

### FEATURES

- Display Diagonal: 14.2"
- Display Format: 640 × 480
- Overall Dimensions:  
384.0 (W) × 285.0 (H) × 30.0 (D) mm
- Active Area: 288.0 (W) × 216.0 (H) mm
- Dot Pitch: 0.45 (W) × 0.45 (H) mm
- Viewing Angle: 6 O'Clock
- Bits Per Color: 6
- Backlight: HCFT Dual Backlight

### DESCRIPTION

The SHARP LQ14D311 Color TFT-LCD module is an active matrix Liquid Crystal Display (LCD) incorporating amorphous silicon Thin Film Transistor (TFT). The module is composed of a color TFT-LCD panel, driver ICs, control circuit, and a power supply circuit. Graphics and text can be displayed on a 640 × 480 dot panel in 262,144 colors by supplying 6-bit data signals for RGB, four kinds of timing signals, +5 VDC, and supply voltage for the backlight. Optimum viewing angle is at the 6 o'clock direction.

**MECHANICAL SPECIFICATIONS**

PARAMETER	SPECIFICATIONS	UNIT
Screen Size	14.2 (Diagonal)	inch
Effective Display Area	288 (W) × 216 (H)	mm
Display Pixels	640 × 480	pixel
	(1 Pixel = R + G + B Dots)	–
Pixel Pitch	0.45 (W) × 0.45 (H)	mm
Pixel Configuration	RGB Vertical Stripe	–
Display Mode	Normally White	–
Outline Dimensions	384 (W) × 285 (H) × 30 (D)	mm
Weight	Approximately 1800	g
Surface Treatment	Hard-Coating 2H	–

**ABSOLUTE MAXIMUM RATINGS**

SYMBOL	PARAMETER	CONDITION	RATINGS	UNIT	NOTE
V <sub>I</sub>	Input Voltage	t <sub>A</sub> = 25°C	–0.3 to V <sub>CC</sub> +0.3	V	1
V <sub>CC</sub>	+5 V Supply Voltage		–0.3 to +7.0	V	–
V <sub>INV</sub>	Input Voltage for Inverter		–0.3 to +14.0	V	–
T <sub>stg</sub>	Storage Temperature	–	–20 to +60	°C	2
Topa	Operating Temperature (Ambient)	–	0 to +40	°C	

**NOTES:**

1. CK, Hsync, Vsync, R0 to R5, G0 to G5, B0 to B5, ENAB.
2. Humidity: 95% RH maximum at t<sub>A</sub> ≤ 40°C. Maximum wet-bulb temperature ≤ 39°C at t<sub>A</sub> > 40°C.  
No condensation.

## INPUT TERMINALS – TFT-LCD PANEL DRIVER

### CN1 (Interface Signal) <sup>1</sup>

PIN NUMBER	SYMBOL	FUNCTION	POLARITY
1	CK	Clock Signal for Sampling Each Data Signal	–
2	GND	–	–
3	Hsync	Horizontal Sync Signal	Negative
4	Vsync	Vertical Sync Signal	Negative
5	R3	RED Data Signal	Positive
6	R4	RED Data Signal	Positive
7	R5	RED Data Signal (MSB)	Positive
8	GND	–	–
9	G3	GREEN Data Signal	Positive
10	G4	GREEN Data Signal	Positive
11	G5	GREEN Data Signal (MSB)	Positive
12	GND	–	–
13	B3	BLUE Data Signal	Positive
14	B4	BLUE Data Signal	Positive
15	B5	BLUE Data Signal (MSB)	Positive

**NOTE:**

- Connector used: DF13-15P-1.25H (Hirose Electric Co., Ltd.)  
Mating connector: DF13-15S-1.25C (Hirose Electric Co., Ltd.)

### CN2 (Signal & Power Supply) <sup>1</sup>

PIN NUMBER	SYMBOL	FUNCTION	POLARITY
1	V <sub>CC</sub>	+5 V Power Supply	–
2	V <sub>CC</sub>	+5 V Power Supply	–
3	GND	–	–
4	GND	–	–
5	ENAB	Data Enable Signal (to Settle the Display Position)	Positive
6	TST	This is Electrically Opened During Operation	–

**NOTE:**

- Connector used: DG13-6P-1.25H (Hirose Electric Co., Ltd.)  
Mating connector: DF13-6S-1.25C (Hirose Electric Co., Ltd.)

**CN3 (Interface Signal)<sup>1,2</sup>**

PIN NUMBER	SYMBOL	FUNCTION	POLARITY
1	R0	RED Data Signal (LSB)	Positive
2	R1	RED Data Signal	Positive
3	R2	RED Data Signal	Positive
4	GND	–	–
5	G0	GREEN Data Signal (LSB)	Positive
6	G1	GREEN Data Signal	Positive
7	G2	GREEN Data Signal	Positive
8	GND	–	–
9	B0	BLUE Data Signal (LSB)	Positive
10	B1	BLUE Data Signal	Positive
11	B2	BLUE Data Signal	Positive
12	TST	This is Electrically Opened During Operation	–
13	TST	This is Electrically Opened During Operation	–
14	TST	This is Electrically Opened During Operation	–

**NOTES:**

- Used connector: DF13-14P-1.25H (Hirose Electric Co., LTD.)  
Mating Connector: DF13-14S-1.25C (Hirose Electric Co., LTD).
- Do not use the input data signal terminals and enable signal terminal open.

**DC/AC INVERTER****CN4<sup>1</sup>**

PIN NO.	SYMBOL	FUNCTION
1	V <sub>INV</sub>	+12 V Input Power Supply Voltage
2	NC	–
3	GND	–

**NOTE:**

- Used connector: S3B-EH (JST)  
Mating connector: EHR-3 (JST)

ELECTRICAL CHARACTERISTICS AND CURRENT DISSIPATION ( $t_A = 25^\circ\text{C}$ )

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
$V_{CC}$	+5 V Supply Voltage	–	+4.75	+5.0	+5.25	V	1
$I_{CC}$	+5 V Current Dissipation	–	–	1000	TBD	mA	–
$V_{IL}$	Input Signal Voltage (Low)	$V_{CC} = +5\text{ V}$	–	–	+1.5	V	–
$V_{IH}$	Input Signal Voltage (High)		+3.5	–	–	V	
$I_{OL}$	Input Leakage Current	$V_I = 0\text{ V}$	–10	–	0	$\mu\text{A}$	–
$I_{OH}$		$V_I = V_{CC}$	0	–	+10	$\mu\text{A}$	–
$V_{INV}$	DC/AC Inverter Supply Voltage	–	+10.8	+12.0	+13.2	V	–
$I_{INV}$	DC/AC Inverter Input Current	$V_{INV} = +12\text{ V}$	–	–	2000	mA	–
$F_L$	Lamp Frequency	–	–	42	–	KHz	2
–	Lamp Lifetime	–	–	5000	–	Hour	3

## NOTES:

- ON-OFF condition for supply voltage
  - $t_1$ : rise time ( $\leq 100\text{ ms}$ )
  - $t_2$ : power off time ( $\geq 150\text{ ms}$ )
  - Do not turn on again in the period  $t_2$ .
- Backlight unit is composed of a couple of HCFT.
- Lifetime is defined as a sum of on-time until at least either of the following occurs under the cycle of 170 minutes on – 10 minutes off repeatedly at standard conditions.
  - A lamp does not work.
  - The surface brightness is below 60% of the original brightness.

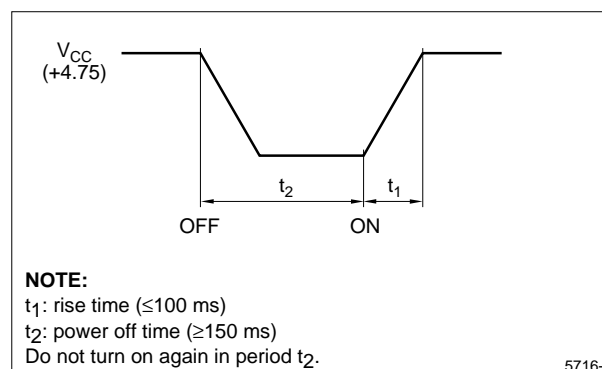


Figure 1. ON/OFF Condition for Supply Voltage

## TIMING CHARACTERISTICS OF INPUT SIGNALS

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
1/t <sub>C</sub>	Clock Frequency	–	25.175	28.322	MHz
t <sub>CH</sub>	Clock High Time	5	–	–	ns
t <sub>CL</sub>	Clock Low Time	10	–	–	ns
t <sub>DS</sub>	Data Setup Time	5	–	–	ns
t <sub>DH</sub>	Data Hold Time	10	–	–	ns
t <sub>ES</sub>	Enable Signal Setup Time	5	–	–	ns
t <sub>H</sub>	Horizontal Sync Signal Cycle	–	31.78	–	μs
		770	800	900	Clock
t <sub>HP</sub>	Horizontal Sync Signal Pulse Width	–	96	–	Clock
t <sub>V</sub>	Vertical Sync Signal Cycle	–	16.7	–	ms
		–	525	–	Line
t <sub>VP</sub>	Vertical Sync Signal Pulse Width	–	2	–	Line
t <sub>HS</sub>	Horizontal Sync Signal Display Start	–	(144)	–	Clock
t <sub>HD</sub>	Horizontal Sync Signal Display Period	–	640	–	Clock
t <sub>VS</sub>	Vertical Sync Signal Display Start	–	34	–	Line
t <sub>VD</sub>	Vertical Sync Signal Display Period	480	480	–	Line
t <sub>VF</sub>	Hsync Clock Phase Difference – Front	0	–	–	ns
t <sub>VB</sub>	Hsync-Vsync Phase Difference – Back	–10	–	–	ns

## NOTES:

1. Make sure the timing of the signals is above values (Standard VGA) to ensure right display position and display quality.
2. Data enable signal should be 'low' longer than one clock in every horizontal period.

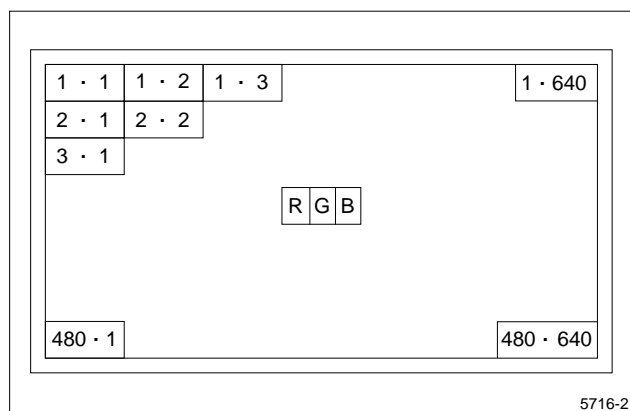
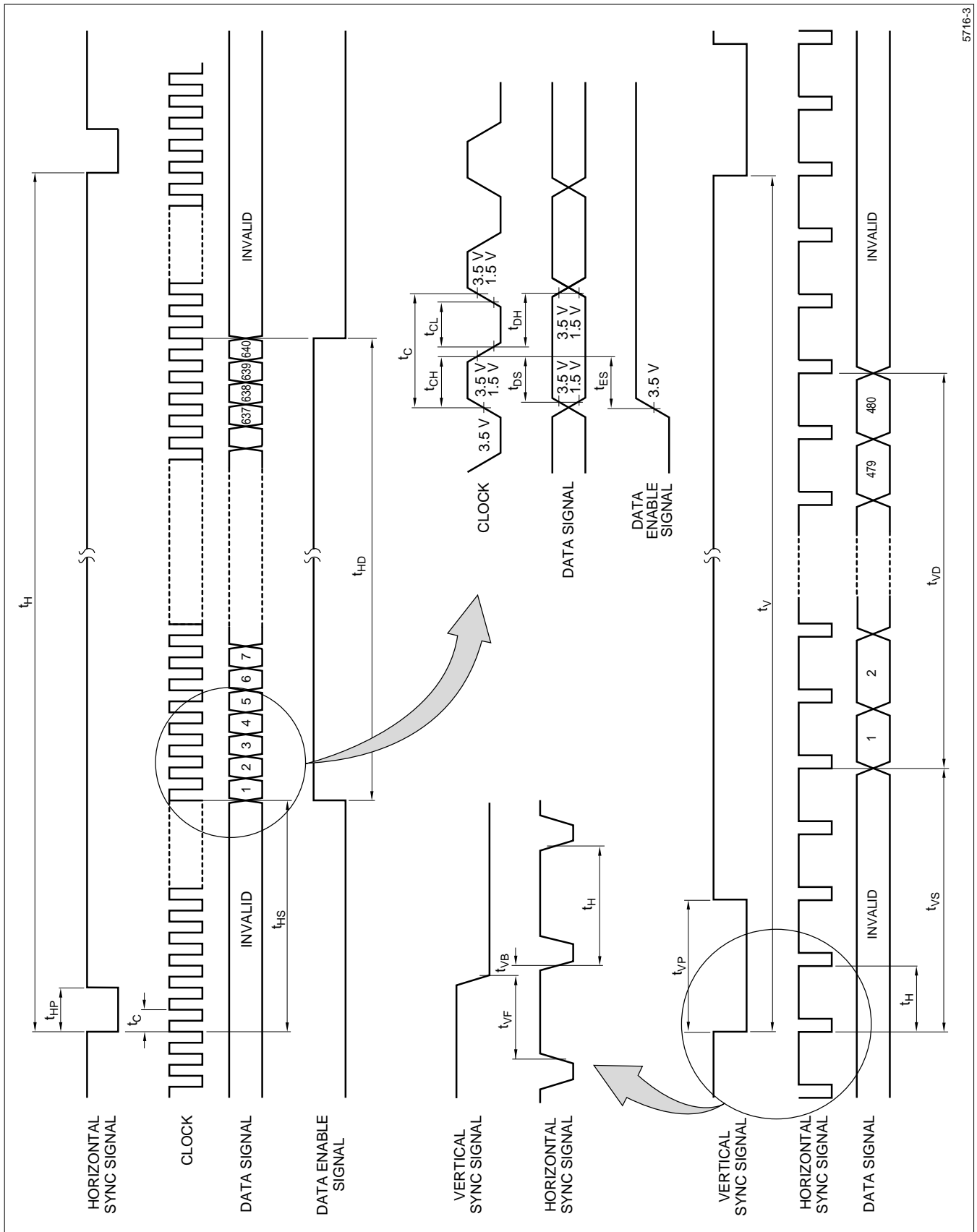


Figure 2. Display Position of Input Data (V - H)



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Figure 3. Input Signal Waveforms

## INPUT SIGNALS, BASIC DISPLAY COLORS, AND GRAY SCALE OF EACH COLOR

COLOR AND GRAY SCALE		DATA SIGNAL														
		R0	R1	R2	...	R5	G0	G1	G2	...	G5	B0	B1	B2	...	B5
Basic Color	Black	0	0	0	...	0	0	0	0	...	0	0	0	0	...	0
	Blue	0	0	0	...	0	0	0	0	...	0	1	1	1	...	1
	Green	0	0	0	...	0	1	1	1	...	1	0	0	0	...	0
	Light Blue	0	0	0	...	0	1	1	1	...	1	1	1	1	...	1
	Red	1	1	1	...	1	0	0	0	...	0	0	0	0	...	0
	Purple	1	1	1	...	1	0	0	0	...	0	1	1	1	...	1
	Yellow	1	1	1	...	1	1	1	1	...	1	0	0	0	...	0
	White	1	1	1	...	1	1	1	1	...	1	1	1	1	...	1
Gray Scale of Red	Black	0	0	0	...	0	0	0	0	...	0	0	0	0	...	0
	↑	1	0	0	...	0	0	0	0	...	0	0	0	0	...	0
	Darker	0	1	0	...	0	0	0	0	...	0	0	0	0	...	0
	↑			.					.					.		
	↓			.					.					.		
	Brighter	1	0	1	...	1	0	0	0	...	0	0	0	0	...	0
	↓	0	1	1	...	1	0	0	0	...	0	0	0	0	...	0
	Red	1	1	1	...	1	0	0	0	...	0	0	0	0	...	0
Gray Scale of Green	Black	0	0	0	...	0	0	0	0	...	0	0	0	0	...	0
	↑	0	0	0	...	0	1	0	0	...	0	0	0	0	...	0
	Darker	0	0	0	...	0	0	1	0	...	0	0	0	0	...	0
	↑			.					.					.		
	↓			.					.					.		
	Brighter	0	0	0	...	0	1	0	1	...	1	0	0	0	...	0
	↓	0	0	0	...	0	0	1	1	...	1	0	0	0	...	0
	Green	0	0	0	...	0	1	1	1	...	1	0	0	0	...	0
Gray Scale of Blue	Black	0	0	0	...	0	0	0	0	...	0	0	0	0	...	0
	↑	0	0	0	...	0	0	0	0	...	0	1	0	0	...	0
	Darker	0	0	0	...	0	0	0	0	...	0	0	1	0	...	0
	↑			.					.					.		
	↓			.					.					.		
	Brighter	0	0	0	...	0	0	0	0	...	0	1	0	1	...	1
	↓	0	0	0	...	0	0	0	0	...	0	0	1	1	...	1
	Blue	0	0	0	...	0	0	0	0	...	0	1	1	1	...	1

## NOTES:

- Each color is displayed in 64 gray scales from 6-bit data signal input. According to the combination of the total 18-bit data, 262,144 colors are available.
- 0 = Low Level Voltage  
1 = High Level Voltage



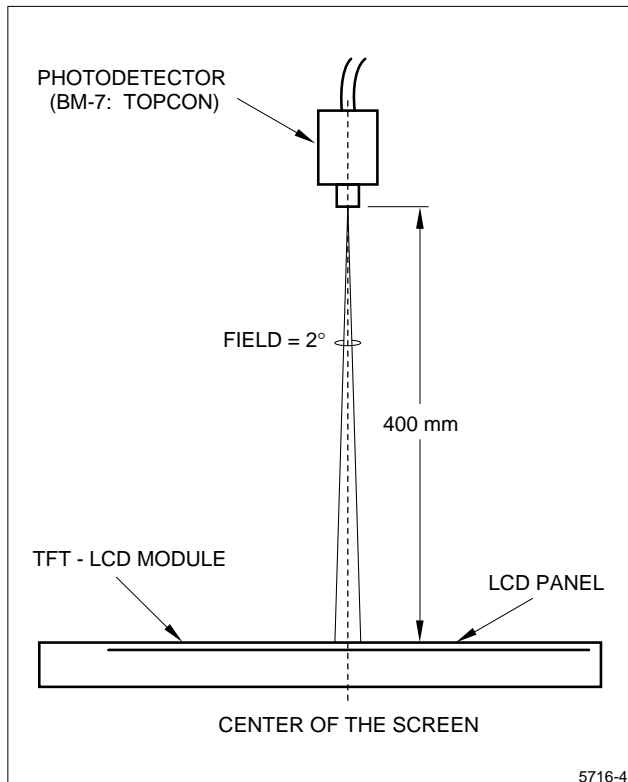
**OPTICAL CHARACTERISTICS (t<sub>A</sub> = 25°C, V<sub>CC</sub> = +5 V)**

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
θ <sub>21.22</sub>	Horizontal Viewing Angle Range	CR > 10	45	—	—	degrees	2
θ <sub>11</sub>	Vertical Viewing Angle Range		10	—	—		
θ <sub>12</sub>			30	—	—		
CR	Contrast Ratio	θ = 0°	60	—	—	—	3
t <sub>R</sub>	Response Time – Rise		—	30	—	ms	4
t <sub>F</sub>	Response Time – Fall		—	50	—	ms	
x	Chromaticity of White		—	0.3127	—	—	—
y			—	0.3290	—	—	
Y <sub>L</sub>	Surface Brightness		TBD	90	—	cd/m <sup>2</sup>	5
δ <sub>W</sub>	White Uniformity		—	—	1.25	—	

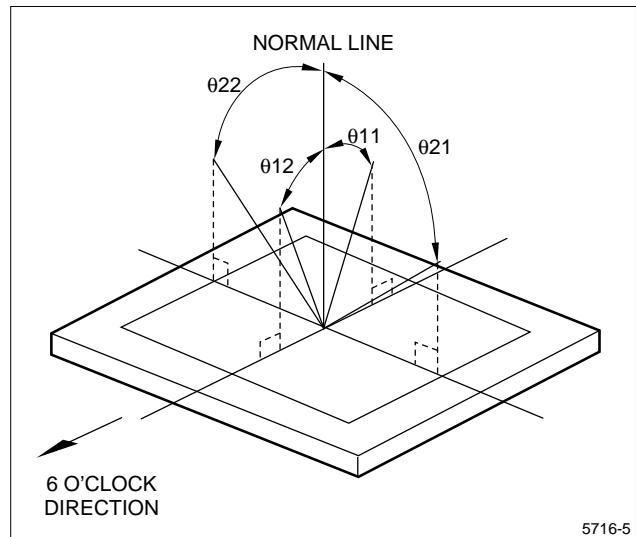
**NOTES:**

1. The measurement shall be executed 15-20 minutes after the module has been lit at the proper rating. The optical characteristics are measured in a dark room or equivalent state at the center of the screen except for white uniformity with the method shown in Figure 4.
2. Figure 5 shows the definition of the viewing angle range.
3. The Contrast Ratio is defined as follows:  $\text{Contrast Ratio} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$
4. The Response Time is measured as shown in Figure 6 by switching the input signals for 'black' ON and OFF.
5. The White Uniformity is defined as the following equation among the values measured at the five spots (A-E) as shown in Figure 7:  

$$\frac{\text{Maximum Luminance (brightness)}}{\text{Minimum Luminance (brightness)}}$$



**Figure 4. Optical Characteristics Measurement Method**



**Figure 5. Definition of Viewing Angle**

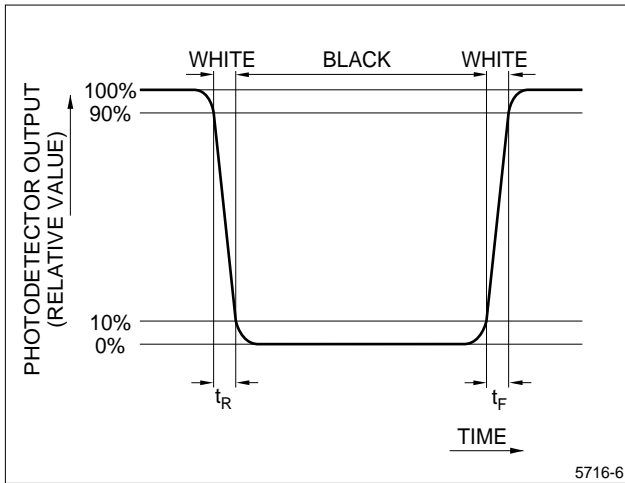


Figure 6. Definition of Response Time

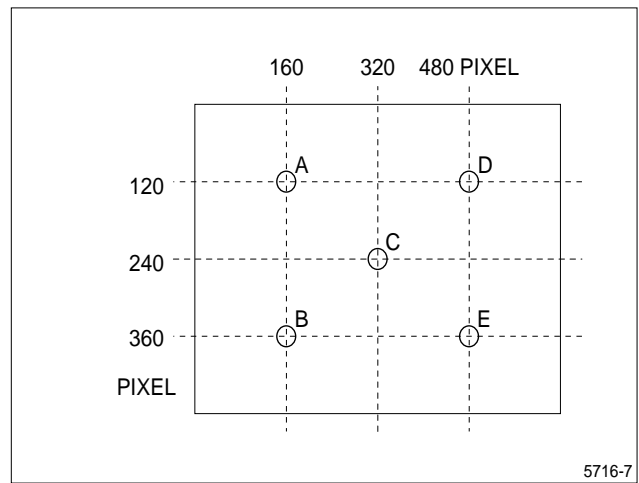


Figure 7. Definition of White Uniformity

**DISPLAY QUALITY**

The display quality of the color TFT-LCD module shall be in compliance with the Delivery Inspection Standard.

**HANDLING PRECAUTIONS**

- Be sure to insert the cable into the connector or take it out of the connector after turning off the power supply on the set side.
- Power ON/OFF sequential timing – To prevent the latch-up of the circuit in the module, keep the sequential timing between input signals and supply voltages as shown in Figure 8.

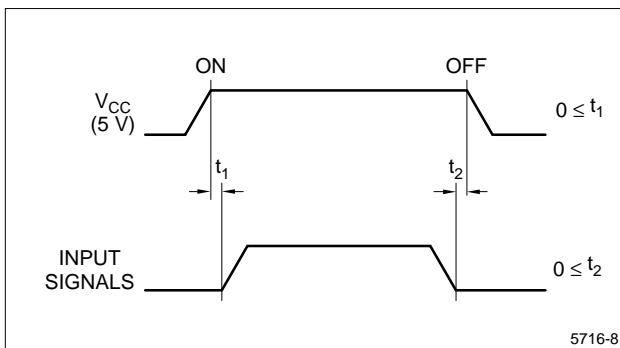


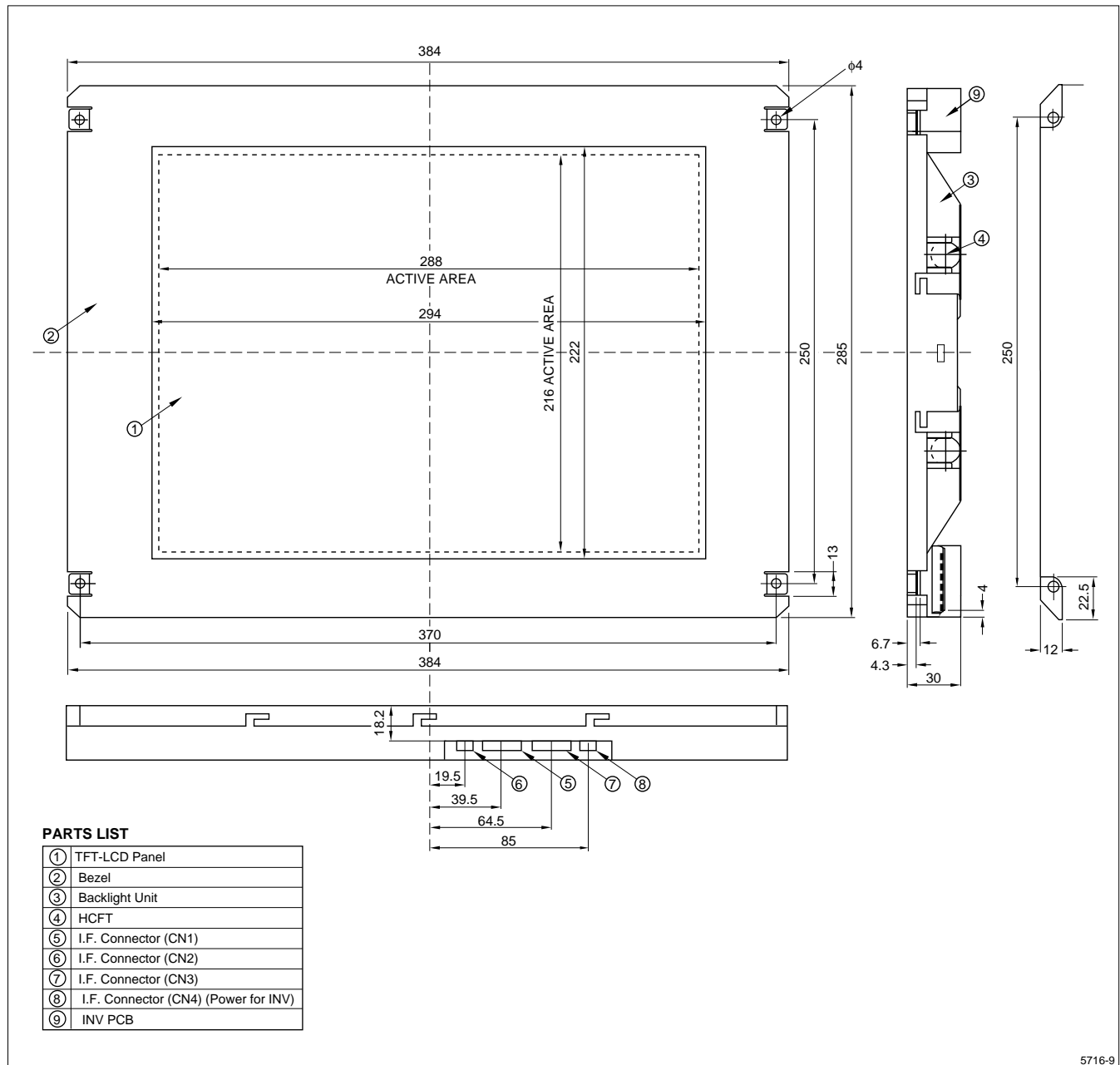
Figure 8. Power ON/OFF Sequential Timing

- When installing the module, be sure to fix the module on the same plane, taking care not to warp or twist the module.
- Handle the front polarizer carefully since it scratches easily.
- Wipe off liquid immediately since it can cause color changes and staining.
- If the surface of the LCD cells need cleaning, wipe it with a soft cloth.
- The LCD is made of glass plates. Use care when handling it to avoid breakage.
- This unit contains CMOS LSIs which are sensitive to electrostatic charges. Take care to protect the unit from electrostatic discharge.
- Adjusting volumes have been optimally set before shipment, so do not change any adjusted values. If adjusted values are changed, the specifications described here may not be satisfied.
- Do not disassemble the unit.
- Observe all other precautionary requirements in handling components.

**OTHER INFORMATION**

If any problem should arise from this specification, the supplier and user should work out a mutually acceptable solution.

OUTLINE DIMENSIONS



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