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MDT0390A6IH-RGB	480 x 128	RGB Interface	TFT Module

Specification

Version: 1	Date: 10/02/2022

Revision

1	08/02/2022	First issue

Display Features	
Display Size	3.90”
Resolution	480 x 128
Orientation	Landscape
Appearance	RGB
Logic Voltage	3V
Interface	RGB
Brightness	500 cd/m^2
Touchscreen	---
Module Size	105.50 x 37.00 x 3.05mm
Operating Temperature	-30°C ~ +85°C
Pinout	40 way FFC
Pitch	0.5mm

RoHS compliant

Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the SC7283 specification.(Provided Separately)

Display Accessories

Part Number	Description
MPBV6	40 Way FFC to cable and wires. Driven by any driver board that can be wired to a 1mm pitch SHDR-40V-S-B receptacle.
MDIB-11	The MDIB-11 is an HDMI to RGB converter. Ideal for connecting a range of Midas TFT displays to a Single Board Computer such as the Raspberry Pi.

Optional Variants

Appearances	Voltage

Summary

3.9” is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 3.9 inch diagonally measured active display area with 480x128 (480 horizontal by 128 vertical pixel) resolution.

General Specifications

- Size: 3.9 inch
- Dot Matrix: 480 x RGBx128(TFT) dots
- Module dimension: 105.5(W) x 37.0(H) x 3.05(D) mm
- Active area: 95.04 x 25.34 mm
- Pixel pitch: 0.198 x 0.198 mm
- LCD type; TFT, Normally Black, Transmissive
- Viewing Angle: 80/80/80/80
- Aspect Ratio: Bar Type
- TFT Driver IC: SC7283 or equivalent
- Interface: 24-bit RGB
- Backlight Type: LED,Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

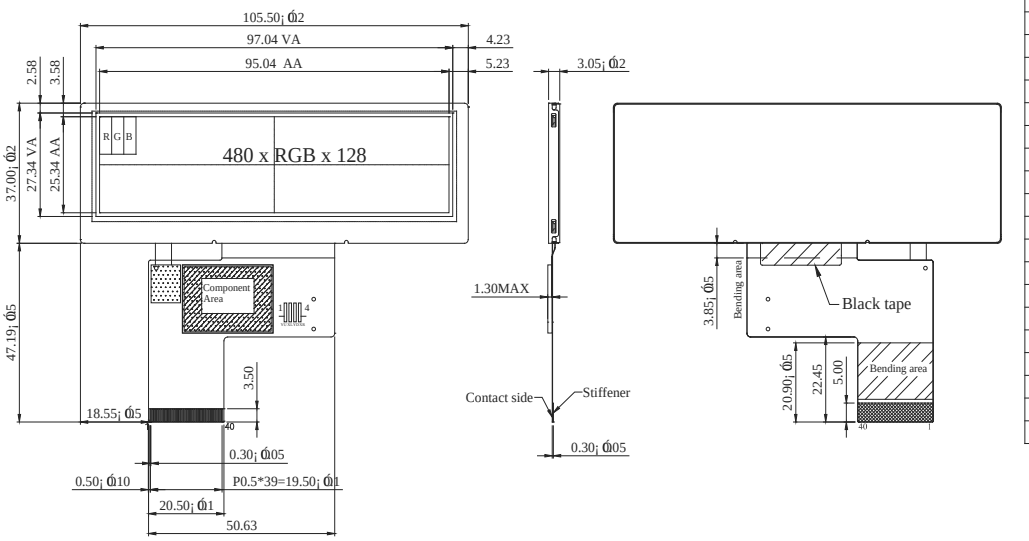
Interface

1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	VLED-	Power for LED backlight cathode	
2	VLED+	Power for LED backlight anode	
3	GND	Power ground	
4	VCC	Power voltage	
5	R0	Red data	
6	R1	Red data	
7	R2	Red data	
8	R3	Red data	
9	R4	Red data	
10	R5	Red data	
11	R6	Red data	
12	R7	Red data	
13	G0	Green data	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data	
19	G6	Green data	
20	G7	Green data	
21	B0	Blue data	
22	B1	Blue data	
23	B2	Blue data	
24	B3	Blue data	
25	B4	Blue data	
26	B5	Blue data	
27	B6	Blue data	
28	B7	Blue data	
29	GND	Power ground	
30	DCLK	Pixel clock input pin	
31	DISP	DISP sets the display mode.	

		DISP: L — Standby mode; H — Normal display mode	
32	HSYNC	Horizontal sync signal, default is negative polarity.	
33	VSYNC	Vertical sync signal, default is negative polarity.	
34	NC	No connection	
35	NC	No connection	
36	GND	Power ground	
37	NC(XR)	No connection	
38	NC(YD)	No connection	
39	NC(XL)	No connection	
40	NC(YU)	No connection	

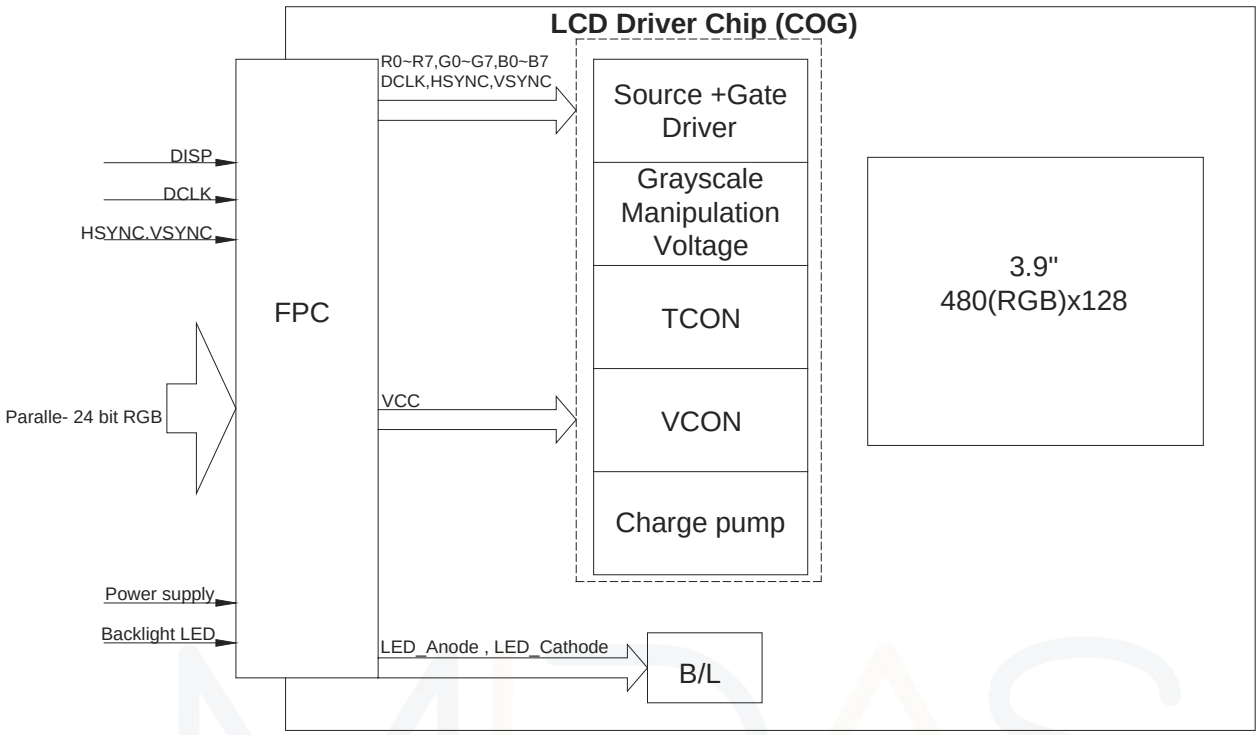
Contour Drawing



PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	VLED-	21	B0
2	VLED+	22	B1
3	GND	23	B2
4	VCC	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	DCLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSYNC
14	G1	34	NC
15	G2	35	NC
16	G3	36	GND
17	G4	37	NC(XR)
18	G5	38	NC(YD)
19	G6	39	NC(XL)
20	G7	40	NC(YU)

The non-specified tolerance of dimension is ¡ ó0.3 mm .

Block Diagram



Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+85	℃
Storage Temperature	TST	-30	—	+85	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

Electrical Characteristics

1. Operating conditions:

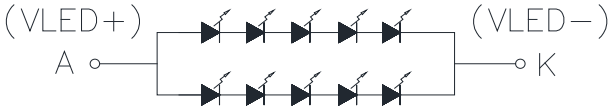
Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VCC	3.0	-	3.6	V	
Supply Current For LCM	ICC	-	20	30	mA	Note1

Note 1 : This value is test for VCC=3.3V , Ta=25 ℃ only

2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	-	40	-	mA	-
Power Consumption	-	560	600	680	mW	-
LED voltage	VLED+	14	15	17	V	Note 1
LED Life Time	-	-	50,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM

Note 2 : Ta = 25 ℃

Note 3 : Brightness to be decreased to 50% of the initial value

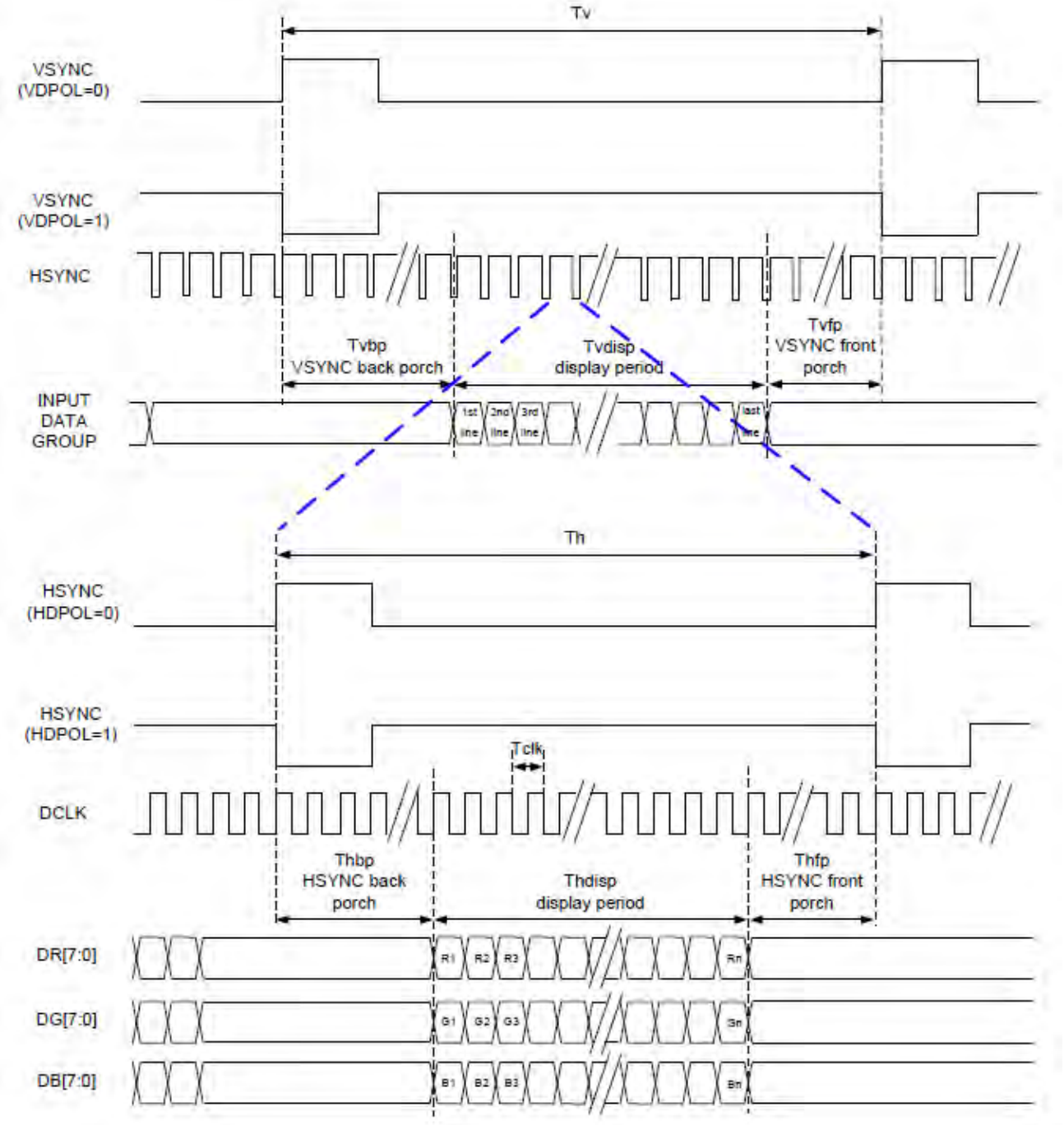
Note 4 : The single LED lamp case

AC Characteristics

AC Electrical Characteristics (VCC= 3.3V, GND= 0V, TA=25℃)

1. RGB Interface

SYNC Mode



2. Parallel 24 bit RGB Input Timing Table

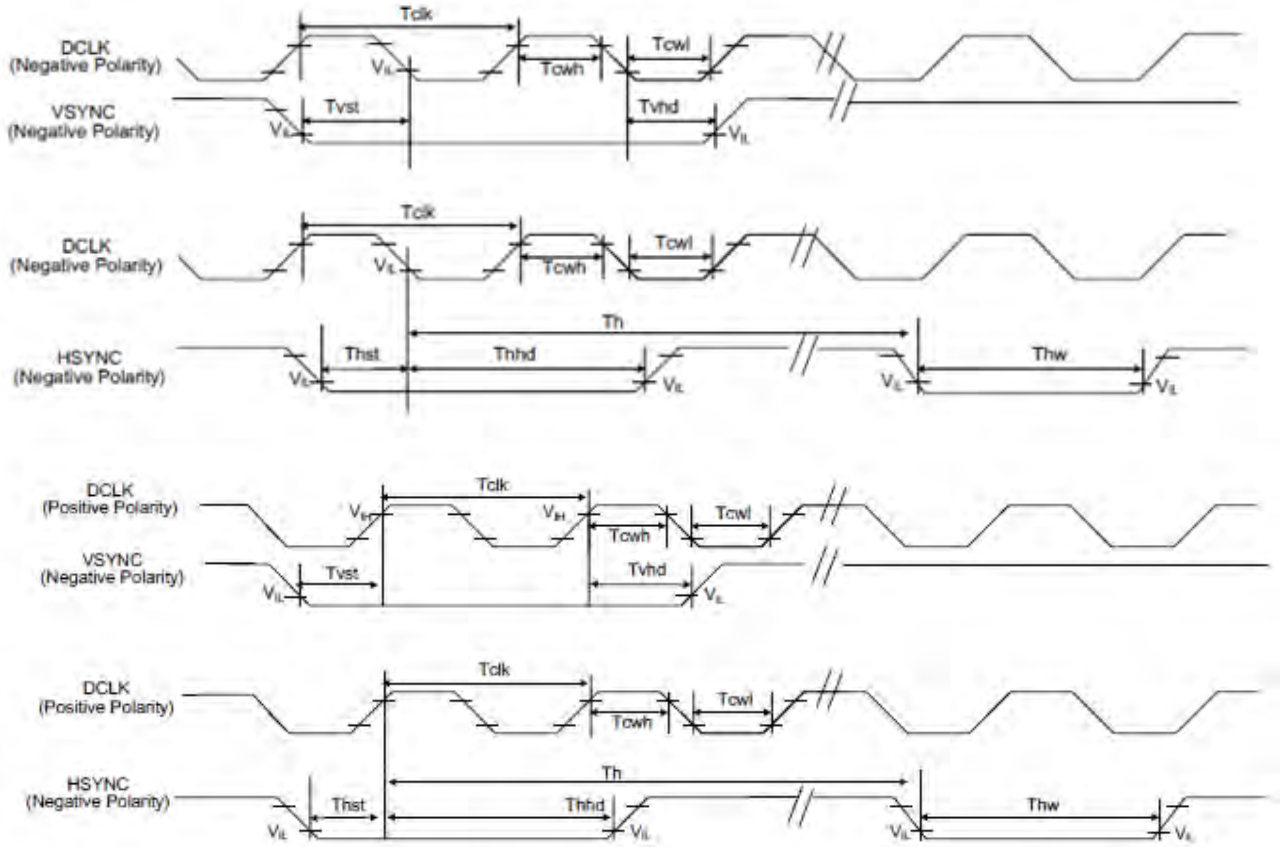
(Parallel 24-bit RGB Input Timing (VCC= 3.3V, GND= 0V, TA=25℃)

480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	Thbp of SYNC mode set by H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp		272		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	Tvbp of SYNC mode set by V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

3. System Bus Timing for RGB Interface

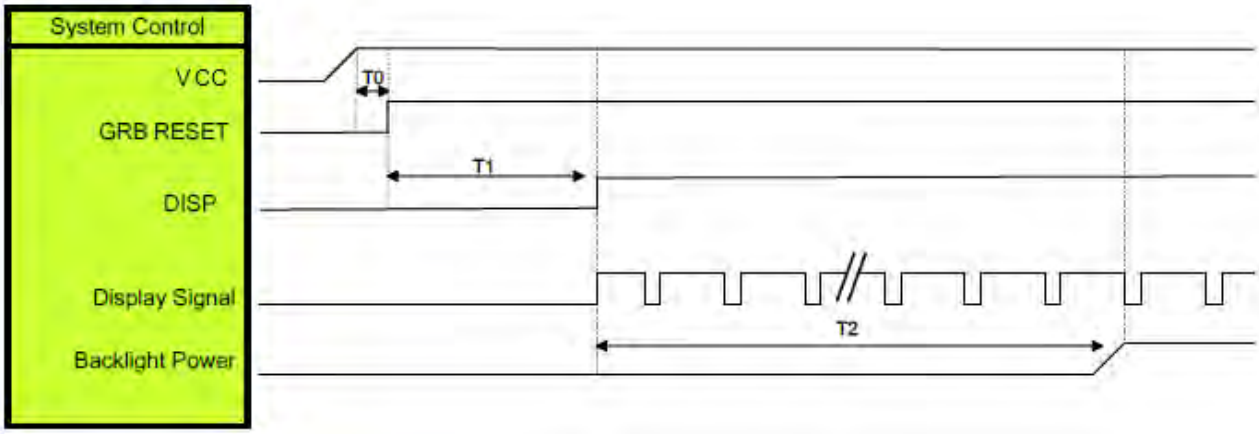
(VCC= 3.3V, GND= 0V, TA=25℃)



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	Thst	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	

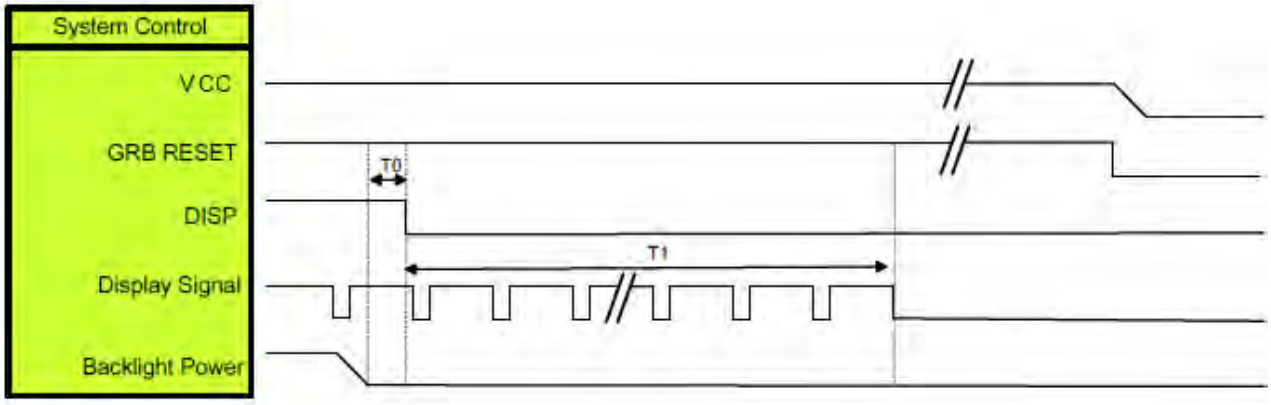
Power sequence

1. Power On Sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

2. Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	80	ms

Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	θ=0°、Φ=0°	-	30	40	ms	Note 3
Contrast ratio		CR	At optimized viewing angle	640	800	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.27	0.32	0.37	-	Note 2,6,7
		Wy		0.295	0.345	0.395	-	
Viewing angle	Hor.	ΘR	CR≧10	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		70	80	-		
		ΦB		70	80	-		
Brightness		-	-	400	500	-	cd/m2	Center of display
Uniformity		(U)	-	75	-	-	%	Note 5

Ta=25±2℃

Note 1: Definition of viewing angle range

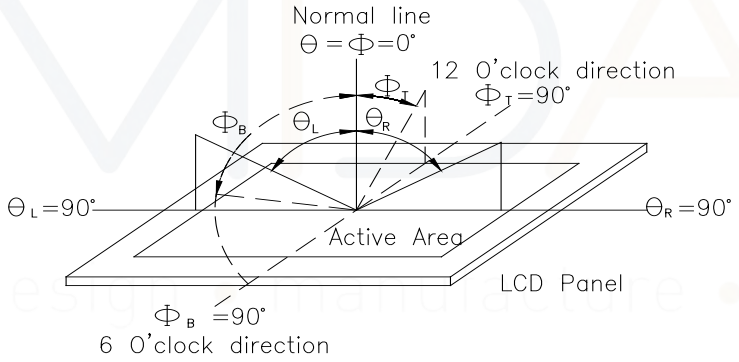


Fig. 11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

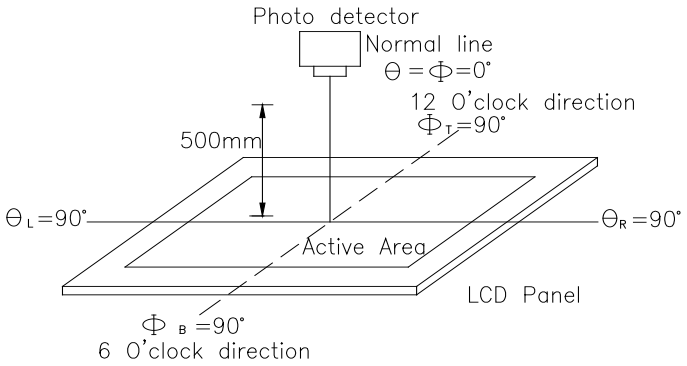
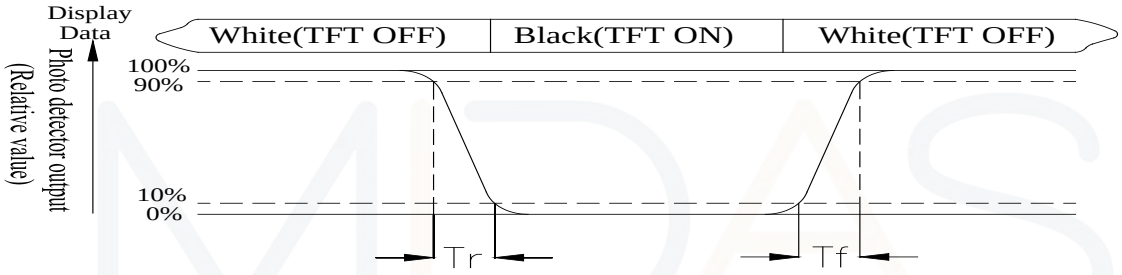


Fig. 11.2. Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%



Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.
Luminance Uniformity (U) = Lmin/Lmax x100%
L = Active area length
W = Active area width

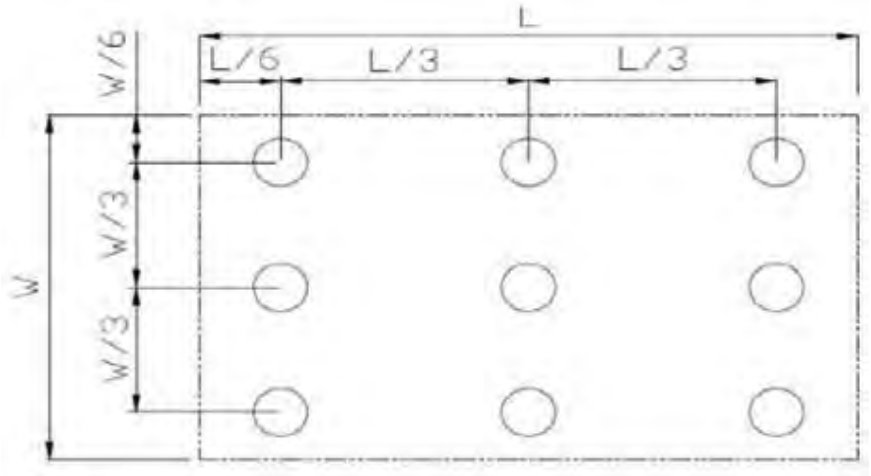


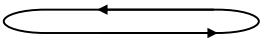
Fig 11.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Reliability

Content of Reliability Test (Super Wide temperature, -30℃~85℃)

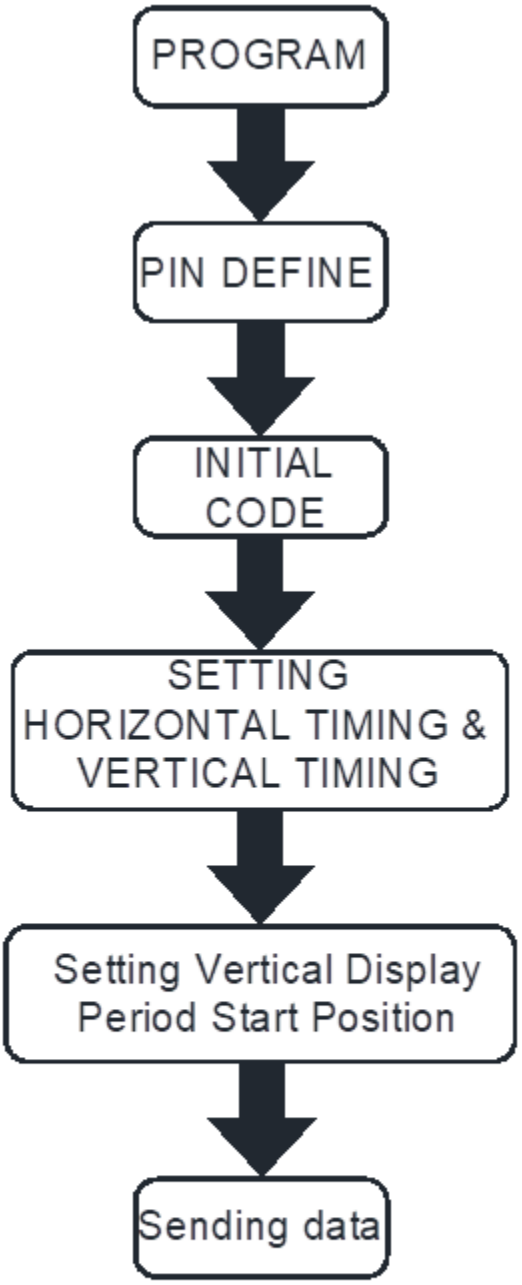
Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	85℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 200hrs	1
High Temperature/ Humidity storage	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -30℃ 25℃ 85℃  30min 5min 30min 1 cycle	-30℃/85℃ 10 cycles	——
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	**3**
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	——

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

Display start address setting



Ex.
One horizontal line=0x0213
VS period time=0x0124
HS Blanking=0x2b
VS Blanking=0x10
HS Front Porch=0x05
VS Front Porch=0x08

Suggestion：
Vertical Display Period
Start Position= 0x9D

Note：
For different Controller ICs, the value of vertical display period start position need to be adjusted accordingly.