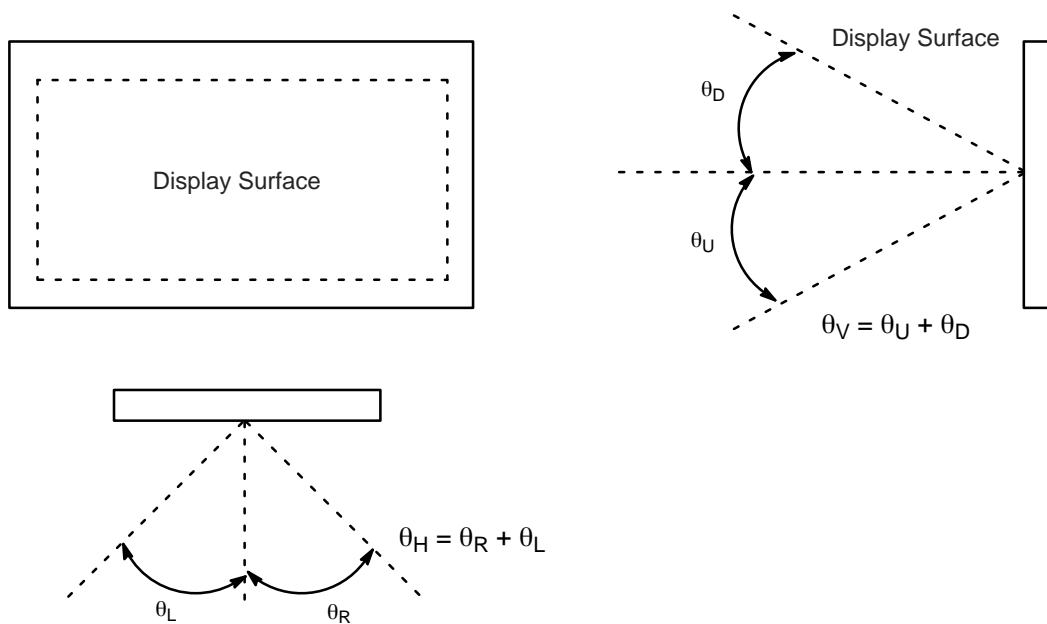


Figure 9-4. Definition of Viewing Angle



Note 5: Contrast ratio and response measurement system  
Based on Figure 9-5.

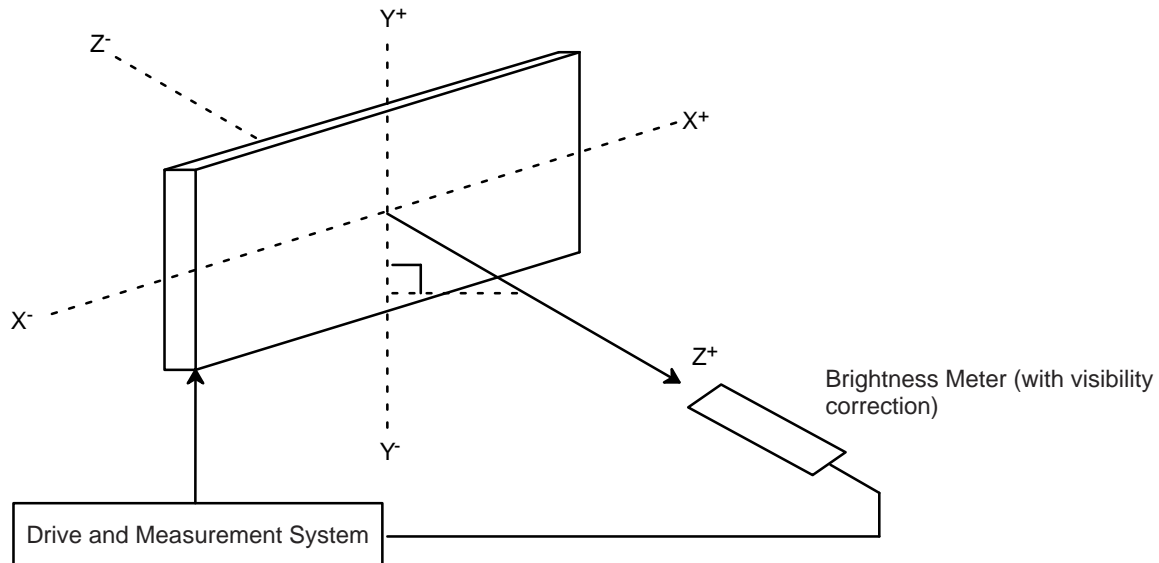


Figure 9-5. Contrast Ratio and Response Measurement System

Note 6: Definition of viewing angle direction

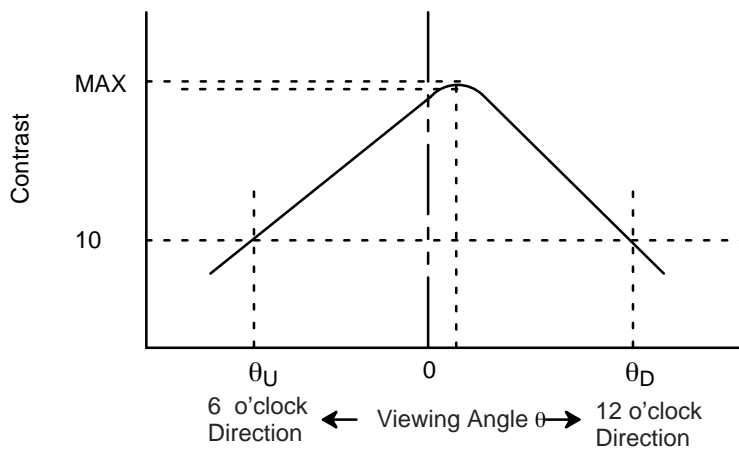


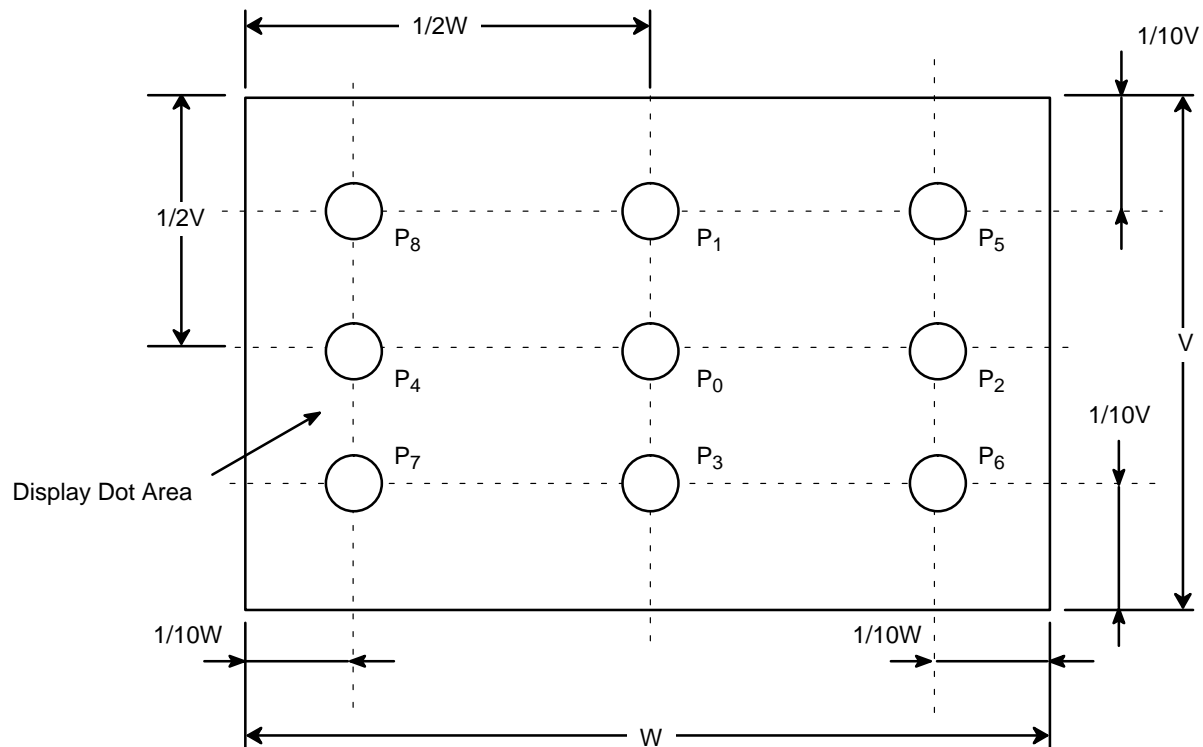
Figure 9-6. Definition of Viewing Angle Direction

**Note 7: Definition of Brightness Uniformity (1)**

Brightness uniformity is defined by the following formula when brightness at the following 9 points (P0 ~P8) on the display area, shown in Figure 9-7, are measured, and when brightness at each point is L0~L8 .

$$\text{Brightness Uniformity } (\Delta L) : \frac{|L_n - \bar{L}|}{\bar{L}} \times 100 (\%) \quad (n=0 \sim 8)$$

$$\bar{L} = \sum_{n=0}^8 L_n / 9$$



**Figure 9-7. Measurement Points**

## 10. INTERFACE SPECIFICATIONS

### 10-1 Interface Signal Array

Tables 10-1 and 10-2 show the description and configuration of interface signals (CN1, 2).

**Table 10-1 Interface Signals (CN1)**

Pin No.	Signal Name	I/O	Polarity	Function
1	CK	I	↓	Dot clock (data sampling)
2	GND	—		Ground
3	*HSYNC	I	Negative	Horizontal synchronizing signal
4	*VSYNC	I	Negative	Vertical synchronizing signal
5	R0	I	Positive	Red digital data bit 0
6	R1	I	Positive	Red digital data bit 1
7	R2	I	Positive	Red digital data bit 2 (MSB)
8	GND	—		Ground
9	G0	I	Positive	Green digital data bit 0
10	G1	I	Positive	Green digital data bit 1
11	G2	I	Positive	Green digital data bit 2 (MSB)
12	GND	—		Ground
13	B0	I	Positive	Blue digital data bit 0
14	B1	I	Positive	Blue digital data bit 1
15	B2	I	Positive	Blue digital data bit 2 (MSB)

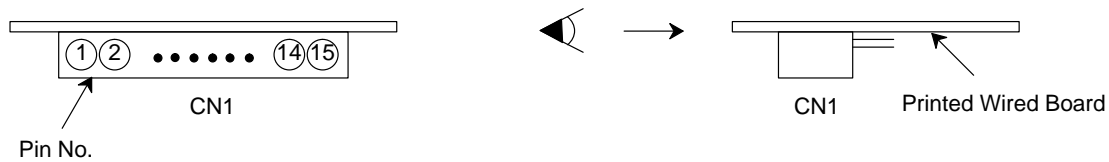
**Table 10-2 Interface Signal (CN2)**

Pin No.	Signal Name	I/O	Polarity	Function
1	V <sub>CC</sub>	I		+5V input power supply
2	V <sub>CC</sub>	I		+5V input power supply
3	GND	—		Ground
4	GND	—		Ground
5	ENAB	I	Positive	Data enable signal
6	V <sub>DD</sub>	I		+12V input power supply
7	V <sub>DD</sub>	I		+12V input power supply
8	GND	—		Ground
9	GND	—		Ground
10	N.C.	—		—

### 10-2 Connectors

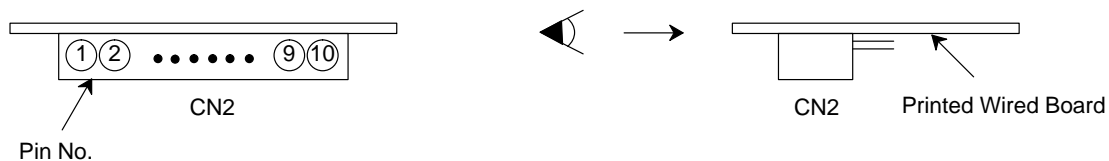
- CN1 connector model name

- |                       |  |                        |
|-----------------------|--|------------------------|
| a) Connector used     | Plug : DF13-15P-1.25H                                | (Manufacturer: Hirose) |
| b) Adaptive connector | Housing : DF13-15S-1.25C                             | (Manufacturer: Hirose) |
|                       | Contact : Electric wire AWG #26 ~ #30, DF13-2630-SCF | (Manufacturer: Hirose) |
| c) Connector position |  |                        |
| d) Pin configuration  | See below.   |                        |



- CN2 connector model name

- |                       |  |                        |
|-----------------------|--|------------------------|
| a) Connector used     | Plug : DF13-10P-1.25H                                | (Manufacturer: Hirose) |
| b) Adaptive connector | Housing : DF13-10S-1.25C                             | (Manufacturer: Hirose) |
|                       | Contact : Electric wire AWG #26 ~ #30, DF13-2630-SCF | (Manufacturer: Hirose) |
| c) Connector position |  |                        |
| d) Pin array          | See below.   |                        |



### 10-3 Interface Timing

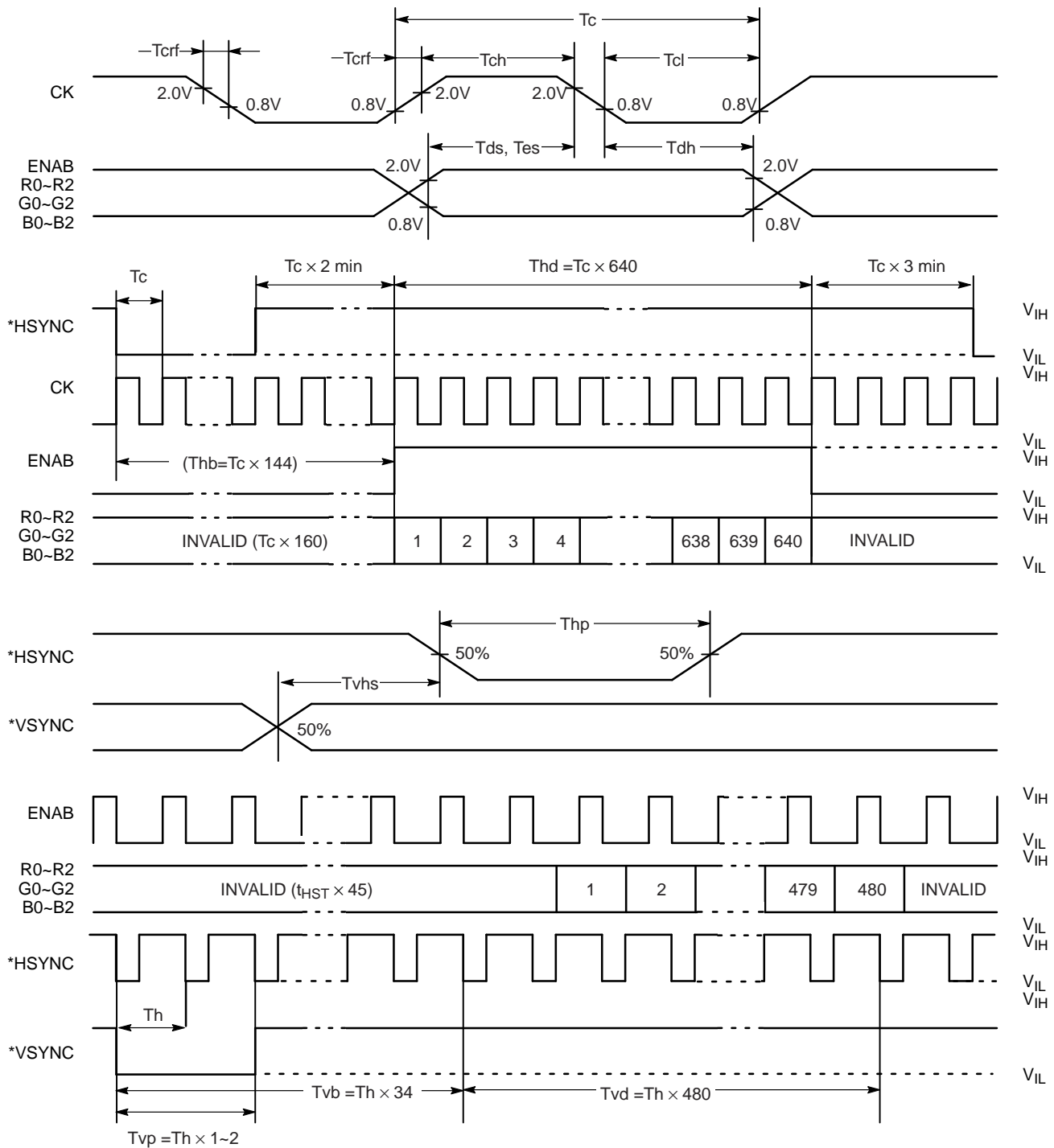


Figure 10-1. Interface Timing Diagrams

### 10-4 Switching Characteristics

**Table 10-4 Switching Characteristics**

( $T_a = 0 \sim +50^\circ\text{C}$ ,  $V_{CC} = +5 \pm 0.25\text{V}$ ,  $V_{DD} = +12 \pm 0.6\text{V}$ )

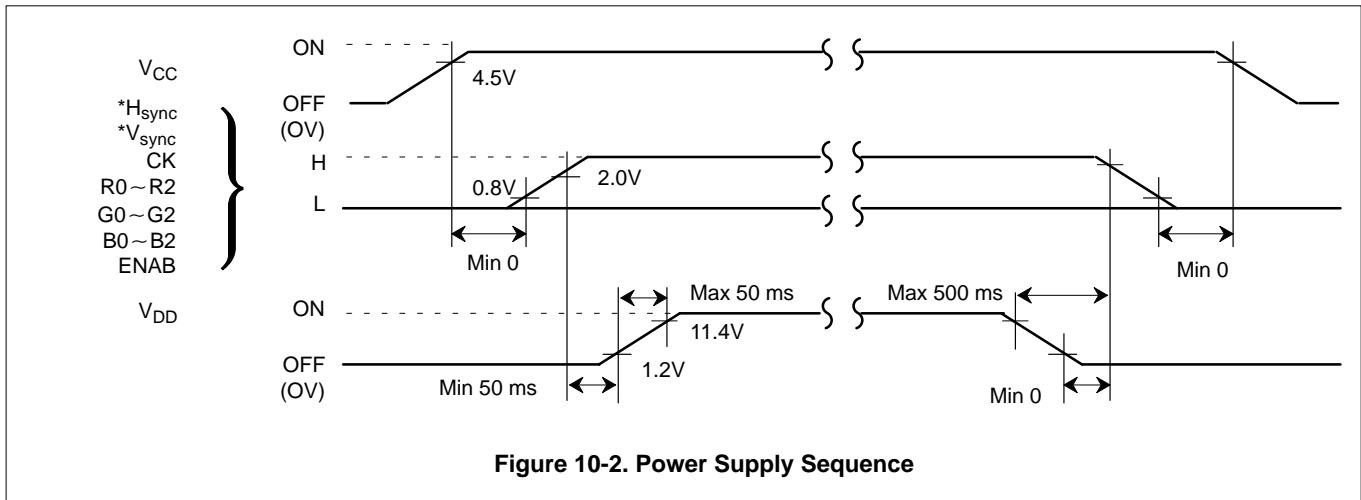
Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock	Frequency	1/Tc	23.916	25.175	26.43	MHz	
	Rise time	Tcrf	—	—	5	ns	
	Clock pulse (H level)	Tch	5	—	—	ns	
	Clock pulse (L level)	Tcl	10	—	—	ns	
Horizontal signal	Cycle	Th	30.00	31.78	36.00	$\mu\text{s}$	
	Pulse width	Thp	770	800	900	Clock	
	Back porch	Thb	2	96	—	Clock	
	Horizontal display period	Thp+2	Thp+2	144	Th-645	Clock	Note 1
Vertical signal	Cycle	Thd	—	640	—	Clock	
	H-V signal phase difference	Tv	515	525	560	Line	
	Pulse width	Tvhs	0	Thp	Th-Thp	$\mu\text{s}$	
	Back porch	Tvp	1	2	33	Line	
	Vertical display period	Tvb	33	33	33	Line	
Enable signal	Setup	Tvd	—	480	—	Line	
	Pulse width	Tes	5	—	Tc-10	ns	
Data	Setup	Tep	—	640	—	Clock	Note 2
	Hold	Tds	5	—	—	ns	
Data	Hold	Tdh	10	—	—	ns	

#### NOTES:

1. The horizontal position is specified by the rising edge of ENAB signal. The variable range must be within the range shown in Table 10-4.
2. When the period of ENAB high level is under 640 clock, LCD does not work normally. When the enable signal source in the horizontal direction does not reach 640 clocks, a normal display is not performed. When ENAB is fixed to low level, however, the protection circuit activates and timing is fixed to default value  $\text{Thb} = \text{Tc} \times 144$ ,  $\text{Tvb} = \text{Th} \times 33$ .
3. When effective display data and enable signals are out of sync, the screen position deviates from a normal display.

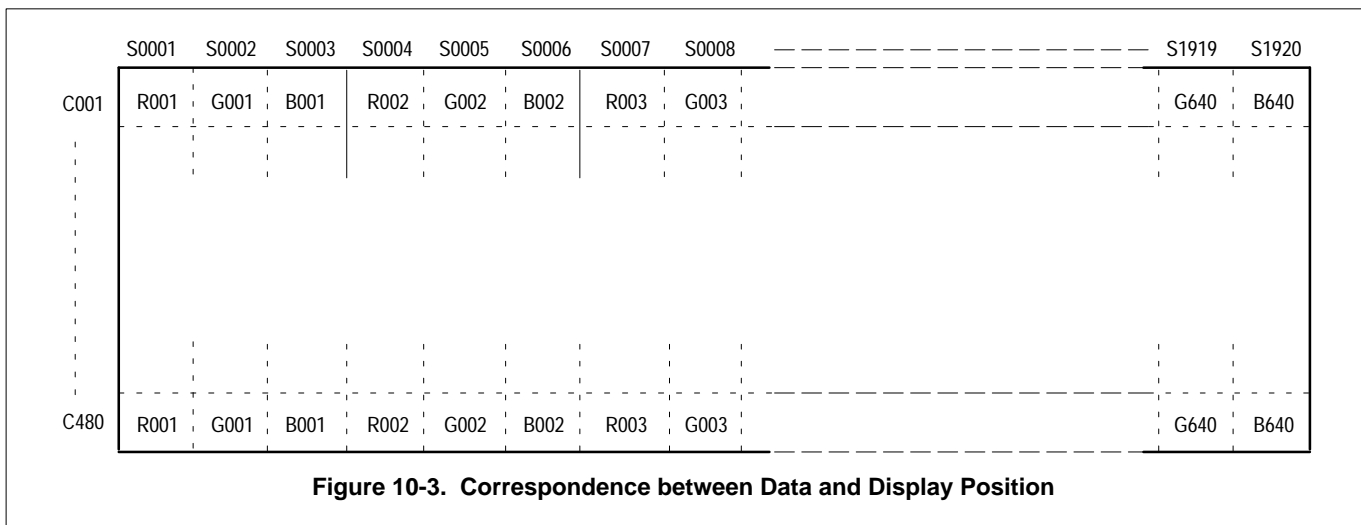
## 10-5 Power Supply Sequence

ON/OFF of the LCD unit power supply must be in the sequence shown in Figure 10-2 to prevent latch-up of the driver IC and to prevent DC driving of the panel.



## 10-6 Correspondence between Data and Display Position

Figure 10-3 shows the correspondence between data and the display position.



## 11. BACK LIGHT SPECIFICATIONS

## 11-1 Back Light Pin Configuration

Tables 11-1 and 11-2 show the description and pin configuration of signals for back light (CN-A, B).

### Table 11-1      Signals for Back Light (CN-A)

Terminal No.	Signal Name	Function
1	GND	Ground of tube 1 and 2
2	NC	—
3	NC	—
4	NC	—
5	V <sub>L</sub> 1	Power supply for cold-cathode tube 1
6	NC	—
7	V <sub>L</sub> 2	Power supply for cold-cathode tube 2

### Table 11-2      Signals for Back Light (CN-B)

Terminal No.	Signal Name	Function
1	GND	Ground of tube 3 and 4
2	NC	—
3	NC	—
4	NC	—
5	V <sub>L</sub> 3	Power supply for cold-cathode tube 3
6	NC	—
7	V <sub>L</sub> 4	Power supply for cold-cathode tube 4

Connector used	Housing	: XHP-7
	Contact	: SXH-001T-P0.6

Adaptive connector      Post with base      :   B7B-XH-A (straight type) or S7B-XH- A (right-angle type)

Manufacturer Japan Solderless Terminal

## 11-2 Life

The life of the back light is a minimum of 10,000 hours at the following conditions:

(1) Working conditions

- ① Ambient temperature :  $25 \pm 5$  °C  
② Tube current (If) : 5mA or less

## (2) Definition of life

- ① Brightness becomes 50% or less than the minimum brightness value.
- ② The light cannot be lit by the minimum value of the breakdown voltage.
- ③ Flashing



## 12. APPEARANCE SPECIFICATIONS

### 12-1 Appearance

Length: L (mm)  
Allowable number of pieces: N    Average diameter: D (mm)

No.	Item		Judgment Method and Standard		Remark
1	Foreign matter	Black particle	0.5>D	N ≤ 4	Identified when lighting Defective inside cell
		Fiber	3.0>L	N ≤ 4	
2	Scratch	Scratch on polarizing plate	10.0>L	N ≤ 6	Limit sample
3	Nick	Nick on polarizing plate	0.5>D	N ≤ 6	Limit sample

Visually inspect appearance keeping your eyes 35 cm or more from the panel, using one 20 W fluorescent light illumination 50 cm above the work table.

At this time, the illuminance in the vertical direction to the fluorescent light is 400 ~ 600 lux (reference value).

#### 12-1-1 Zone

Inside display dot area (211.18 × 158.38 mm)

#### 12-1-2 Luminescent Spots

##### (1) Luminescent spot classification (based on brightness samples)

- |  |     |                             |
|--|-----|-----------------------------|
| • Visible with 2% ND <sup>1</sup> filter                                   | --- | High luminescent spot R • G |
| • Visible with 5% ND <sup>1</sup> filter but not visible with 2% ND filter | --- | Low luminescent R•G•B       |
| • Not visible with 5% ND <sup>1</sup> filter                               | --- | not counted                 |

##### (2) Hold of color filter

- |                        |     |                       |
|------------------------|-----|-----------------------|
| • Hold exceeds 1/2 dot | --- | High luminescent spot |
| • Hold 1/2 dot or less | --- | not counted           |

##### (3) Hold of chrome mask

- |  |     |                       |
|--|-----|-----------------------|
| • Hold exceeds 50 μm ø                               | --- | High luminescent spot |
| • Hold about 50 μm ø                                 | --- | Low luminescent spot  |
| • Hold less than low luminescent spot is not counted |     |                       |

#### NOTES:

1. ND, Neutral Density filter. An optical filter manufactured by Fuji.

### 12-1-3 Number of Luminescent Spots Standard

	Entire Screen	
Brightness classification	High luminescent spots	High and low luminescent spots
Number of defects	12 or less	25 or less

#### NOTES:

1. Display when counting number of luminescent spots must be all black.
2. Number of high luminescent spots of green (G) must be up to 4.
3. Number of two low luminescent spot connections must be up to 5.
4. Number of three luminescent spot connections and two high luminescent spot connections must be 0.
5. Number of a high luminescent spot and a low luminescent spot connections must be up to 2.

### 12-1-4 Distance Between Luminescent Spots

- High luminescent spots R and G - - - 15 mm or more
- High luminescent spot and low luminescent spot - - - 5 mm or more

### 12-1-5 Dark Spots

	Total
Number of defects	10 or less

#### NOTES:

1. Display when counting black spots must be all white.
2. Connection must be up to 2 dots.
3. Distance between defects must be 5 mm or more.
4. If a pixel is partly a black spot, count the number of black spots as follows.
  - (a)  $A < 1/3$ : not counted  
The number of 4 connections must be 1 or 0.
  - (b)  $1/3 \leq A < 2/3$ : regarded as 0.5
  - (c)  $2/3 \leq A$ : regarded as 1  
(A = area of black spot/pixel area)

### 13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 shows the environmental specifications.

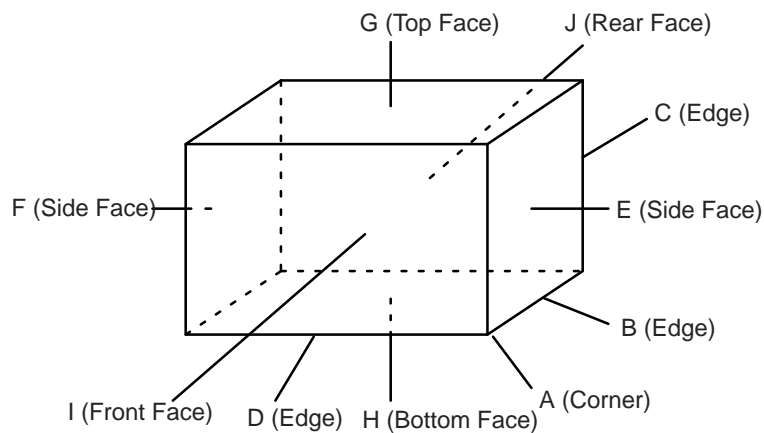
**Table 13-1 Environmental Specifications**

Item	Standard		Remark
Temperature	Operation	0~50 °C	Temperature on surface of LCD panel (display area)
	Storage	-20~60 °C	
Humidity	Operation	20~85%RH	Maximum wet-bulb temperature must not exceed 29 °C. No condensation.
	Storage	5~85%RH	
Vibration	Non-operation	10 ~ 55 Hz, 1 octave/minute, 2.0 G, 20 cycles each in X, Y, and Z directions	For single unit without package
Vibration	Non-operation	10 ~ 55 Hz, 1 octave/minute, 10.0 G, 20 cycles each in X, Y, and Z directions	When unit is packaged
Shock	Non-operation	30 G, 18 ms 3 times each in X, Y, and Z directions	For single unit For specifications when unit is packaged, see Note.

**Note:** Table 13-2 and Figure 13-1 show the shock resistance standard when unit is packaged.

**Table 13-2 Shock Resistance Standard when Unit is Packaged**

Dropping Location	Dropping Height	Count
H	75 cm	Twice



**Figure 13-1. Direction to Apply Shock to Package**

## 14. INDICATIONS

This unit has the following indications.

- (1) Product Name : LCD unit
- (2) Model No. : FLC 26 VGC 3W
- (3) Product Drawing No. : NA19014-C351
- (4) Manufacturing No. : 

4	7	0	0	0	0	1	
							Ser. No.
							Manufacturing month (Oct. = X, Nov. = Y, Dec. = Z)
							Last digit of manufacturing year
- (5) Version No. : 

01	A	(Example)
		Functional version
		Operational version
- (6) Manufactured Country Name : Made in Japan
- (7) Company Name : Fujitsu Limited
- (8) Disposal method of cold-cathode tube

## 15. PACKAGING

Specified separately in packaging specifications.

## 16. WARRANTY

- (1) The warranty period is one year after shipment. Products which fail during this period are repaired or are replaced without charge, unless the failure is caused by the user.

## 17. PRECAUTIONS

Adhere to the following precautions to correctly use this LCD unit.

### (1) Handling of LCD panel

- ① Since the LCD panel is made of glass, do not apply any strong mechanical shock to it. Excessive shock may damage the panel or cause a malfunction.
- ② Do not press hard on the LCD panel surface.  
In the LCD panel, the gap between two glass plates is kept perfectly even to maintain display characteristics and reliability. If this panel is subject to hard pressing, the following occurs.
  - ① Ununiform color
  - ② Orientation of liquid crystal becomes disorderlyProblem ① returns to normal after a while. Problem ② returns to normal if power is shut off once then turned on again. However these occurrences must be avoided to insure reliability.
- ③ Do not scratch the polarizing plate on the LCD panel surface.  
Since the polarizing plate is made of a soft film, the following must be adhered to.
  - Do not press or rub the display surface with a hard tool, pincet, etc.
  - For handling, use cotton or conductive gloves so that the display surface is not contaminated.
  - If the display surface is contaminated by dust or dirt, clean it as follows with a soft cloth (deer skin, etc.).
    - [Dust] Wipe off with a soft cloth (do not rub).
    - [Dirt] Lightly wipe off with a soft cloth soaked in the specified solvent.  
Specified solvent: isopropyl alcohol  
Do not use water and such solvents as ketones (acetone, etc.) and aromatics (xylene, toluene, etc.).

**[Caution]** Be careful not to allow the specified solvent to enter the unit.

  - If saliva or water drops are left for a long period of time, the area may become deformed or discolored. Wipe off immediately in the same way as for dirt.
  - Do not allow oil to adhere to the unit, since the cleaning of oil is difficult.
- ④ Do not place or contact objects on the display surface since this may leave traces.

### (2) Handling of LCD unit

- ① Do not strongly pull the cold-cathode tube cable.  
If the cable is pulled with a 2 kg or stronger force, the cable may be damaged or reliability may decrease. Pull within the specified value of force.
- ② Assemble the device in a dust free environment.  
If conductive foreign matter adheres to the unit, failures may occur.
- ③ Take anti-static measures when assembling the device.  
Since the LCD Unit uses a CMOS - IC, the following considerations are necessary.
  - Do not take the unit out of the conductive bag until the time when the device is assembled.
  - When assembling the device, the operator must be grounded, wearing cotton or conductive gloves.
  - For the area to assemble the device, place an earth mat on the floor and work table, and discharge static electricity via an earth wire.
  - If necessary, ground operation tools (soldering iron, radio pliers, pincet, etc.).
  - Assemble the device in a humidity controlled environment (50 ~ 60%). Do not work in an environment where humidity is extremely low (50% RH or less).
- ④ Do not strongly pull the connecting cable on the rear face of the LCD unit.  
If the connecting cable is strongly pulled, failures may occur.
- ⑤ Do not disassemble or remodel the LCD unit.  
If this LCD Unit is disassembled or remodeled, the display quality and reliability may not be assured.

### (3) Precautions when operating LCD unit

- ① Signal input terminals not being used must be connected to Vcc or Vss, so that the design logic functions are implemented.
- ② Adhere to the specified power supply sequence.  
If ① and ② are not followed, the CMOS - IC may cause a latchup, or the DC voltage may be applied to the liquid crystal, and a failure or serious display quality deterioration may occur.
- ③ Do not operate the LCD unit when condensation is present.  
If the LCD unit is operated when condensation is present on the output terminals of the LCD area, the terminal area causes an electro-chemical reaction, which may cause a disconnection. Condensation easily occurs especially when the unit is moved from a cold to warm environment.

- ④ Do not operate the LCD unit with the drive voltage exceeding the specified voltage.  
If the LCD unit is operated with the drive voltage exceeding the specified voltage, the IC may be damaged or the life of the liquid crystal may be shortened considerably.
- ⑤ Use the LCD unit within the specified operating temperature range.  
If the LCD unit is used at a higher temperature than the specified operating temperature, display colors shift to blue, and if continuously operated at a higher temperature (40°C or more), the deflecting plate deteriorates and contrast decreases. If the LCD unit is used at a lower temperature than the specified operating temperature, the response speed decreases considerably. If the operating temperature is even lower, the liquid crystal may solidify and become damaged.
- ⑥ Always input the control signals at correct timing.  
If control signals (CK, ENAB, \*HSYNC, \*VSYNC) are not input, the internal circuit automatically generates signals and displays a specified pattern to protect the liquid crystal panel. However, in this status the display does not satisfy the desired display quality.

#### (4) Precautions when designing device mounting

- ① Do not press the display surface and base face of the LCD unit.  
If the display surface must be very strongly pressed due to the device mounting design, the desired display quality and reliability may not be assured. If the back light base must be pressed due to the mounting design, brightness uniformity and the reliability of the cold-cathode tube may not be assured.
- ② Consider the device mounting design, so that twisting and bowing do not occur to the LCD Unit.  
Outstanding twisting and bowing may damage display quality and reliability.
- ③ The power cable length between the LCD unit and inverter must be 300 mm or less.  
Otherwise the back light may not light or flickering may occur.
- ④ Do not contact the cable of the cold-cathode tube and the metal plate. Leakage may occur and the specified brightness may not be obtained.

#### (5) Storage method

- ① Do not store the LCD Unit in an organic solvent or in an atmosphere of corrosive gas.  
In an organic solvent atmosphere, the polarizing plate discolors and display quality deteriorates. In a corrosive gas environment, various problems may occur.
- ② Store the LCD unit in a Fujitsu package or in a unitary package.  
When storing, Fujitsu packages can be stacked to a maximum of 3, and unitary packages can be stacked to a maximum of 6. The LCD unit inside a unitary package is in an anti-static bag. Keep the unit in that status.
- ③ It is recommended that the storage environment be a humidity controlled cool dark location.  
Recommended storage environment
  - Place : Dark (avoid direct sunlight)
  - Temperature : 10 ~ 35°C
  - Humidity : 50 ~ 60% RH

Note) If the unit is left or used in an environment of 60°C or more for a long period of time, optical characteristics may deteriorate. If the unit is left or used in an environment of -20°C or lower, the liquid crystal may solidify and the LCD panel may be damaged.

#### (6) Disposal method

- ① LCD unit  
Components can be classified into metal, resin and glass.  
The material name or its abbreviation is written on the resin components. Mercury is in the cold-cathode tube used as the light source of the back light. Dispose of the tube according to the related laws.
- ② Packaging material  
Except for the anti-static bag, packaging material is completely made of paper which can be recycled.

#### (7) Other

- ① If the LCD panel is damaged, do not inhale or allow the liquid crystal to enter the mouth.  
If the liquid crystal contacts the body or cloth, immediately wash it off with soap. Follow precautions for regular electronic components.

## **18. OTHER**

Specifications of the TFT-LCD panel used for this LCD Unit may be changed. In that case, both parties must discuss the matter before changing the specification. If the content of a specification is questionable, the problem must be solved based on discussions between both parties.

# LCD Unit Specification FLC26VGC3W

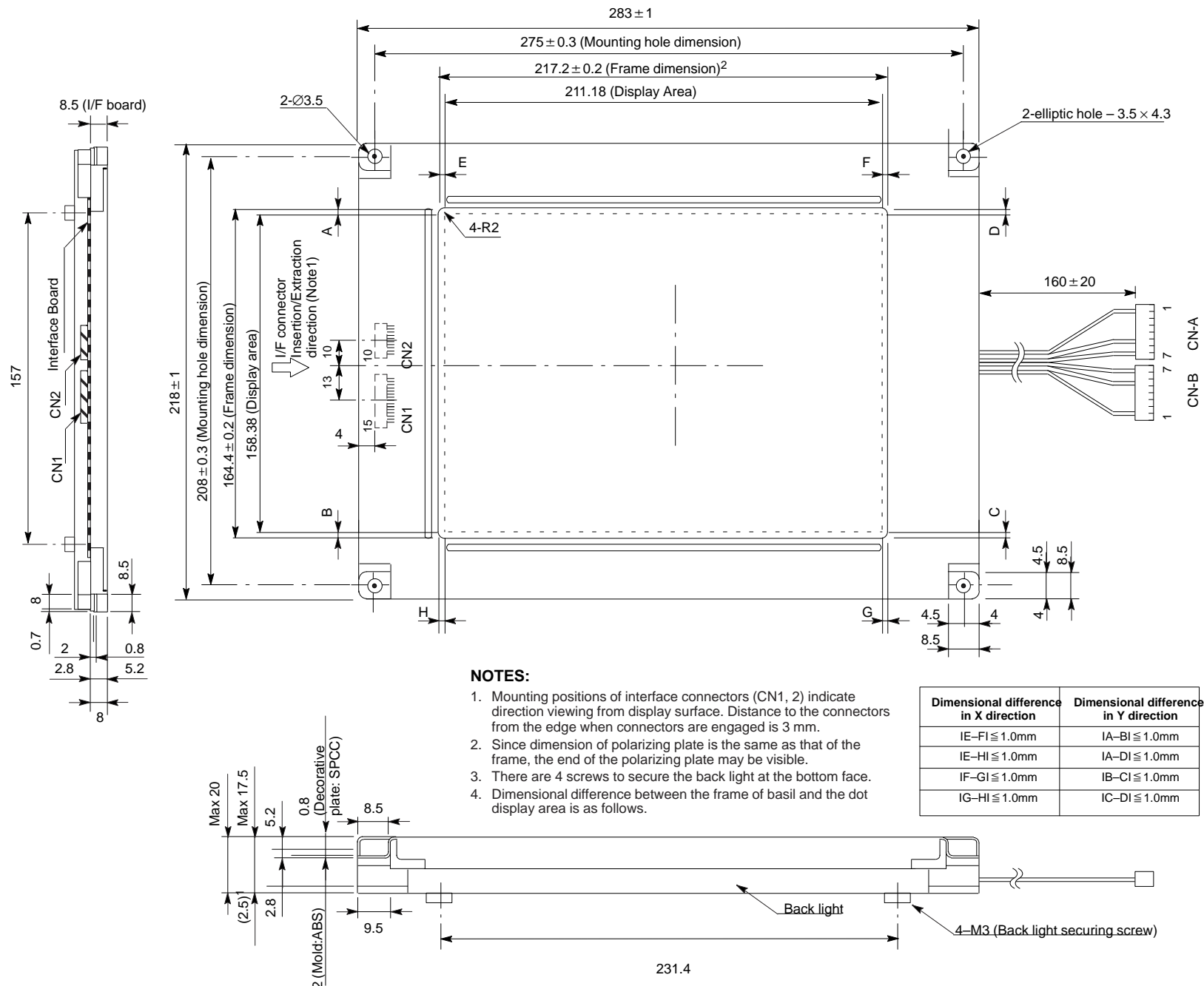


Figure 8-1. LCD Unit Dimensional Outline Drawing