



CrystalFontz America, Incorporated

GRAPHIC TFT MODULE SPECIFICATIONS

CFAF800480C1-050T

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MAIN FEATURES

FEATURES' MODULE CLASSIFICATION INFORMATION

① CFA **②** F **③** 800 **④** 480 **⑤** C1- **⑥** 050 **⑦** T

①	Brand	Crystalfontz America, Inc.
②	Display Type	F – TFT
③	Number of Pixels (Width)	800 pixels
④	Number of Pixels (Height)	480 pixels
⑤	Model Identifier	C1
⑥	diagonal size	5.0 inch
⑦	Backlight Type & Color	T – White LED Backlight



ORDERING INFORMATION

PART NUMBER
CFAF800480C1-050T

1.0 MECHANICAL SPECIFICATIONS

PHYSICAL CHARACTERISTICS

Number of Pixels		
800 x480 pixels = 384000 pixels		
Pixel Detail	Horizontal	Vertical
Pixel Size	0.135	0.135
RGB Pixel		

Module Depth		
	Maximum	Nominal
Millimeters	3.7	3.4
Inches	0.1457	0.1339

Viewing Area		
	Width	Height
Millimeters	110.3	68.5
Inches	4.3740	3.4606

Active Area		
Diagonal	Inches: 5.0"	
	Width	Height
Millimeters	108	64.8
Inches	1.6667	2.5512

Module Excluding		
	Width	Height
Millimeters		
Inches		

Module Overall Including		
	Width	Height
Millimeters	121	76
Inches	4.6635	3.0531



2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DD}	-0.5	5.0	V	GND=0
Logic Signal Input Level	V_i	-0.3	$V_{DD} + 0.3$	V	

2.1.2 Back-Light Unit

Item	Symbol	Typ.	Max.	Unit	Note
Forward current	I_L	30	40	mA	(1)(2)(3)
Forward voltage	V_L	23.1 (Typ)	-	V	(1)(2)(3)

Note

- (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.
- (2) $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test Condition: LED current 40 mA. The LED lifetime could be decreased if operating I_L is larger than 40mA.

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	70	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-30	80	$^\circ\text{C}$	

CAUTION

Do not drive the LEDs at any current over their rated maximum of 20mA (15mA recommended for longer life). Be aware that the forward voltage of white LEDs can vary (LED to LED, batch to batch, and over time) by a significant amount. We recommend using a constant current LED power supply such as the AP3036, NCP5007, FAN5333, or similar to drive the LEDs. Do not use a constant voltage source to drive the LEDs.



3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast	CR	Normal Viewing Angle	480	600	—		(1)(2)	
Response time	Rising		T_R	—	2	4	msec	(1)(3)
	Falling		T_F	—	6	12		
White luminance (Center)	Y_L			320	400	—	cd/m ²	(1)(4)(7) ($I_L=40mA$)
Color chromaticity (CIE1931)	White		W_x	0.260	0.310	0.360		(1)(4)
		W_y	0.280	0.330	0.380			
Viewing angle	Hor.	θ_L	65	75	—			
		θ_R	65	75	—			
	Ver.	θ_U	50	60	—			
		θ_D	60	70	—			
Brightness uniformity	B_{UNI}	$\theta=0$	70	—	—	%	(5)(7)	
Optima View Direction	12 O'clock						(6)	

3.2 Measuring Condition

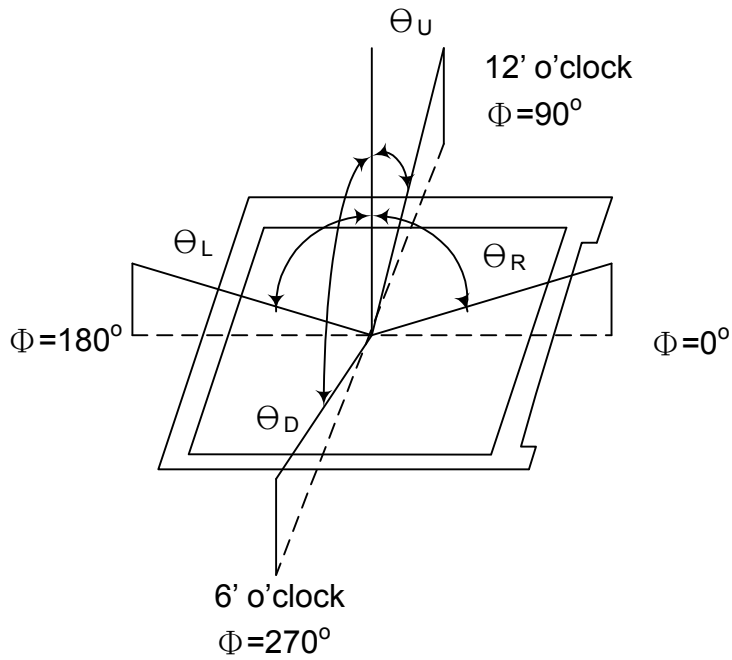
- Measuring surrounding: dark room
- LED current I_L : 40mA
- Ambient temperature: 25±2°C
- 15min. warm-up time.

3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size: 20 ~ 21m



Note (1) Definition of Viewing Angle:



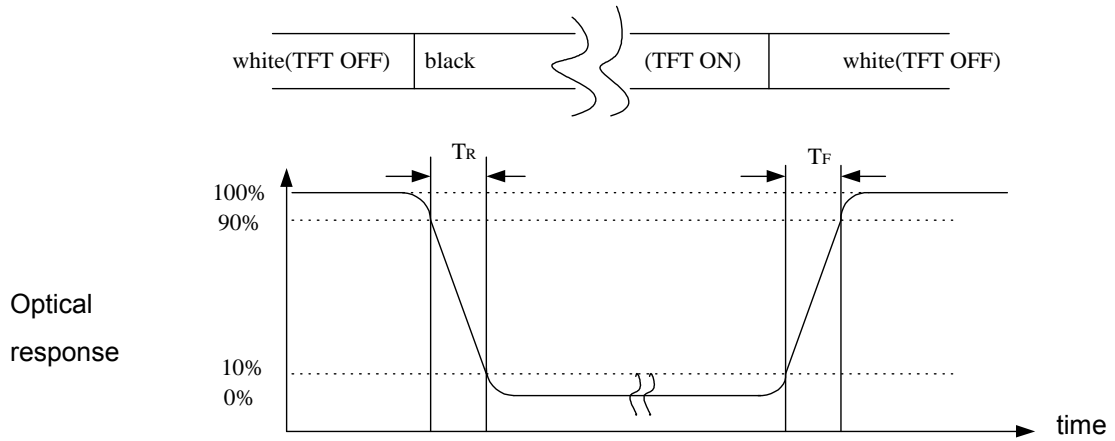
Note (2) Definition of Contrast Ratio (CR):

Measured at the center point of panel

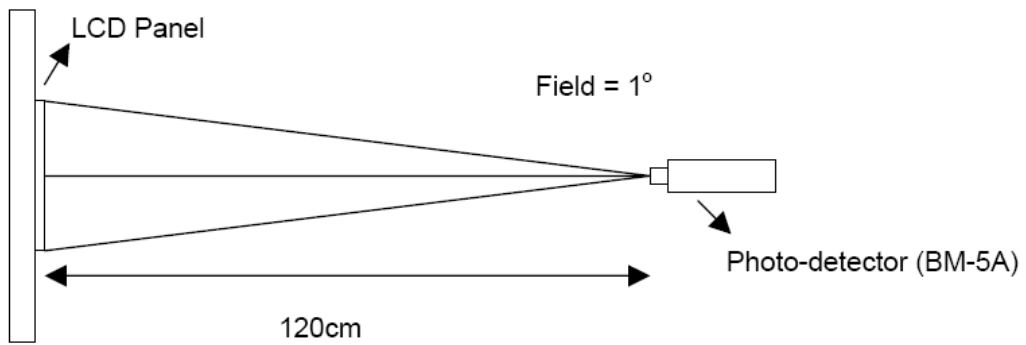
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



Note (3) Definition of Response Time: Sum of T_R and T_F

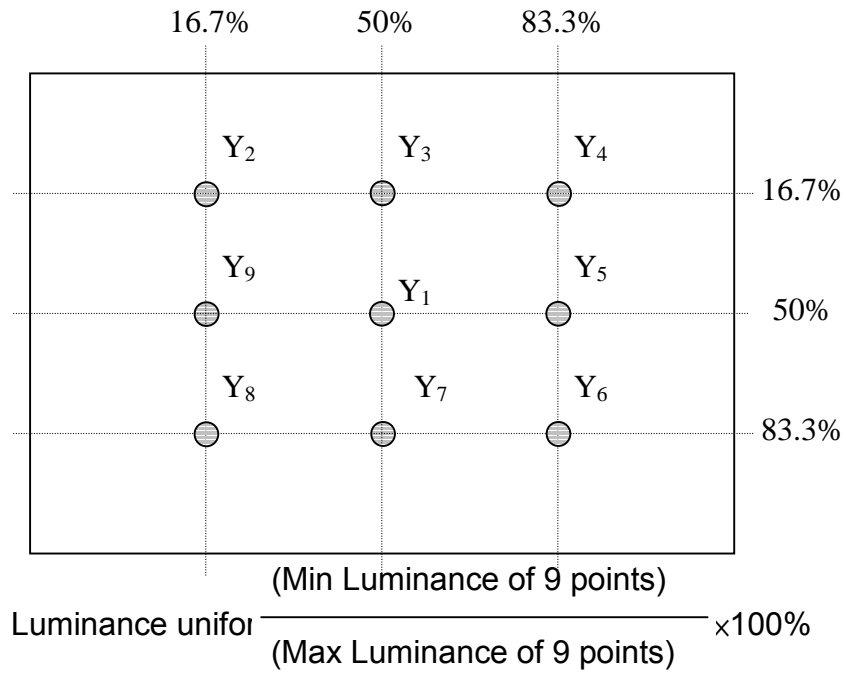


Note (4) Definition of optical measurement setup





Note (5) Definition of brightness uniformity



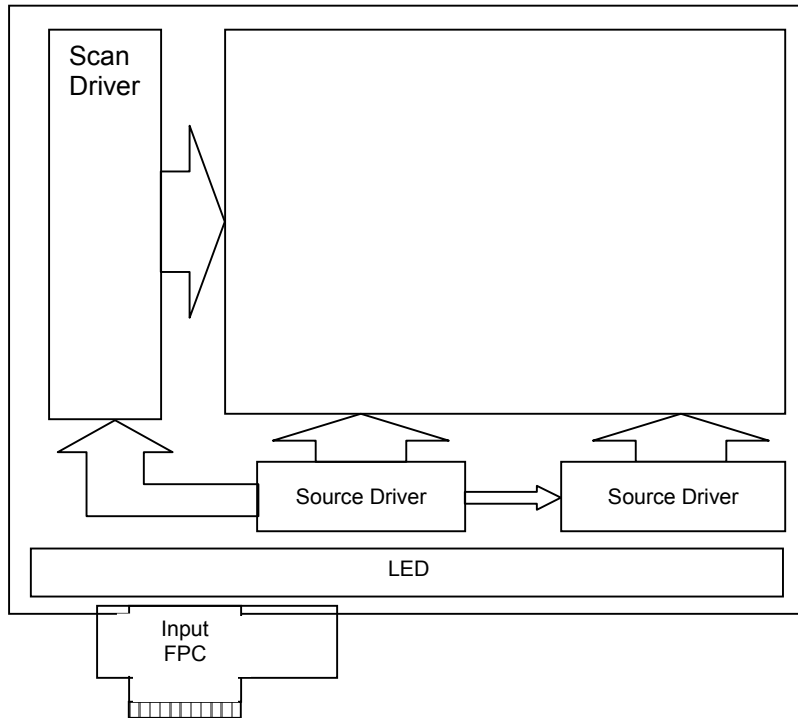
Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

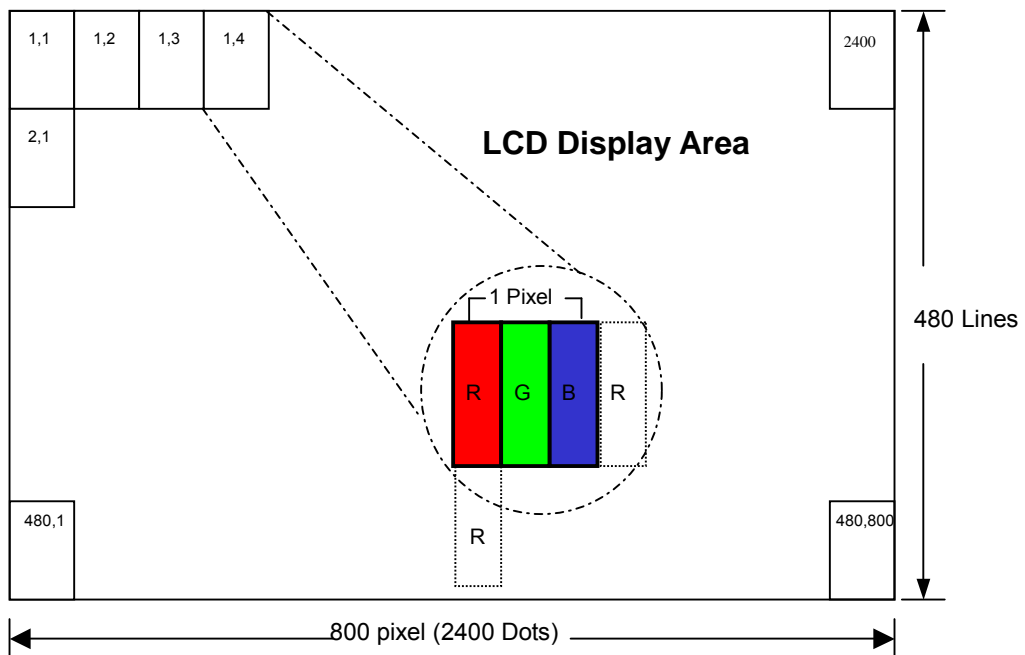


4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format





5.0 INPUT INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface.

The recommended model is FH19SC-40S-0.5SH (51) manufactured by HIROSE.

Pin No.	Symbol	I/O	Function
1	V _{LED-}	P	Power for LED backlight cathode
2	V _{LED+}	P	Power for LED backlight anode
3	GND	P	Power ground
4	V _{DD}	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	DGND	I	Digital ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSYNC	I	Vertical sync signal
34	DE	I	Data enable
35	NC	-	No Connect
36	GND	P	Power ground
37	X_R	I/O	Right electrode - differential analog
38	Y_B	I/O	Bottom electrode - differential analog
39	X_L	I/O	Left electrode - differential analog
40	Y_T	I/O	Top electrode - differential analog

I/O: I: input, O: output, P: power



6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	V_{DD}	3.0	3.3	3.6	V	
Input signal voltage	V_{iH}	$0.7 V_{DD}$	-	V_{DD}	V	Note (1)
	V_{iL}	GND	-	$0.3 V_{DD}$	V	Note (1)
Current of power supply	I_{DD}	-	-	220	mA	$V_{DD} = 3.3V$

Note (1): HSYNC, VSYNC, DE, R/G/B Data

Note (2): GND=0V

6.2 Back-Light Unit

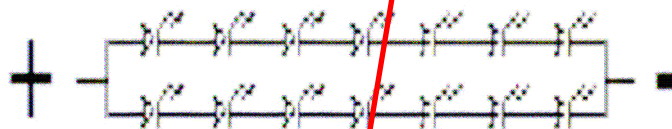
The backlight system is an edge-lighting type with 14 LED.

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward current	IL	-	30	40	mA	(2)
Forward voltage	VL	-	23.1	-	V	
Operating LED life time	Hr	10000		-	Hour	(1)(2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and $I_L=40\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 40mA. The constant current driving method is suggested.



LED Light Bar Circuit

CAUTION

Do not drive the LEDs at any current over their rated maximum of 20mA (15mA recommended for longer life). Be aware that the forward voltage of white LEDs can vary (LED to LED, batch to batch, and over time) by a significant amount. We recommend using a constant current LED power supply such as the AP3036, NCP5007, FAN5333, or similar to drive the LEDs. Do not use a constant voltage source to drive the LEDs.

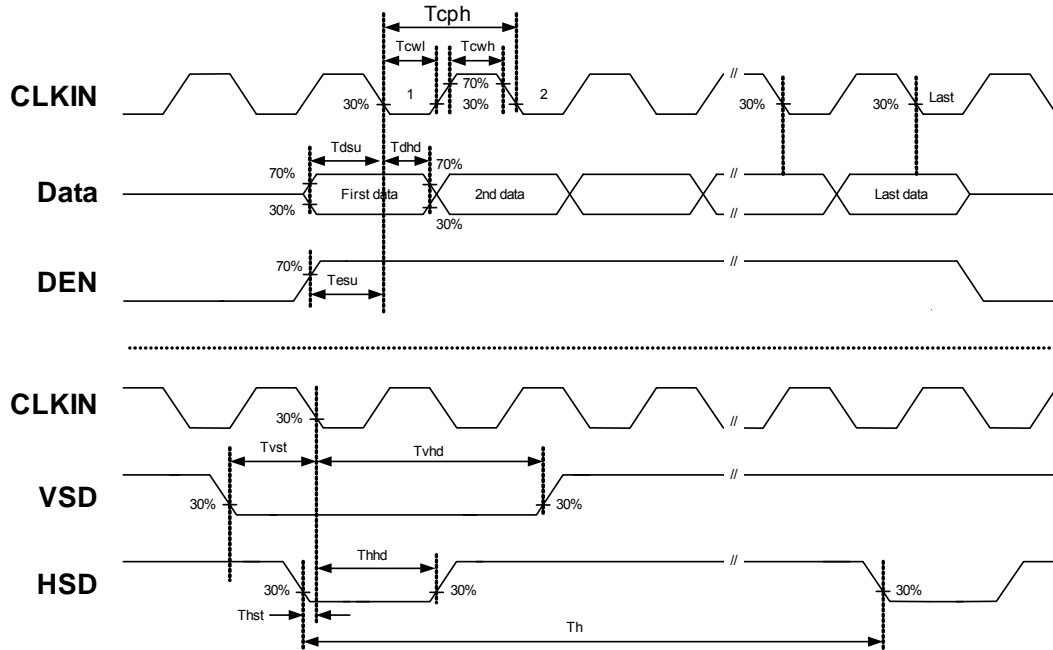


6.3 AC Characteristics

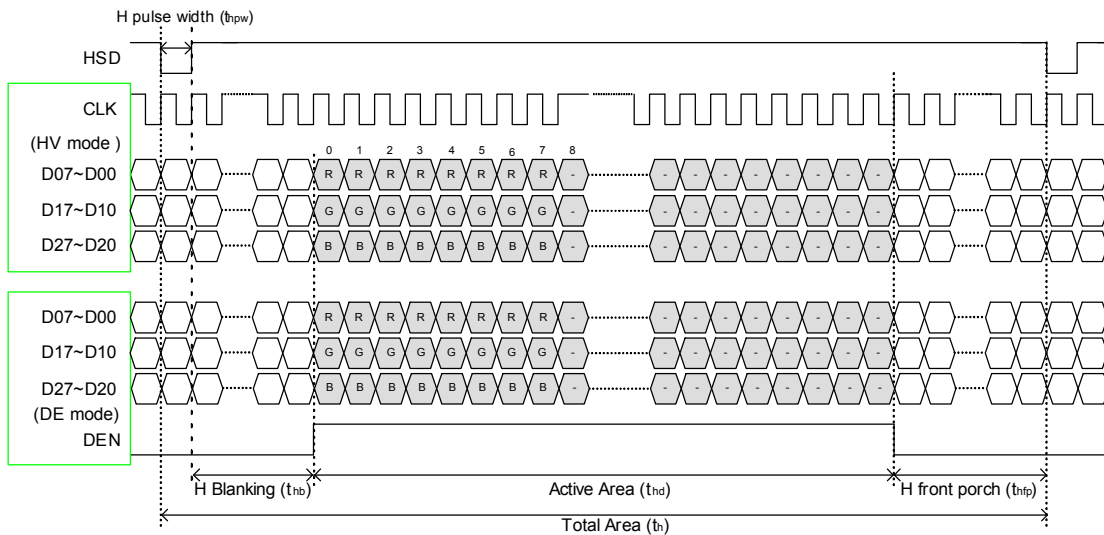
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tclk	25			ns	
DCLK frequency	fclk		33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8			ns	
HSYNC setup time	Thst	8			ns	
HSYNC hold time	Thhd	8			ns	
Data setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd		800		Tcph	
HSYNC period time	Th		928		Tcph	
HSYNC width	Thwh	1	48		Tcph	
HSYNC back porch	Thbp		40		Tcph	
HSYNC front porch	Thfp		40		Tcph	
Vertical display area	Tvd		480		th	
VSYNC period time	Tv		525		th	
VSYNC width	Tvwh		3		th	
VSYNC back porch	Tvbp		29		th	
VSYNC front porch	Tvfp		13		th	



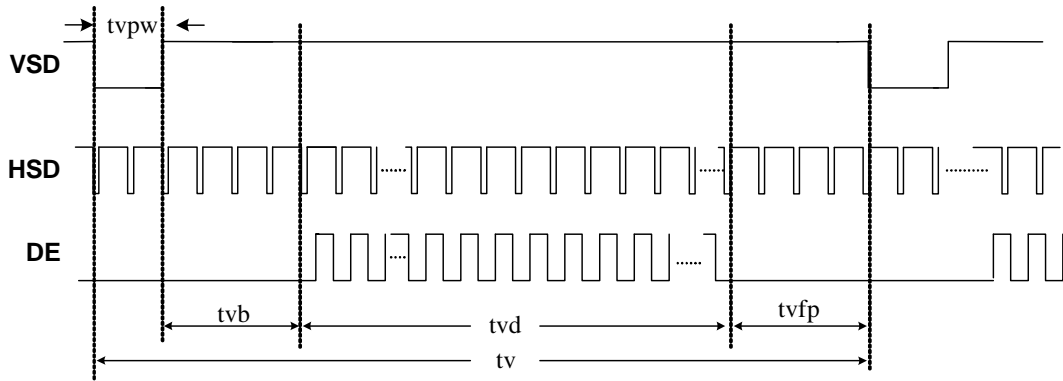
6.4 Timing Diagram of Interface Signal



Sampling clock timing



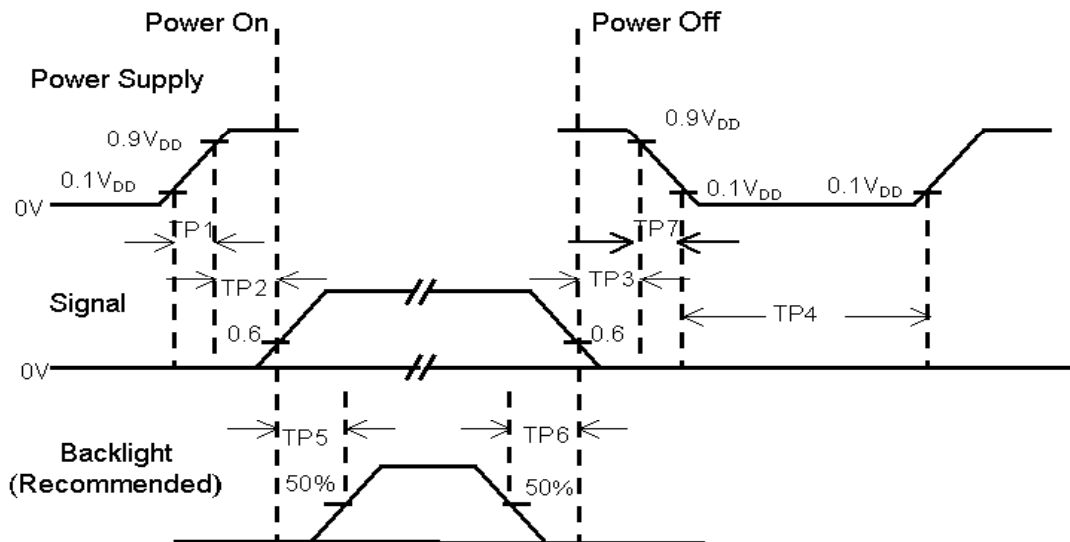
Horizontal display timing range



Vertical timing



6.5 Power Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

Note : (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD} .

- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.



7.0 RELIABILITY TEST ITEMS

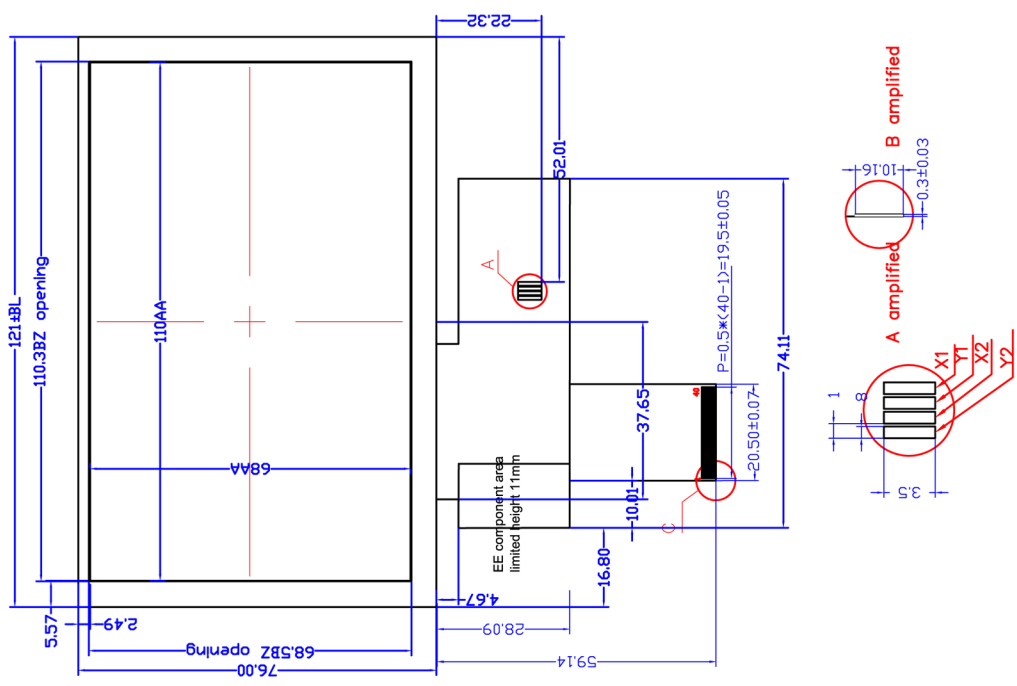
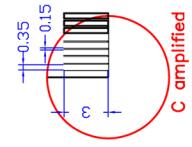
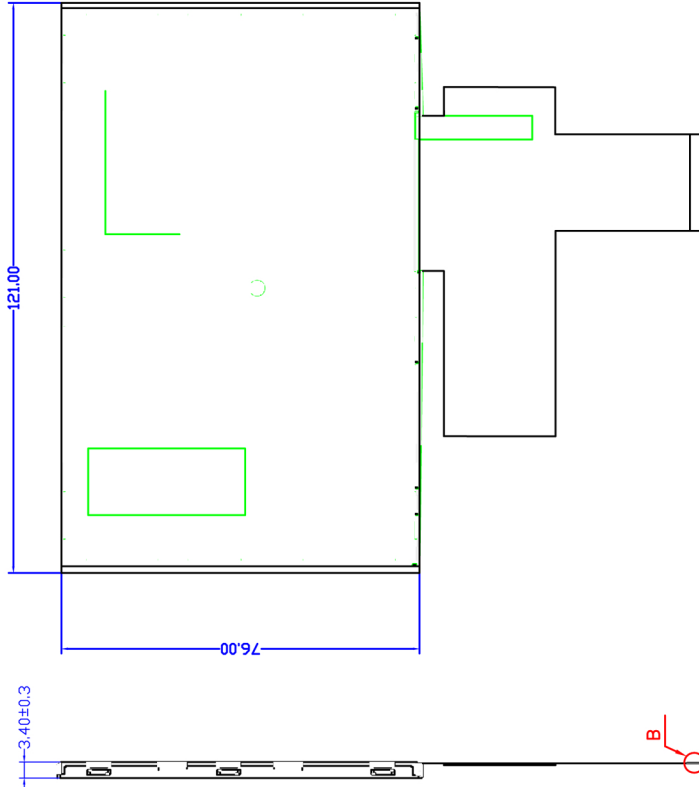
No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+70°C, 240hrs	
4	Low Temperature Operation	Ta=-20°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.



8.0 MODULE OUTLINE DRAWINGS

PIN	SYMBOL
1	Vled+
2	Vled+
3	GND
4	Vdd
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	D00
30	D01
31	D02
32	00C
33	00C
34	DE
35	NC
36	GND
37	X.R
38	Y.B
39	X.L
40	Y.T



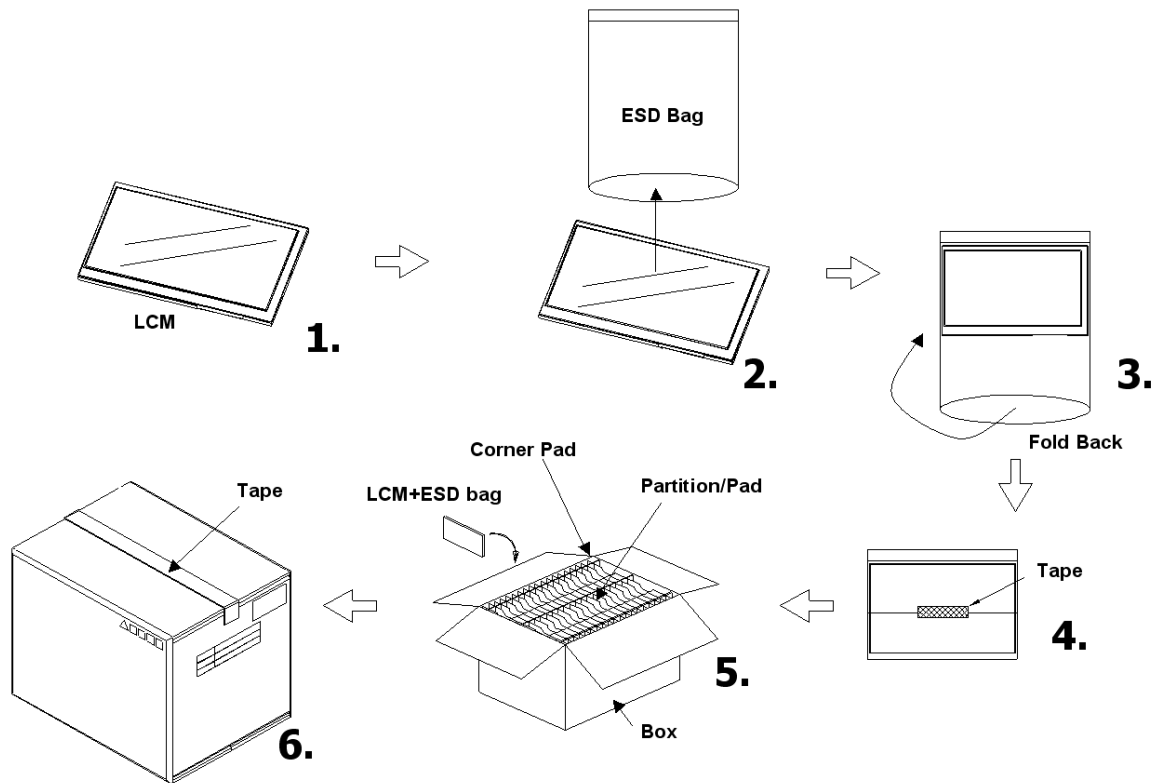


9.0 PACKAGE SPECIFICATION

9.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
CFAF800480C1-050T	200	466x242x304	

9.2 Packing assembly drawings



Items	Material	Notice
Box	Corrugated Paperboard	
Partition/Pad	Corrugated Paperboard	
Corner Pad	Corrugated Paperboard	
ESD bag	Corrugated Paperboard	



10.0 GENERAL PRECAUTION

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. We do not warrant the module, if customers disassemble or modify the module.

10.3 Breakage of LCD Panel

10.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

10.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

10.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

10.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.4 Electric Shock

10.4.1. Disconnect power supply before handling LCD module.

10.4.2. Do not pull or fold the LED cable.

10.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

10.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

10.5.3. It's recommended to employ protection circuit for power supply.

10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

10.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.



10.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

10.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10.8 Static Electricity

10.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

10.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

10.10 Disposal

When disposing LCD module, obey the local environmental regulations.