

FEATURES

- Display Diagonal: 10.4"
- Display Format: 1024 × 768
- Overall Dimensions:
283.0 (W) × 215.6 (H) × 12.5 (D) mm
- Active Area: 212.0 (W) × 159.0 (H) mm
- Dot Pitch: 0.207 (W) × 0.207 (H) mm
- Viewing Angle: 6 O'Clock
- Bits Per Color: 3
- Backlight: CCFT Dual Edgelit

DESCRIPTION

The SHARP LQ10DX01 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 1024 × 768 pixel panel in 512 colors by supplying a 9 × 2 bit parallel data signal, three kinds of timing signals, +5 VDC and +12 VDC supply voltages, and supply voltage for the backlight. Optimum viewing direction is 6 o'clock.

NOTE: A backlight-driving DC/AC inverter is not built into this module.

MECHANICAL SPECIFICATIONS

PARAMETER	SPECIFICATIONS	UNIT	NOTE
Screen Size	26 (Diagonal)	cm	–
	10.4 (Diagonal)	inch	–
Effective Display Area	212.0 (H) × 159.0 (V)	mm	–
Display Pixels	1024 (H) × 768 (V)	pixel	–
	(1 Pixel = R + G + B Dots)	–	–
Pixel Pitch	0.207 (H) × 0.207 (V)	mm	–
Pixel Configuration	RGB Vertical Stripe	–	–
Display Mode	Normally White	–	–
Outline Dimensions	283 (W) × 215.6 (H) × 12.5 (D)	mm	1
Weight	870 ± 30	g	–
Surface Treatment	Anti-Glare and Hard-Coating 2H	–	–

NOTE:

1. Excludes backlight cables.

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	CONDITION	RATINGS	UNIT	NOTE
V _I	Input Voltage	t _A = 25°C	–0.3 to V _{CC} +0.3	V	1
V _{CC}	+5 V Supply Voltage		–0.3 to +7	V	–
V _{DD}	+12 V Supply Voltage		–0.3 to +14	V	–
T _{stg}	Storage Temperature	–	–25 to +60	°C	2
T _{opa}	Operating Temperature - Ambient	–	0 to +50	°C	

NOTES:

1. CK, Hsync, Vsync, R00 – R02, G00 – G0, B00 – B02, R10 – R12, G10 – G12, B10 – B12.
2. Humidity: 95% RH maximum at t_A ≤ 40°C. Maximum wet-bulb temperature 39°C or less at t_A > 40°C.
No condensation.

INPUT TERMINALS – TFT-LCD PANEL DRIVING SECTION

CN1 (Data Signals) ¹

PIN NUMBER	SYMBOL	FUNCTION
1	GND	–
2	R00	RED Data Signal of the Odd Pixels (LSB)
3	R01	RED Data Signal of the Odd Pixels
4	R02	RED Data Signal of the Odd Pixels (MSB)
5	R10	RED Data Signal of the Even Pixels (LSB)
6	R11	RED Data Signal of the Even Pixels
7	R12	RED Data Signal of the Even Pixels (MSB)
8	GND	–
9	G00	GREEN Data Signal of the Odd Pixels (LSB)
10	G01	GREEN Data Signal of the Odd Pixels
11	G02	GREEN Data Signal of the Odd Pixels (MSB)
12	G10	GREEN Data Signal of the Even Pixels (LSB)
13	G11	GREEN Data Signal of the Even Pixels
14	G12	GREEN Data Signal of the Even Pixels (MSB)
15	GND	–
16	B00	BLUE Data Signal of the Odd Pixels (LSB)
17	B01	BLUE Data Signal of the Odd Pixels
18	B02	BLUE Data Signal of the Odd Pixels (MSB)
19	B10	BLUE Data Signal of the Even Pixels (LSB)
20	B11	BLUE Data Signal of the Even Pixels
21	B12	BLUE Data Signal of the Even Pixels (MSB)

NOTE:

1. Connector used: DF9B-21P-1V (Hirose Electric Co., Ltd.)
Mating connector: DF9B-21S-1V (Hirose Electric Co., Ltd.)

CN2 (POWER SUPPLY AND SIGNALS)^{1, 2}

PIN NO	SYMBOL	FUNCTION
1	GND	–
2	CK	Clock Signal for Sampling Each Data Signal
3	GND	–
4	Hsync	Horizontal Sync Signal (Negative)
5	GND	–
6	Vsync	Vertical Sync Signal (Negative)
7	TEST1	This Shall be Electrically Opened During Operation
8	TEST2	
9	TEST3	This Shall be Connected to V _{CC}
10	V _{DD}	+12 V Power Supply
11		
12		
13	V _{CC}	+5 V Power Supply
14		
15		

NOTES:

- Used connector: DF9B-15P-1V (Hirose Electric Co., LTD)
Mating connector: DF9B-15S-1V (Hirose Electric Co., LTD)
- The shielding case is connected with signal GND.

INPUT TERMINALS – BACKLIGHT DRIVING SECTION**CNA, CNB (BACKLIGHT)**^{1, 2}

PIN NO	SYMBOL	FUNCTION
1	V _{HIGH}	Power Supply for Lamp (High-Voltage Side)
2	NC	–
3	V _{LOW}	Power Supply for Lamp (Low-Voltage Side)

NOTES:

- Used connector: QZ-19-3F01 (Honda Tsushin Kogyo Co., LTD)
Mating connector: QZ-19-3MYL (Honda Tsushin Kogyo Co., LTD)
- Cable length: CNA & CNB 50 –0/+15 mm

ELECTRICAL CHARACTERISTICS AND CURRENT DISSIPATION

TFT-LCD PANEL DRIVING ($t_A = 25^\circ\text{C}$)

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
V_{CC}	+5 V Supply Voltage	–	+4.5	+5.0	+5.5	V	–
I_{CC}	+5 V Current Dissipation	–	–	320	550	mA	1
V_{DD}	+12 V Supply Voltage	–	+10.8	+12.0	+13.2	V	–
I_{DD}	+12 V Current Dissipation	–	–	370	450	mA	1
V_{IL}	Input Voltage (Low)	$V_{CC} = +5\text{ V}$	–	–	1.5	V	–
V_{IH}	Input Voltage (High)		+3.5	–	–	V	–
V_{RP}	Permissive Input Ripple Voltage	V_{CC}, V_{DD}	–	–	100	mV _{P-P}	–
I_{OL}	Input Low Current	$V_I = 0\text{ V}$	–10	–	–	μA	–
I_{OH}	Input High Current	$V_I = V_{CC}$	0	–	+10	μA	–

NOTE:

- Current dissipation is measured as shown in Figure 1.

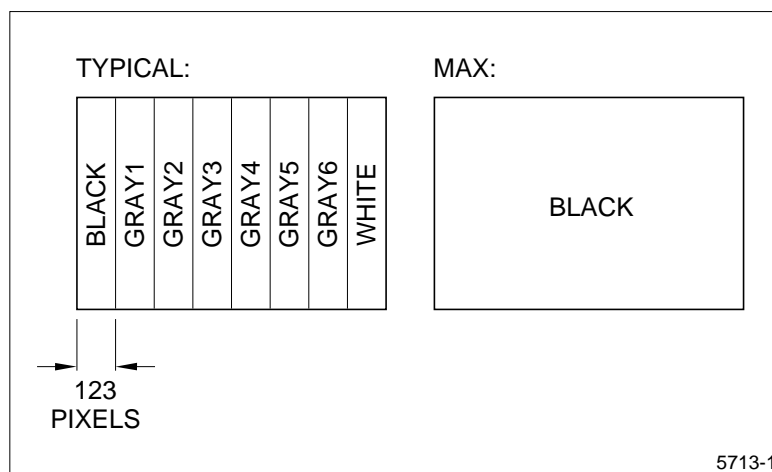


Figure 1. Current Dissipation

ELECTRICAL CHARACTERISTICS – BACKLIGHT ($t_A = 25^\circ\text{C}$)

The Backlight system is an edge-lighting type (2 CCFTs).

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
V_L	Lamp Voltage	Just for reference	–	455	–	V_{RMS}	–
I_L	Lamp Current	Just for reference	6.5	7.0	7.5	mARMS	–
P_L	Lamp Power Consumption	–	–	3.2	–	W	1
F_L	Frequency	–	20	–	60	kHz	2
V_S	Kick-Off Voltage	$t_A = 25^\circ\text{C}$ $t_A = 0^\circ\text{C}$	–	–	1000 1200	V_{RMS}	–
T_L	Lamp Lifetime	–	10,000	–	–	Hour	3

NOTES:

1. Calculated value for reference ($I_L \times V_L$).
2. Lamp frequency may produce interference with horizontal sync frequency, causing heat on the display. Therefore, make lamp frequency as different as possible from the ones of horizontal sync and harmonics horizontal sync to avoid interference.
3. Brightness becomes 50% of the original brightness at standard conditions ($I_L = 7.0$ mA RMS).

TIMING CHARACTERISTICS OF INPUT SIGNALS

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	NOTE
1/t _C	Clock Frequency	–	27.0	28.4	MHz	1
t _{CH}	Clock High Time	5	–	–	ns	–
t _{CL}	Clock Low Time	10	–	–	ns	–
t _{DS}	Data Setup Time	0	–	–	ns	–
t _{DH}	Data Hold Time	10	–	–	ns	–
t _H	Horizontal Sync Signal Cycle	–	19.259	–	μs	–
		516	520	–	Clock	–
t _{HP}	Horizontal Sync Signal Pulse Width	4	4	32	Clock	–
t _{HC}	CK-Hsync Phase Difference	0	–	Tc-10	ns	–
t _V	Vertical Sync Signal Cycle	–	14.868	–	ms	–
		772	772	–	Line	–
t _{VP}	Vertical Sync Signal Pulse Width	4	4	8	Line	–
t _{VH}	Hsync-Vsync Phase Difference	0	–	100	ns	–

NOTE:

1. Two pixel-data are sampled at a time:
 - a. Make sure that the signals are above data to ensure right display position and display quality.
 - b. If the frequency is lower, deterioration of display quality, such as flickering, may occur.

Display Period

ITEMS	STANDARDS	BEGINNING	ENDING	UNIT
Horizontal	Falling Edge of Hsync	4	516	Clock
Vertical	Falling Edge of Vsync	4	772	Line

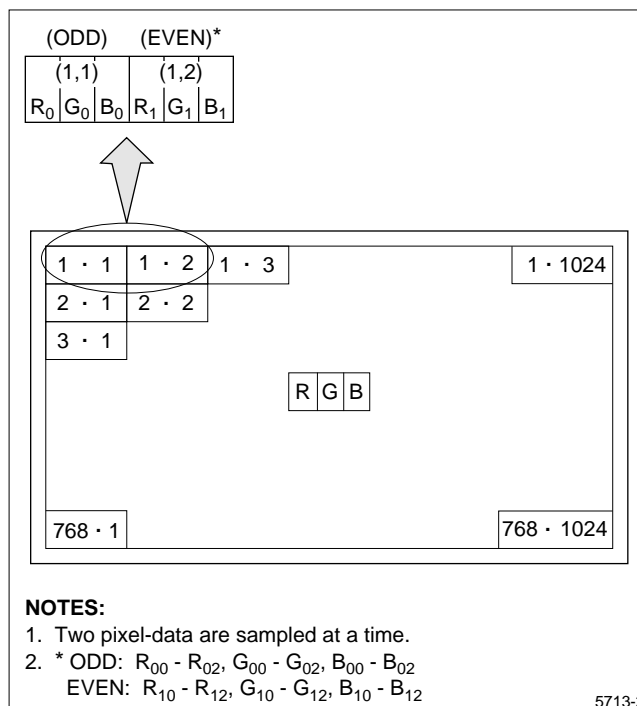
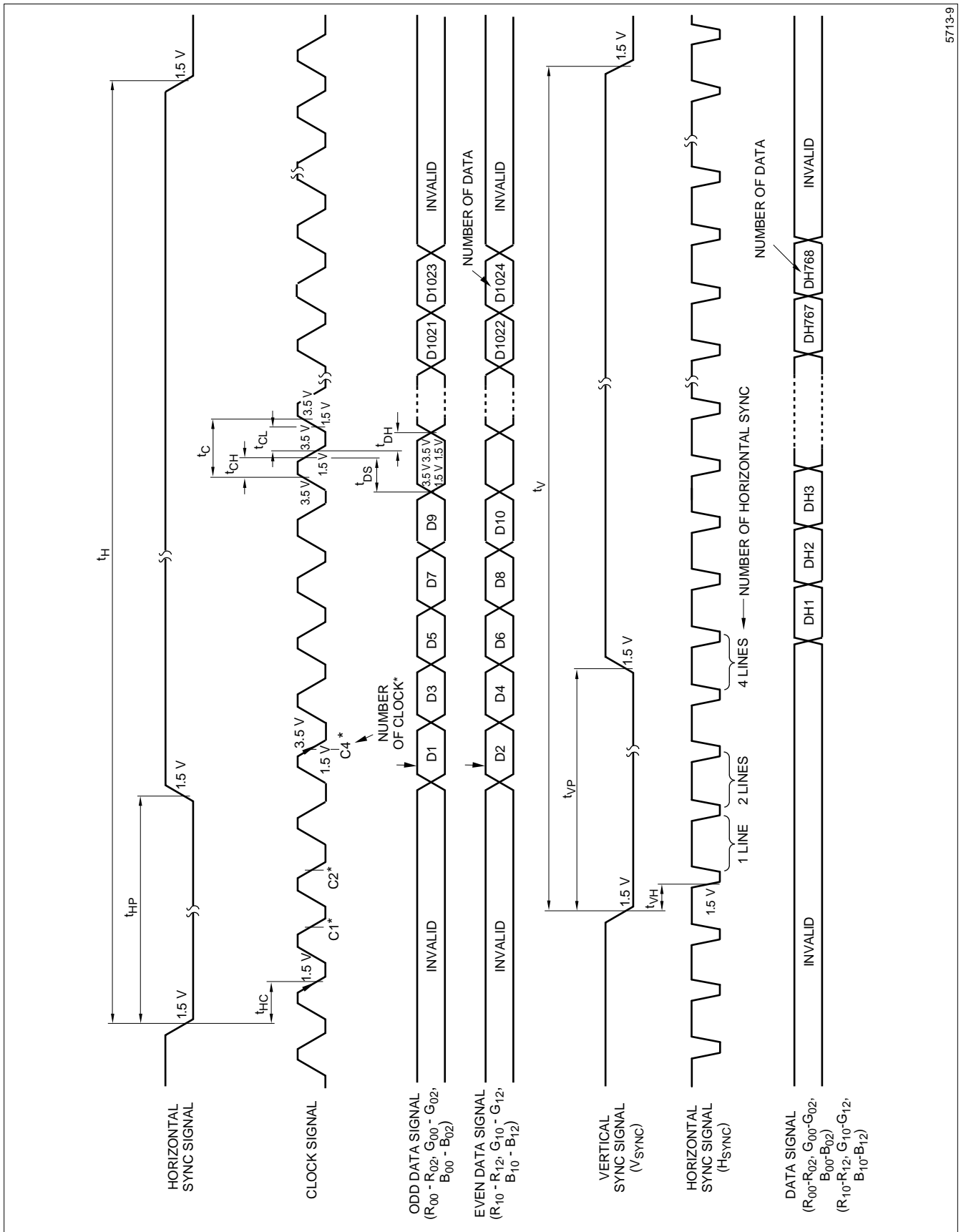


Figure 2. Display Position of Input Data (V - H)



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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									
	ODD	R ₀₀	R ₀₁	R ₀₂	G ₀₀	G ₀₁	G ₀₂	B ₀₀	B ₀₁	B ₀₂
	EVEN	R ₁₀	R ₁₁	R ₁₂	G ₁₀	G ₁₁	G ₁₂	B ₁₀	B ₁₁	B ₁₂
Basic Color	Black	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	1	1	1
	Green	0	0	0	1	1	1	0	0	0
	Light Blue	0	0	0	1	1	1	1	1	1
	Red	1	1	1	0	0	0	0	0	0
	Purple	1	1	1	0	0	0	1	1	1
	Yellow	1	1	1	1	1	1	0	0	0
	White	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0
	↑	1	0	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0
	↑	1	1	0	0	0	0	0	0	0
	↓	0	0	1	0	0	0	0	0	0
	Brighter	1	0	1	0	0	0	0	0	0
	↓	0	1	1	0	0	0	0	0	0
	Red	1	1	1	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0
	↑	0	0	0	1	0	0	0	0	0
	Darker	0	0	0	0	1	0	0	0	0
	↑	0	0	0	1	1	0	0	0	0
	↓	0	0	0	0	0	1	0	0	0
	Brighter	0	0	0	1	0	1	0	0	0
	↓	0	0	0	0	1	1	0	0	0
	Green	0	0	0	1	1	1	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0
	↑	0	0	0	0	0	0	1	0	0
	Darker	0	0	0	0	0	0	0	1	0
	↑	0	0	0	0	0	0	1	1	0
	↓	0	0	0	0	0	0	0	0	1
	Brighter	0	0	0	0	0	0	1	0	1
	↓	0	0	0	0	0	0	0	1	1
	Blue	0	0	0	0	0	0	1	1	1

NOTES:

- Each color is displayed in eight gray scales from 3-bit data signal input. According to the combination of the total 9-bit data, 512 colors are displayed.
- 0 = Low-Level Voltage
1 = High-Level Voltage

OPTICAL CHARACTERISTICS (t_A = 25°C, V_{CC} = +5.0 V, V_{DD} = +12.0 V)

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
θ _{21.22}	Horizontal Viewing Angle Range	CR > 10	45	—	—	degrees	2
θ ₁₁	Vertical Viewing Angle Range		10	—	—		
θ ₁₂			30	—	—		
CR	Contrast Ratio	θ = 0°	60	—	—	—	3
t _R	Response Time – Rise		—	30	—	ms	4
t _F	Response Time – Decay		—	50	—	ms	
Y _L	Luminance of White		50	70	—	cd/m ²	—
x	Chromaticity of White		—	0.313	—	—	—
y			—	0.329	—	—	—
δ _W	White Uniformity		—	—	1.25	—	5

NOTES:

- The measurement shall be executed 15-20 minutes after the module has been lit at the proper rating (I_L = 7.0 mA RMS). The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Figure 4. These characteristics, except for White Uniformity, are measured at the center of the screen.
- Figure 5 shows the definitions of the viewing angle range.
- The Contrast Ratio is defined as follows: Contrast Ratio = $\frac{\text{Luminance(brightness) with all pixels white}}{\text{Luminance(brightness) with all pixels black}}$
- The Response Time is measured as shown in Figure 6 by switching the input signals for 'black' ON and OFF.
- Definition of White Uniformity is defined as the following equation among the values measured at the five spots (A - E) (see Figure 7):

$$\frac{\text{maximum luminance(brightness)}}{\text{minimum luminance(brightness)}}$$

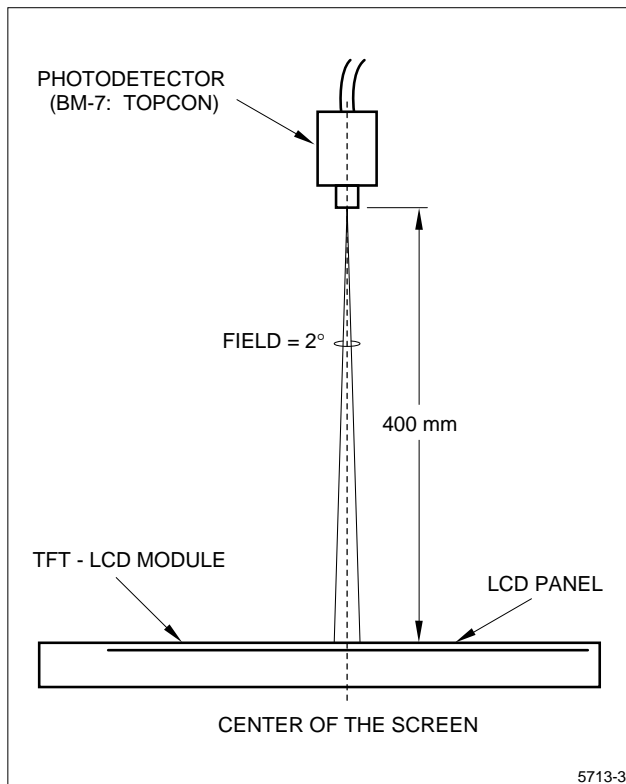


Figure 4. Optical Characteristics Measurement Method

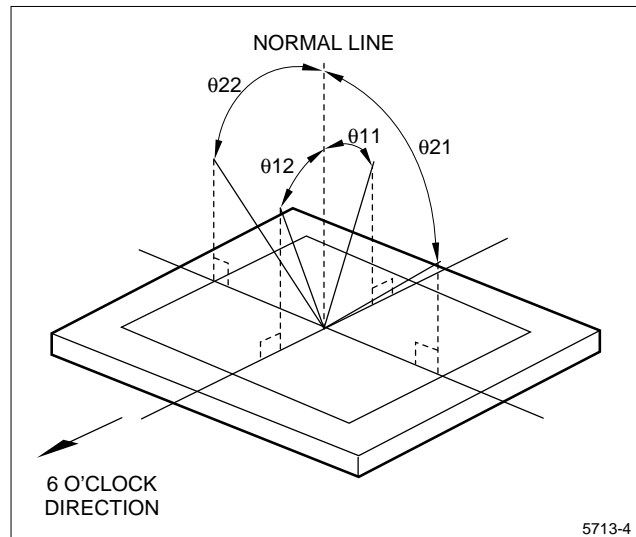


Figure 5. Definition of Viewing Angle

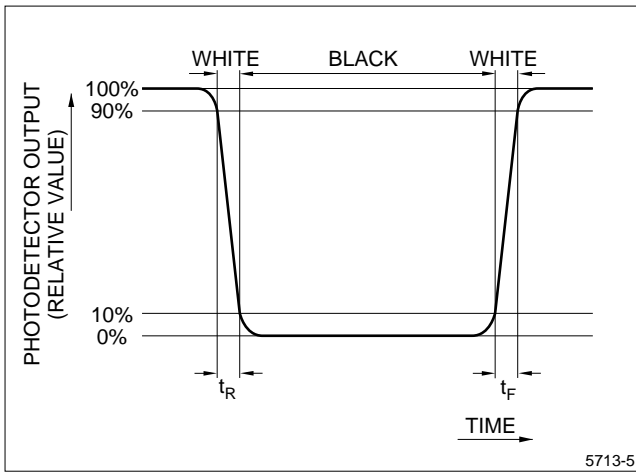


Figure 6. Definitions of Response Time

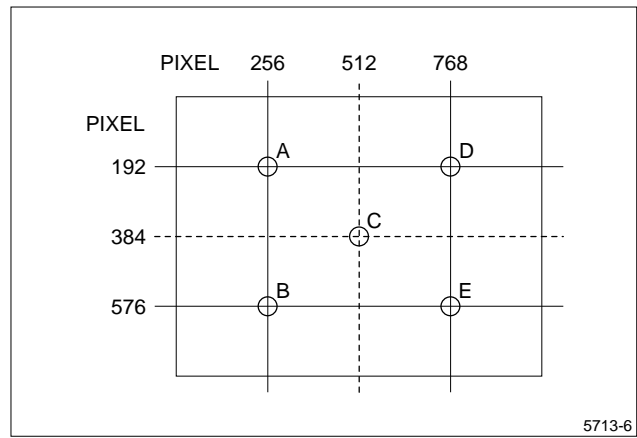


Figure 7. Definition of White Uniformity

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 remove it from 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.
- When installing the module, be sure to fix the module on the same plane, taking care not to warp or twist the module.

- A transparent acrylic resin board or other type of transparent protective plate is recommended to be attached to the front of the module to protect the LCD panel.
- Since the front polarizer is easily damaged, use care to not scratch the face.
- Wipe liquid off 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.
- Since CMOS LSI is used in this module, avoid static electric problems by grounding yourself before handling the module.
- 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.

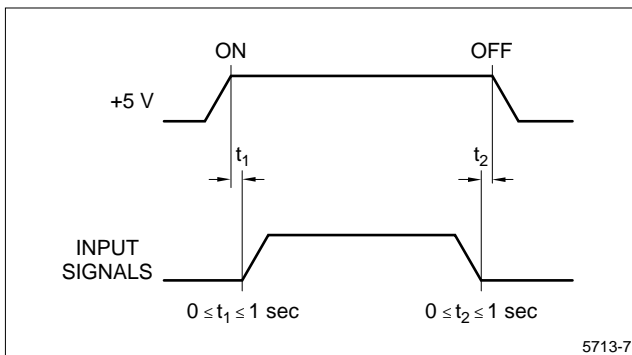


Figure 8. Power ON/OFF Sequential Timing

PACKING SPECIFICATIONS

Refer to the Packing Form shown in Figure 9.

- Piling number of cartons: 6 (MAX)
- Package quantity in one carton: 10 (MAX)
- Carton size: 420 (W) x 330 (H) x 400 (D) mm
- Total weight of 1 carton filled with full modules: 12,000g

OTHER INFORMATION

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

RESULT EVALUATION CRITERIA

Under the display quality test conditions with normal operation state, there shall be no change which may affect practical display function.

RELIABILITY TEST ITEMS

NUMBER	TEST ITEM	CONDITIONS
1	High Temperature Storage Test	$t_A = 60^\circ\text{C}$, 240 H
2	Low Temperature Storage Test	$t_A = -25^\circ\text{C}$, 240 H
3	High Temperature and High Humidity Operation Test	$t_A = 40^\circ\text{C}$, 95% RH, 240 H (No condensation)
4	High Temperature Operation Test	$t_A = 50^\circ\text{C}$, 240 H (The panel temperature must be less than 60°C)
5	Low Temperature Operation Test	$t_A = 0^\circ\text{C}$, 240H
6	Vibration Test (Non-Operating)	Frequency: 10 to 57 Hz Vibration width (one side): 0.075 mm Frequency: 58 to 500 Hz Gravity: 9.8m/s^2 Sweep Time: 11 minutes Test Period: 3 hours in total (One hour for each direction of X/Y/Z)
7	Shock Test (Non-Operating)	Maximum Gravity: 490m/s^2 Pulse Width: 11 ms, sine wave Direction: $\pm X/\pm Y/\pm Z$, once for each direction

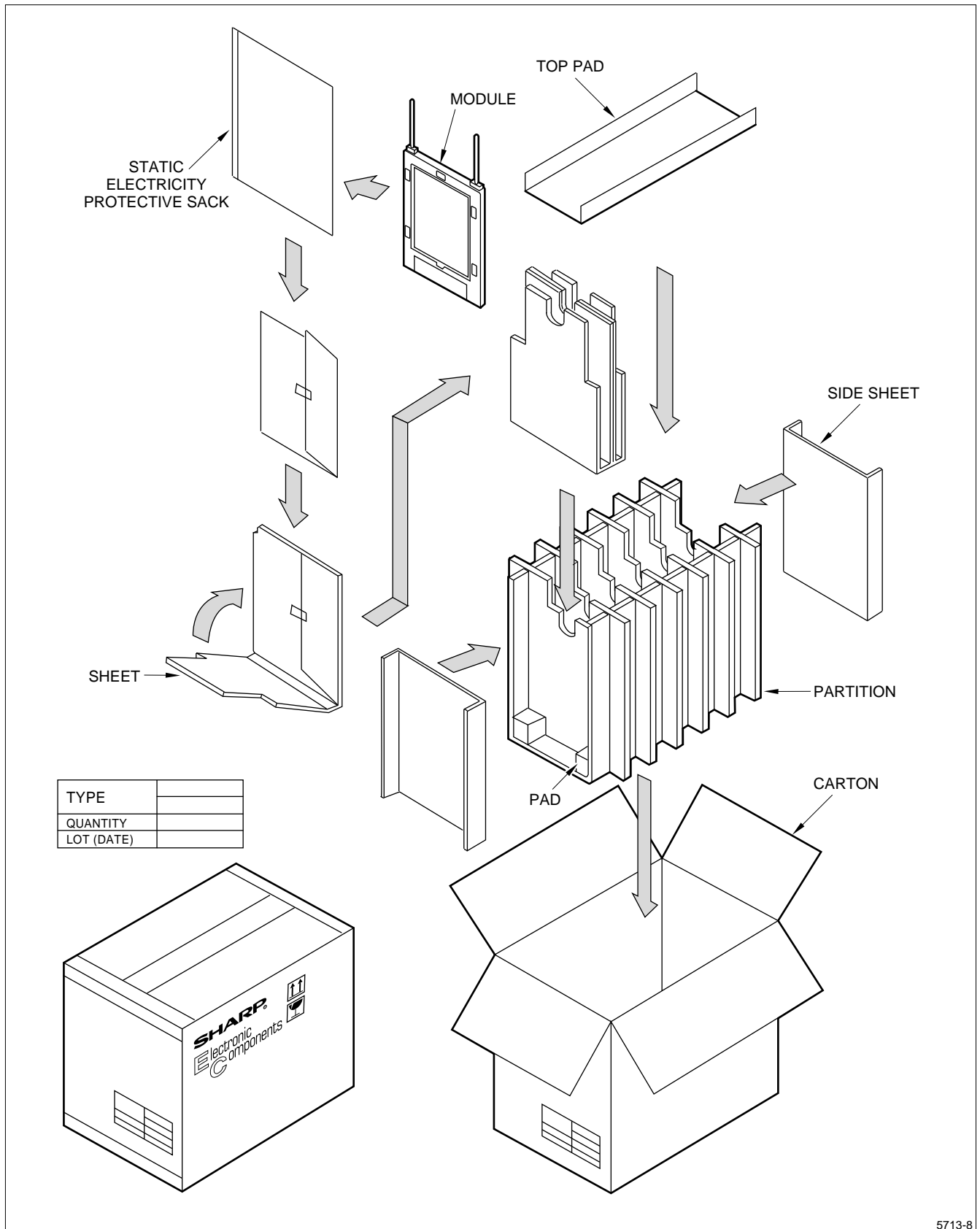
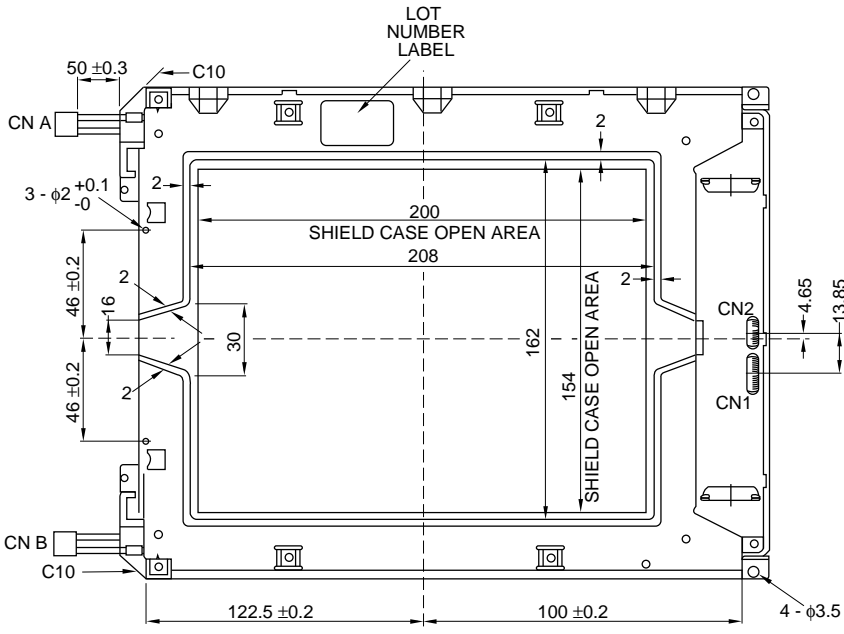
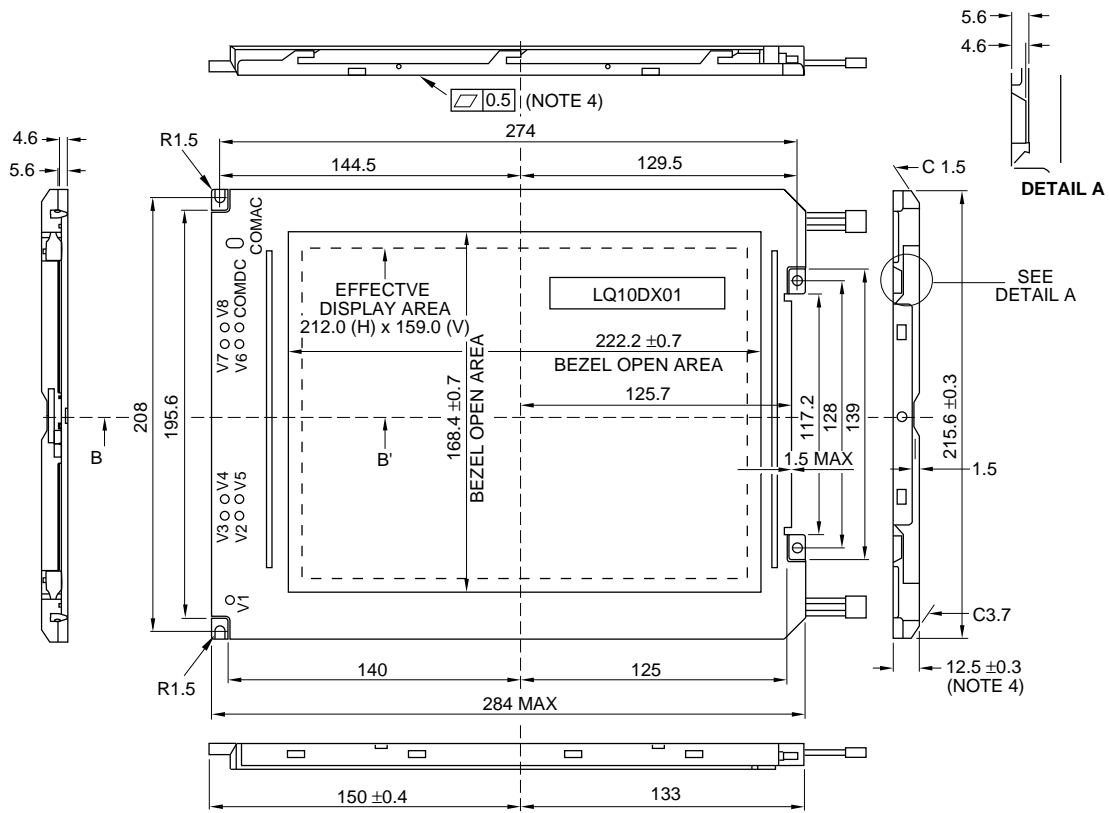
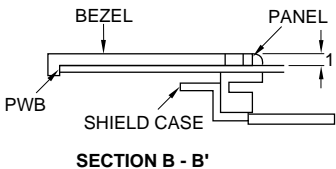


Figure 9. Packing Form

OUTLINE DIMENSIONS



- NOTES:**
1. φ2.5 Hole (x3) is locating hole of module.
 2. Inserted depth of locating pin is 5 mm MAX.
 3. Tolerances are ±0.3 mm unless otherwise specified.
 4. The flatness is not included in the specified tolerance.



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