DisplayModule

DM-TFTR119-464

1.19" 240 X 240 Round TFT LCD - RGB

Table of Contents

Record of Revision

Rev	Issue Date	Description
1.0	2021/10/15	New created

1. FEATURES

The 1.19” LCD module is the active matrix color TFT LCD module applied by LTPS (Memory in Pixel type) technology. This module is composed of a TFT LCD module, and a Mini-LED back-light unit. The product is designed for the requirement of the green product.

2. GENERAL SPECIFICATIONS

2.1 STRUCTURES

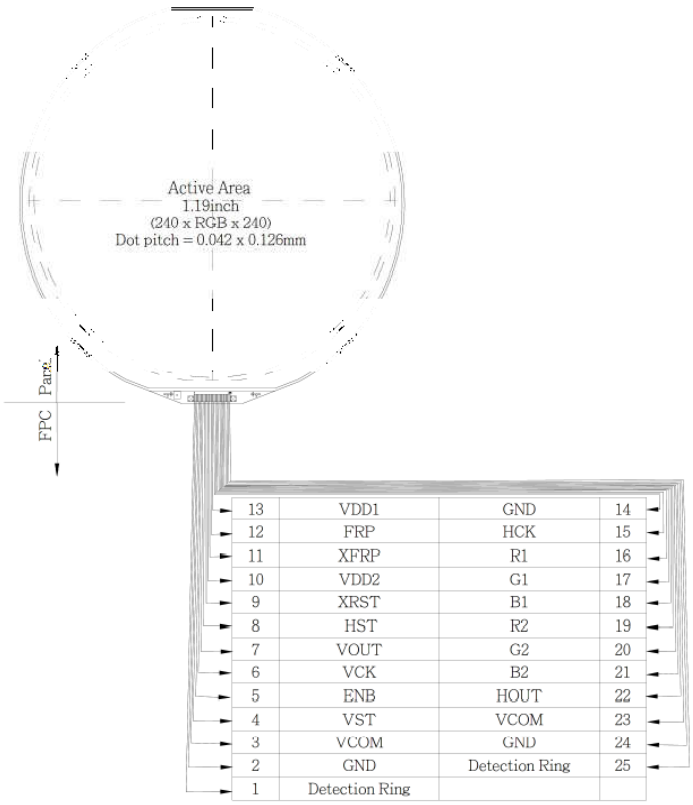
Item	Description	Unit
Display Size (Diagonal)	1.19”	Inch
Display Type	MIP ECB normally black mode	-
Active Area (HxV)	30.24(Diameter)	mm
Number of Dots (HxV)	240*RGB*240	dot
Number of colors	64 colors	--
Dot Pitch (HxV)	42*126	um
Color Arrangement	RGB Stripe	-
Outline Dimension	33.0 x 34.47 x 1.592	mm
Weight	2.7	g
Panel surface treatment	HC	-

*Exclude FPC and protrusions.

*Polarizer hardness is 2H.

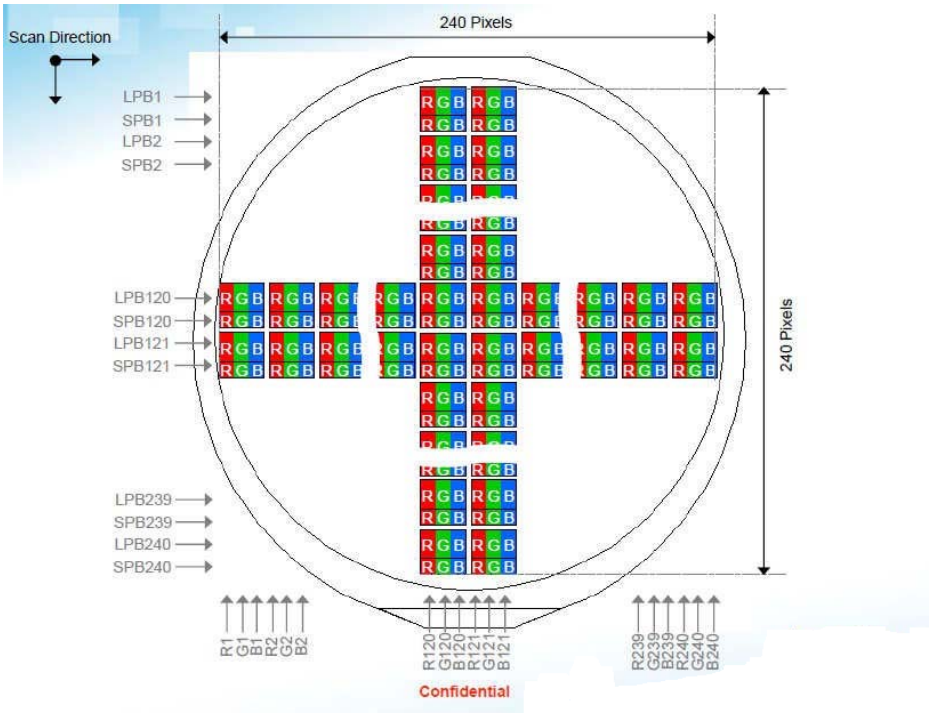
*Polarizer with APCF.

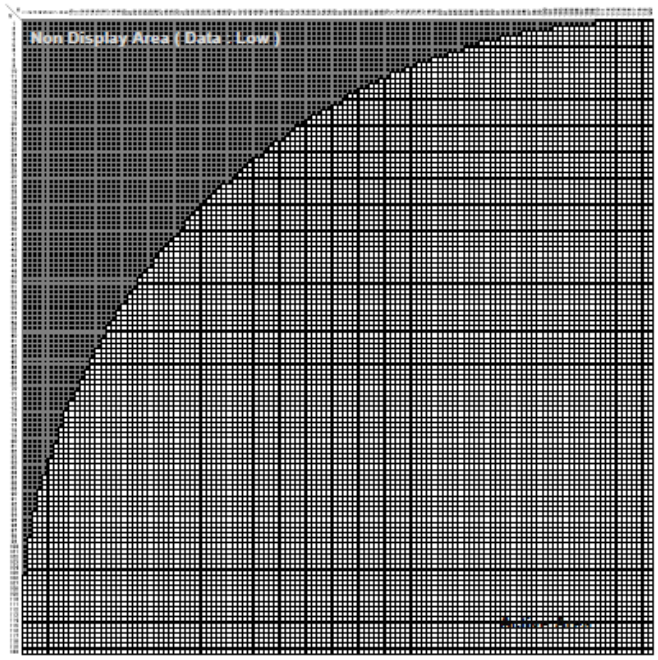
2.2 BLOCK DIAGRAM

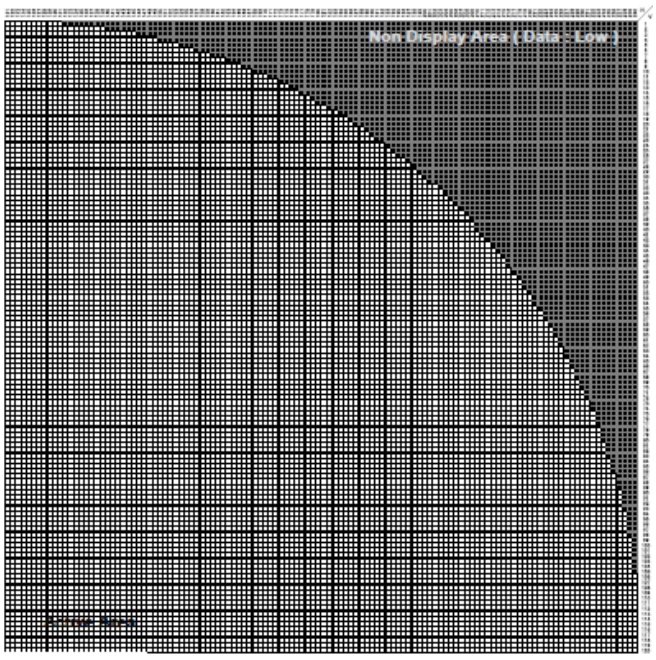


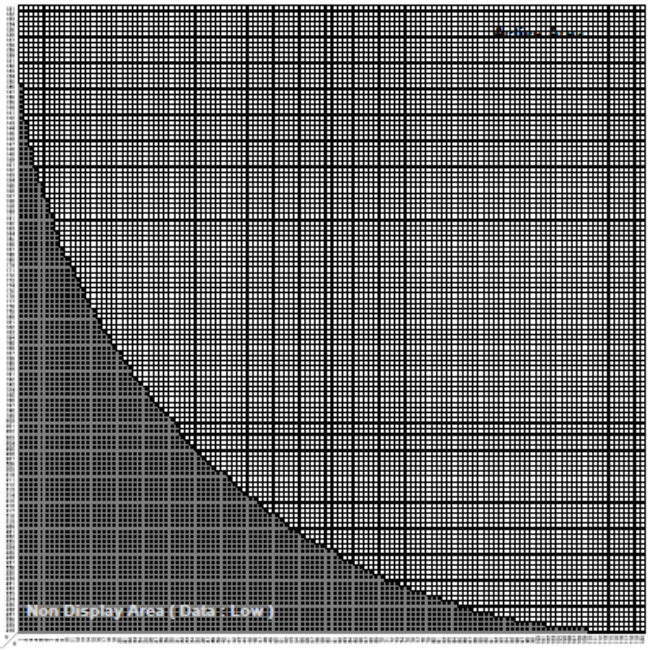
13	VDD1	GND	14
12	FRP	HCK	15
11	XFRP	R1	16
10	VDD2	G1	17
9	XRST	B1	18
8	HST	R2	19
7	VOUT	G2	20
6	VCK	B2	21
5	ENB	HOUT	22
4	VST	VCOM	23
3	VCOM	GND	24
2	GND	Detection Ring	25
1	Detection Ring		

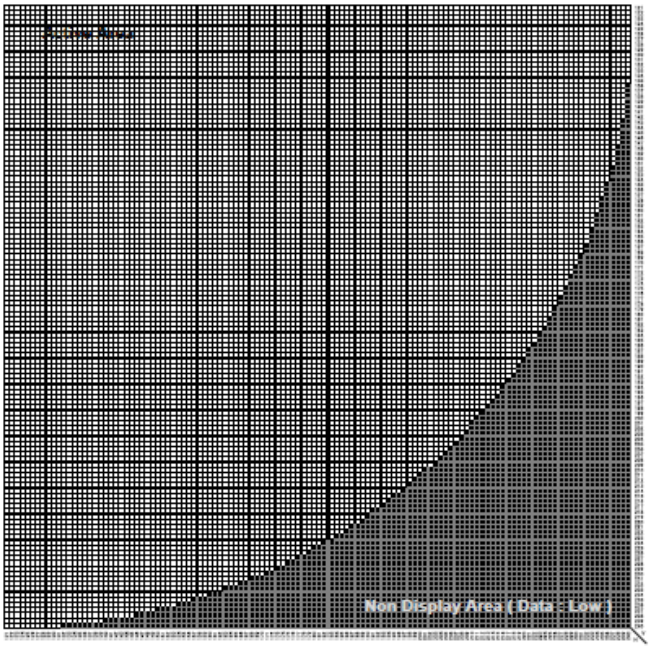
2.3 Pixel layout and pixel configuration and Pixel address map




Non Display Area (Data - Low)


Non Display Area (Data - Low)


Non Display Area (Data - Low)


Non Display Area (Data - Low)

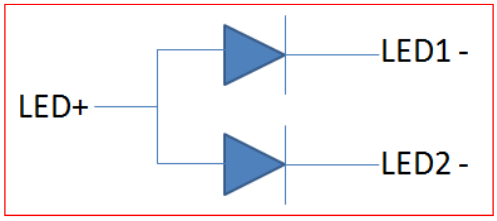
3. INPUT/OUTPUT TERMINALS

TFT LCD Panel

Recommend connector: Compatible with Hirose:DF40C-24DP-0.4V(51)

Pin	Symbol	I/O	Description	Remark
1	LED1-	P	Power supply for LED1(Cathode)	Note 1
2	N.C.	NC	Not connected to the LCD	
3	VDD2	P	Power supply for the vertical driver and pixel memory	
4	VST	I	Start signal for the vertical driver	
5	ENB	I	Write enable signal for the pixel memory	
6	FRP	I	Liquid crystal driving signal (“OFF pixel”)	
7	VDD1	P	Power supply for the horizontal driver and pixel memory	
8	HST	I	Start signal for the horizontal driver	
9	R1	I	Red image data (Odd pixels)	
10	G1	I	Green image data (Odd pixels)	
11	B1	I	Blue image data (Odd pixels)	
12	HOUT	O	Output from the end of the horizontal shift register	
13	VCOM	I	Common electrode driving signal	
14	B2	I	Red image data (Even pixels)	
15	G2	I	Green image data (Even pixels)	
16	R2	I	Blue image data (Even pixels)	
17	HCK	I	Shift clock for the horizontal driver	
18	GND	P	GND for the LCD	
19	XFRP	I	Liquid crystal driving signal (“ON pixel”)	
20	XRST	I	Reset signal for the horizontal and vertical driver	
21	VCK	I	Shift clock for the vertical driver	
22	VOUT	O	Output from the end of the vertical shift register	
23	LED+	P	Power supply for LEDs(Anode)	Note 1
24	LED2-	P	Power supply for LED2(Cathode)	Note 1

Note 1: The figure below shows the connection of backlight LED.



Absolute maximum ratings

PARAMETER	RATINGS	UNIT	REMARKS
Power supply voltage	0 to 5.5	V	
VCOM,FRP and XFRP signal voltage	0 to 5.5	V	
Input control signal voltage	0 to 5.5	V	
Mini-LED Forward Current IF	2	mA	Single LED
Mini-LED Reverse Voltage VR	9	V	Single LED
Operating temperature range (LCD panel surface)	-20 to +70	℃	
Storage temperature range	-30 to +80	℃	

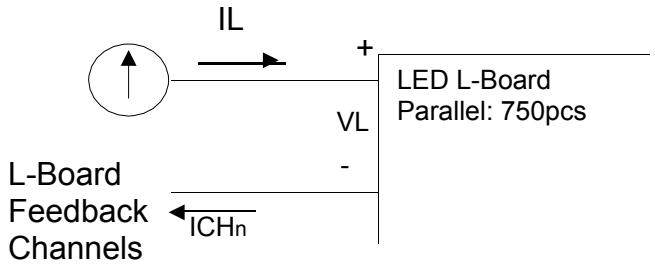
4. Operation Conditions

Supply voltage

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LCD Supply Voltage	VDD1	3.1	3.2	3.3	V	
	VDD2	4.75	5.0	5.25	V	

Mini-LED BL Normal Operation Ratings

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Quantity			750		pcs	
Forward Voltage	V_F	2.65	2.85	2.8	V	I_F=2mA/LED
L-Board Voltage	V_L	2.25	2.4	2.55	V	duty = 12.5%
Each Channel Current	$I_{CH1\sim n}$	-	2.5	-	mA	-
Total Current	I_L	-	5	-	mA	-



Input signals

About the “H” level and “L” level definition please refer to the below table: GND=0V, Ta=25℃

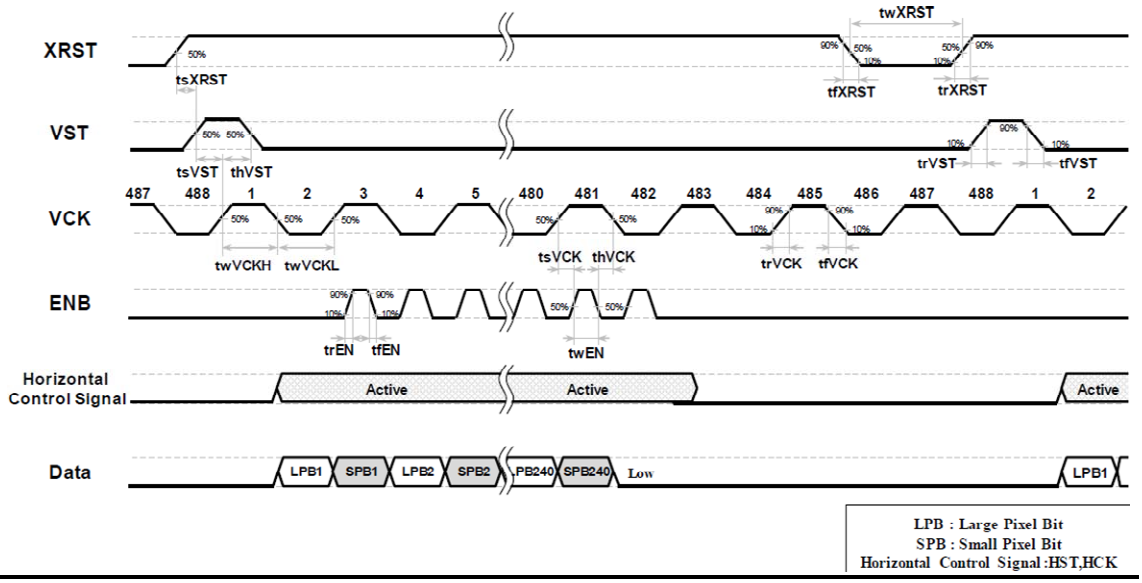
Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Logic-High Input Voltage	VIH	VDD1-0.1	-	VDD1+0.1	V	VDD1
Logic-Low Input Voltage	VIL	GND	-	GND+0.1	V	VDD1
Logic-High input Voltage	VIH	VDD2-0.25	-	VDD2+025	V	VDD2
Logic-Low input Voltage	VIL	GND	-	GND+0.1	V	VDD2
Common center voltage	VCOMc	1.55	1.6	1.65	V	
Common voltage amplitude	VCOMp-p	3.1	3.2	3.3	V	
FRP/XFRP center voltage	VFRPc	-	VCOMc	-	V	
FRP/XFRP voltage amplitude	VFRPp-p	3.1	3.2	3.3	V	

5. AC timing Characteristics (25.6Hz recipe)

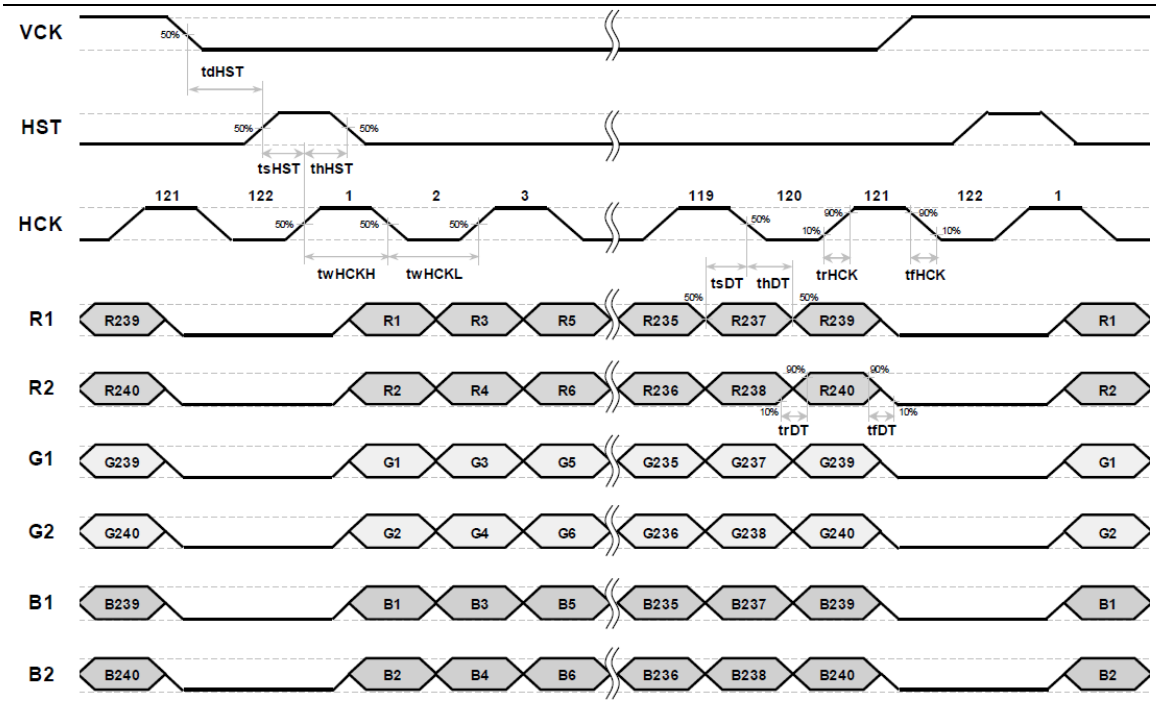
Conditions of clock timing, temp.=25°C, VDD1=3.2V, VDD2=5.0V

Parameter		Symbol	Min.	Typ.	Max.	Unit
XRST	XRST rising time	trXRST	--	--	50.0	ns
	XRST falling time	tfXRST	--	--	50.0	
	XRST pulse (low) width	twXRST	160.09	--	--	us
	XRST rising --> VST rising	tsXRST	0.00	--	--	
VST	Period	--	39.06	--	--	ms
	VST rising time	trVST	--	--	50.0	ns
	VST falling time	tfVST	--	--	50.0	
	VST rising --> VCK rising	tsVST	40.02	--	--	us
	VST holding time	thVST	40.02	--	--	
VCK	VCK rising time	trVCK	--	--	50.0	ns
	VCK falling time	tfVCK	--	--	50.0	
	VCK pulse high width	twVCKH	80.05	--	--	us
	VCK pulse low width	twVCKL	80.05	--	--	
	VCK rising --> ENB rising	tsVCK	20	--	--	
	VCK holding time	thVCK	20	--	--	
ENB	ENB rising time	trEN	--	--	50.0	ns
	ENB falling time	tfEN	--	--	50.0	
	ENB pulse (high) width	twEN	40.05	--	--	us
HST	VCK rising --> HST rising	tdHST	0	--	--	us
	HST rising --> HCK rising	tsHST	0.33	--	--	
	HST holding time	thHST	0.33	--	--	
HCK	HCK rising time	trHCK	--	--	50.0	ns
	HCK falling time	tfHCK	--	--	50.0	
	HCK pulse high width	twHCKH	0.66	--	--	us
	HCK pulse low width	twHCKL	0.66	--	--	
Data	Data rising time	trDT	--	--	50.0	ns
	Data falling time	tfDT	--	--	50.0	
	Data setup-up time	tsDT	0.33	--	--	us
	Data holding time	thDT	0.33	--	--	
VCOM	VCOM cycle time	tcVCOM	15.00	16.67	18.34	ms
FRP XFRP	VCOM rising time	trVCOM	--	--	100.0	us

Vertical (update mode)

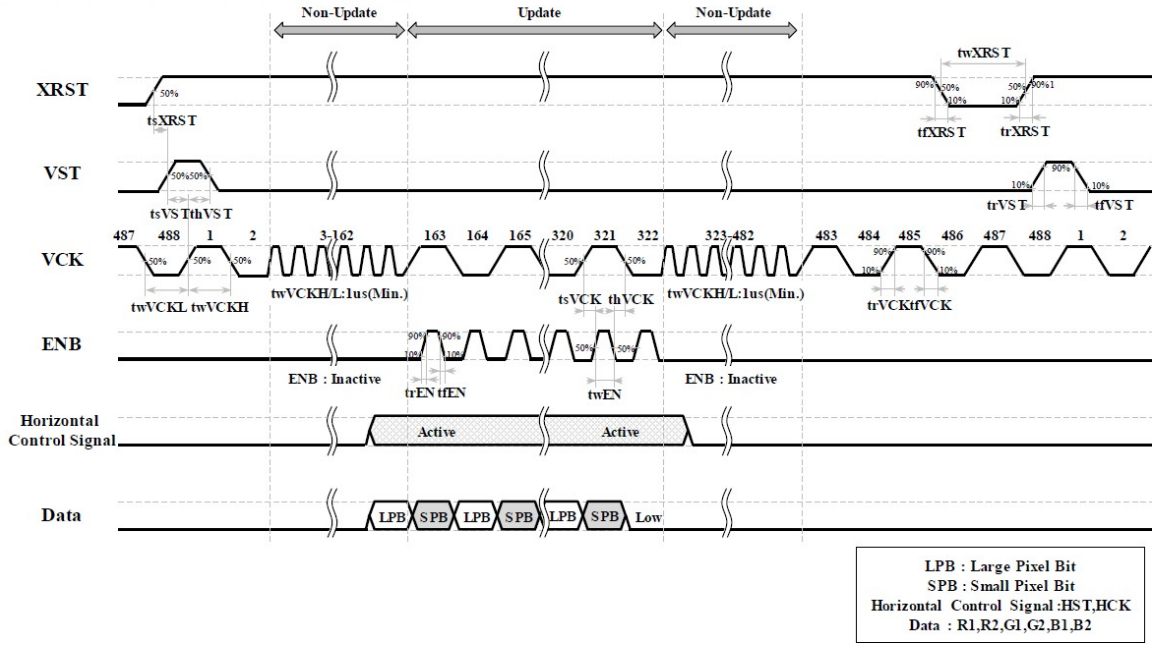


Horizontal (update mode)



Partial update

When 80-160 lines of the image is updated.

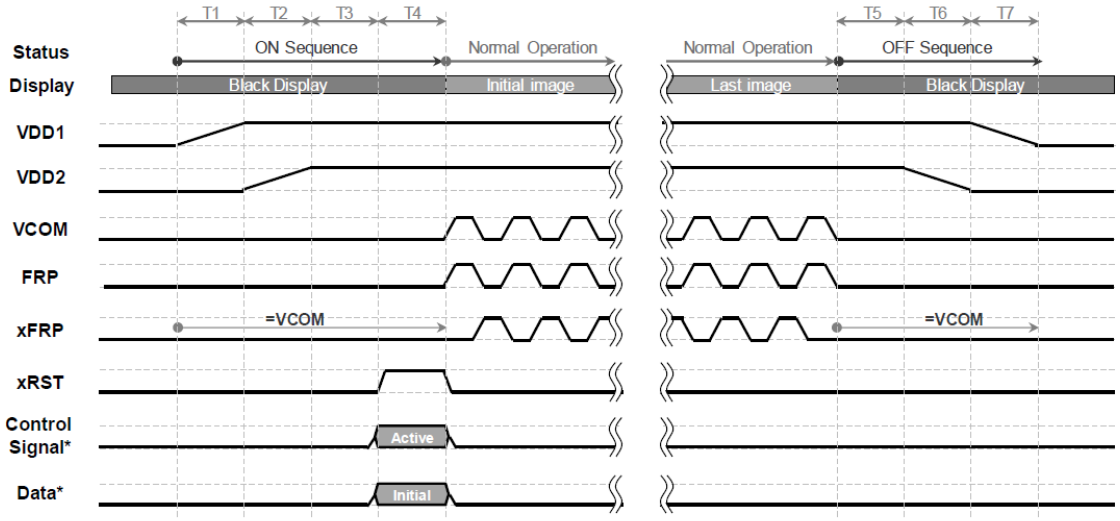


6. POWER SEQUENCE

Power on/off sequence

[On Sequence]
1) VDD1 Rise Time T1; Depends on IC
2) VDD2 Rise Time T2; Depends on IC
3) Internal Circuit Rest Time T3; twXRST or more
4) Pixel Memory Initialize Time T4; 1Frame

[OFF Sequence]
1) Pixel electrode discharge time T5; twXRST or more
2) VDD2 fall time T6; Depends on IC
3) VDD1 fall time T7; Depends on IC



*Control Signal = VST, VCK, ENB, HST, HCK
*Data = R1,R2,G1,G2,B1,B2

7. OPTICAL CHARACTERISTICS

7.1 Optical Specification

7.1.1 Reflective mode

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Viewing Angles		Θ_L	CR ≥ 2	45	55	--	Degree	Note 7-1
		Θ_R		45	55	--		
		Θ_T		45	55	--		
		Θ_B		45	55	--		
Contrast Ratio		CR	Θ=0°	8	14	--		Note 7-2
Response Time		Tr+Tf		--	9	14	ms	Note 7-3
Reflectance		--		7.0	8.4	--	%	Note 7-4
Chromaticity	White	W_x		0.284	0.315	0.354	-	Note 7-5
		Wy		0.303	0.338	0.374	-	
	Red	Rx		0.444	0.489	0.534	-	
		Ry		0.273	0.318	0.363	-	
	Green	Gx		0.258	0.303	0.348	-	
		Gy		0.390	0.435	0.480	-	
	Blue	Bx		0.139	0.184	0.229	-	
		By		0.164	0.209	0.254	-	
NTSC		CIE1931		11.4	17.7	--	%	

*() means only for reference

7.1.2 Transmissive mode

*() means only for reference

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Luminance on surface (IL=5mA)		*Lv*	Θ=0°	10	12	--	cd/m2	
Contrast Ratio		CR		7	10	--		Note 7-2
Transmittance		--		0.60	0.84	--	%	Note 7-4
Chromaticity	White	W_x		0.214	0.254	0.294	-	Note 7-5
		Wy		0.194	0.234	0.274	-	
	Red	Rx		0.300	0.330	0.360		
		Ry		0.168	0.218	0.268		
	Green	Gx		0.230	0.260	0.290		
		Gy		0.258	0.298	0.338		
	Blue	Bx		0.174	0.204	0.234		
		By		0.120	0.160	0.200		
NTSC		CIE1931		3.0	4.5	--	%	

Basic Measure Conditions

(1) Driving voltage

VDD1=3.2 V

VDD2=5.0 V

(2) Ambient Temperature: Ta=25℃

(3) Testing Point: Measure in the display center point and the test angle Θ=0°

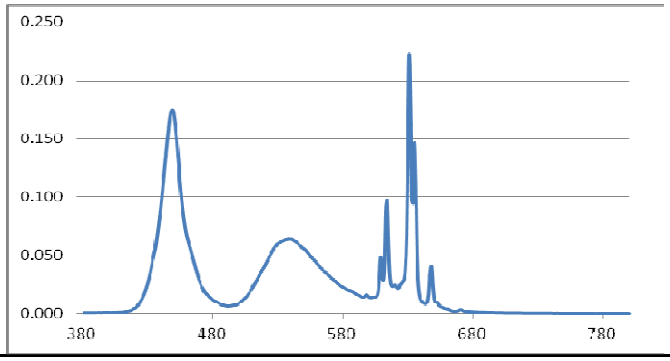
(4) Measurement equipment

DMS900 (AUTRONIC MELCHERS) or similar instrument

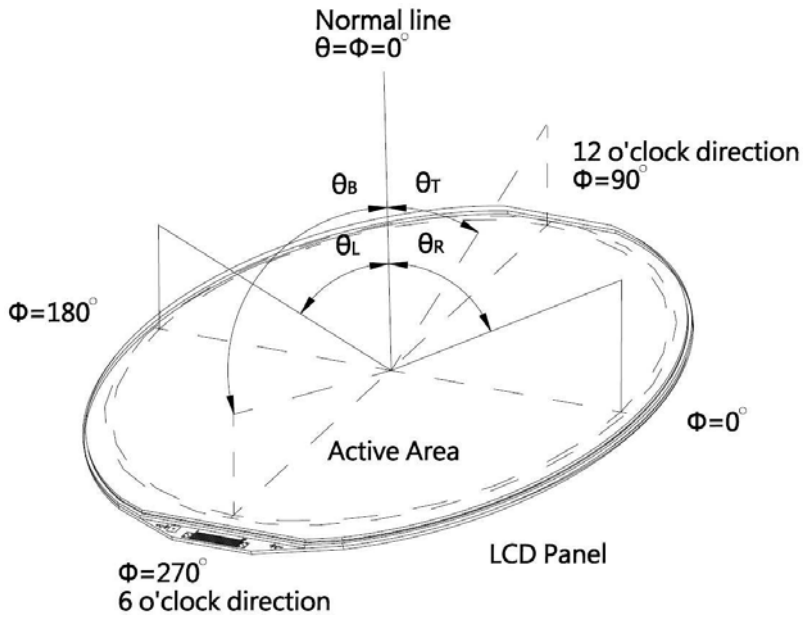
(5) Light source

- Reflective mode: Diffuse light
- Transmissive mode: Backlight (For reference)

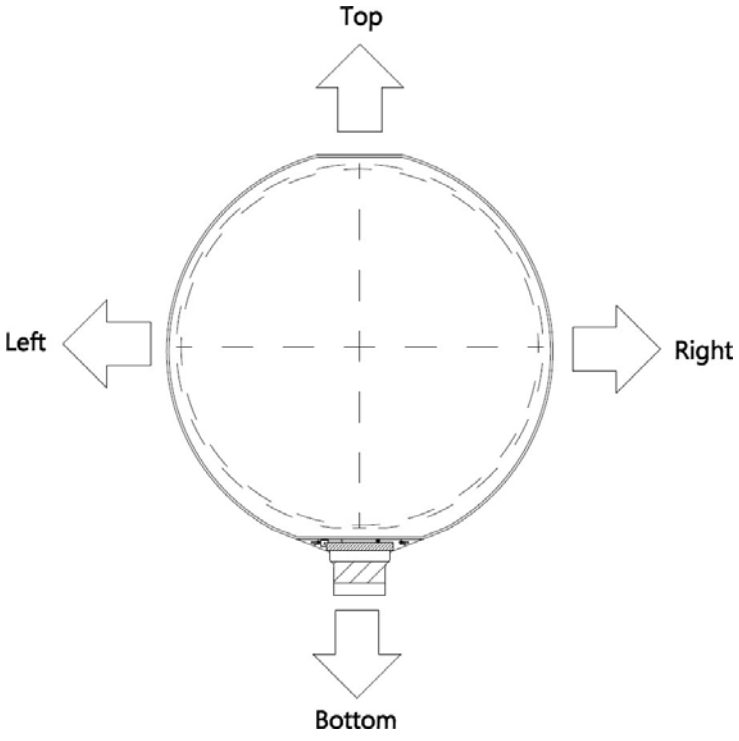
Backlight referred to INX real measurement, spectrum was attached below



Note 7-1: Viewing angle diagrams:



Definition of viewing angle



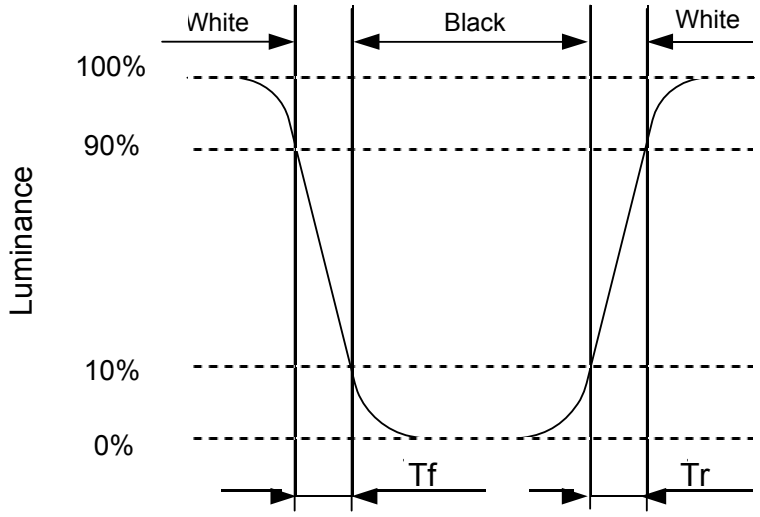
Definition of viewing angle for display

Note 7-2: Contrast Ratio:

Contrast ratio is measured in optimum common electrode voltage.

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

Note 7-3: Definition of response time:



Definition of measuring points

Note 7-4: Luminance:

Measured at the center area of the panel when LCD panel is driven at “white” state

Note 7-5: Chromaticity: The same test condition as Note 7-4.

8. RELIABILITY

	Test item	
1	High Temperature Storage	Ta=80℃ 72h
2	Low Temperature Storage	Ta=-30℃ 72h
3	High Temperature & High Humidity Storage	Ta=60℃ / 90%RH 72h （No condensation）
4	High Temperature Operation	Ta=70℃ 72h
5	Low Temperature Operation	Ta=-20℃ 72h
6	Thermal shock (non-operating)	Ta= -20℃(30min)to 70℃(30min),10cycles
7	Packing Vibration	10Hz~50Hz Swing:0.75mm time:30min
8	Packing Drop	Height 60cm,1 corner 3edges,6 surfaces. 1 time each direction

Note:

1. The test samples have recovery time for 2 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.
2. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

9. HANDLING CAUTIONS

9.1 ESD (Electrical Static Discharge) Strategy

ESD will cause serious damage of the panel, ESD strategy is very important in handling. Following items are the recommend ESD strategy.

(1) In handling LCD panel, please wear non-charged material gloves. And the conduction ring connect wrist to the earth and the conducting shoes to the earth is necessary.
(2) The machine and working table for the panel should have ESD prohibition strategy.
(3) In handling the panel, ionize flowing decrease the charge in the environment is necessary.
(4) In the process of assembly the module, shield case should connect to the ground.

9.2 Environment

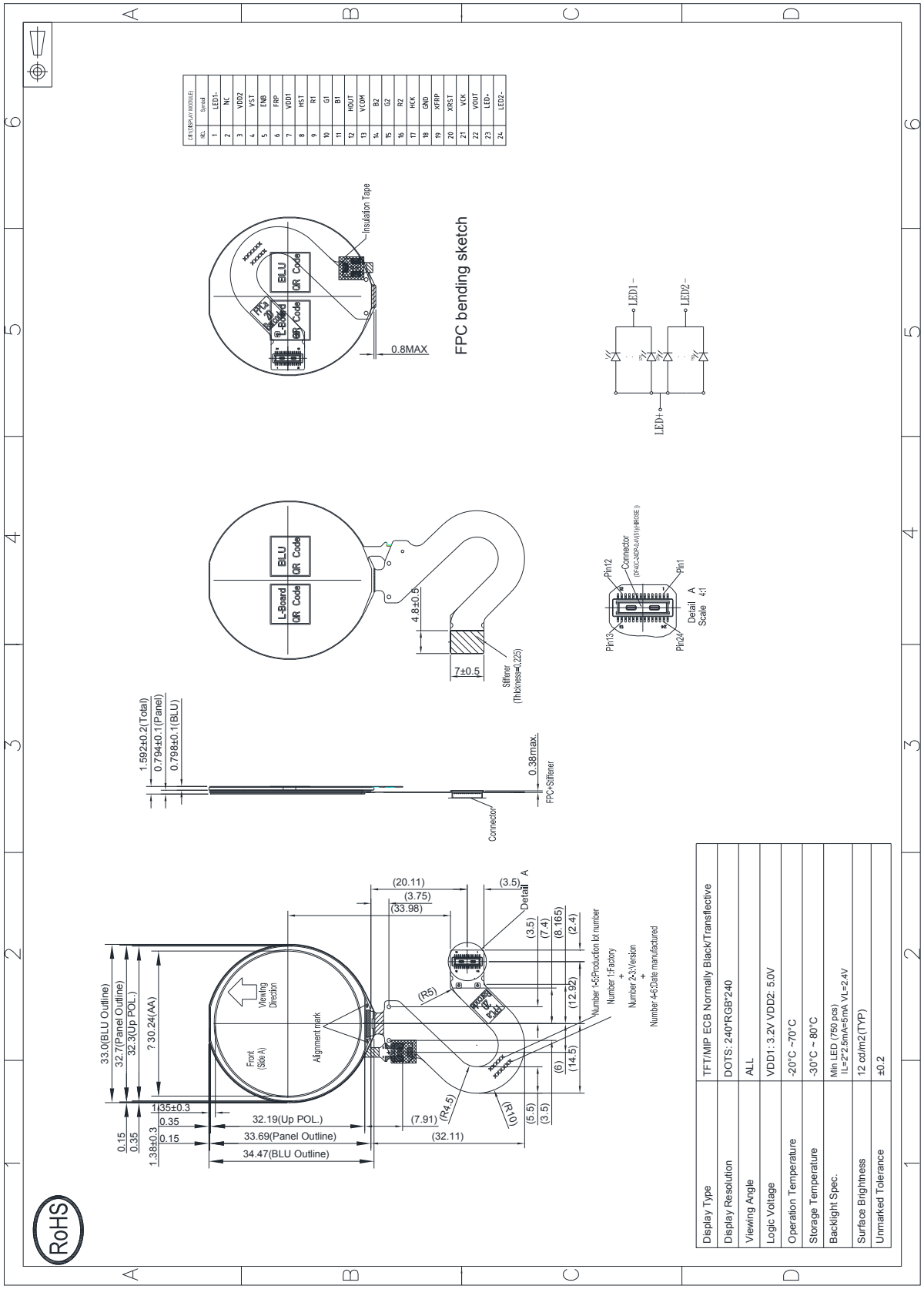
(1) Working environment of the panel should in the clean room.
(2) The front polarizer is easy damaged, handle it carefully and do not scratch it by sharp material.
(3) Panel has polarizer protective film in the surface please remove the protection film of polarizer slowly with ionized air to prevent the electrostatic discharge.

9.3 Others

(1) Turn off the power supply before connecting and disconnecting signal input cable.
(2) The connection area of FPC and panel is very weak, do not handle panel only by FPC or bend FPC.
(3) Water drop on the surface or condensation as panel power on will corrode panel electrode.
(4) As the packing bag open, watch out the environment of the panel storage. High temperature and high humidity environment is prohibited.
(5) When the TFT LCD module is broken, please watch out whether liquid crystal leaks out or not. If your hand touches liquid crystal, wash your hand cleanly by water and soap as soon as possible.

10. MECHANICAL CHARACTERISTICS

Mechanical Drawing



11. PACKING DRAWING

TBD.