Module No.: IE-TP-1816CH05R24-CB-1 *Date : 2024-02-20*

History of Version

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
02/21/2024	01	001	Preliminary.	-	
03/07/2024	01	002	Second Drawing Touch IC ICNT8952 change to FT5426	- 10	
03/22/2024	01	003	Add Capacitive Touch Panel(CTP) Interface	13	
04/01/2024	01	004	Third Drawing Touch IC FT5426 change to FT5446	- 10	
06/27/2024	01	005	Frist Sample Modify Timing Characteristics	- 15~17	

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Resolution	800 * 3 (RGB) * 480 Dots
LCD Type	Full Viewing Angle, Normally Black , Transmissive type
Screen size(inch)	7.0 inch
Color configuration	RGB Vertical Strip
Backlight Type	White LED B/L
Weight	175g
Interface	24 Bits RGB Interface
Other(controller/driver IC)	ST72568 (Or Compatible IC)
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	192.96(W) x 110.76(L) x 5.49(H)	mm

LCD panel

Item	Standard Value	Unit
Active Area	153.84 (W) x 85.632(L)	mm
Pixel Size	0.1923(W) * 0.1784(H)	mm

Note: For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Supply for TFT Panel	DVDD	GND=0	-0.3	4.0	V	-
Operating Temperature	T_{OP} (Ts)	Note 1	-20	+70	°C	
Storage Temperature	T_{ST} (Ta)	Note 2	-30	+80	°C	
Storage Humidity	H_D	Ta ≦ 60 °C	20	90	%RH	

The absolute maximum rating values of this product are not allowed to be exceeded at any time. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 1: Ts is the temperature of panel's surface

Note 2: Ta is the ambient temperature of samples

1.4 DC Electrical Characteristics

Module GND = 0V, Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply for TFT Panel	DVDD	GND=0V	3.1	3.3	3.6	V
Input Voltage for TFT Panel	V_{IH}	GND=0V	0.7DVDD	-	DVDD	V
	V_{IL}	GND=0V	0	-	0.3DVDD	
Supply Current for TFT Panel	DIDD	DIDD@DVDD=3.3V	-	100	150	mA

1.5 Optical Characteristics

TFT LCD Module DVDD= 3.3 V, Ta=25°C

Item	Symbol		Condition	Min.	Typ.	Max.	unit	-
Response time	Tr+Tf		Ta = 25°C θX, θY = 0°	-	30	45	ms	Note 2
Viewing angle	Top	θY+	CR ≥ 10		80	-	Deg.	Note 4
	Bottom	θY-			80	-		
	Left	θX-			80	-		
	Right	θX+			80	-		
Contrast ratio	CR		Ta = 25°C θX , θY = 0°	500	600	-	-	Note 3
Color of CIE Coordinate	White	X		0.23	0.28	0.33	-	Note1
		Y		0.31	0.36	0.41		
	Red	X		0.53	0.58	0.63		
		Y		0.32	0.37	0.42		
	Green	X		0.27	0.32	0.37		
		Y		0.55	0.60	0.65		
	Blue	X		0.08	0.13	0.18		
		Y		0.08	0.13	0.18		
Average Brightness Pattern=white display （With LCD & T/P ） *2	IV		IF=160mA	260	425	-	cd/m2	Note1
Uniformity （With LCD & T/P） *1	△ B		IF=160mA	70	-	-	%	Note1

Note 1:

*1: △B=B(min) / B(max) * 100%

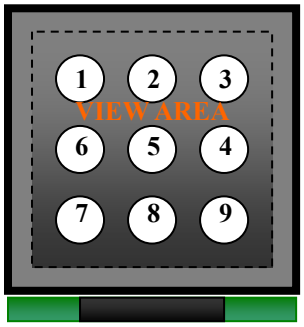
*2: Measurement Condition for Optical Characteristics:

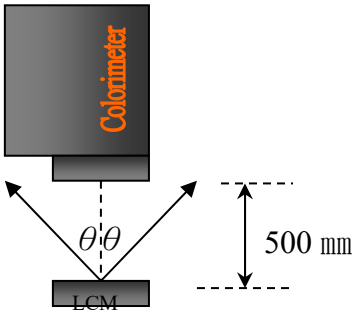
a: Environment: 25℃±5℃ / 60±20%R.H, no wind, dark room below 10 Lux at typical lamp current and typical operating frequency

b: Measurement Distance: 500 ± 50 ㎜, (θ= 0°)

c: Equipment: TOPCON BM-7 fast, (field 1°), after 10 minutes operation

d: The uncertainty of the C.I.E coordinate measurement ±0.01, Average Brightness ± 4%





Colorimeter=BM-7 fast

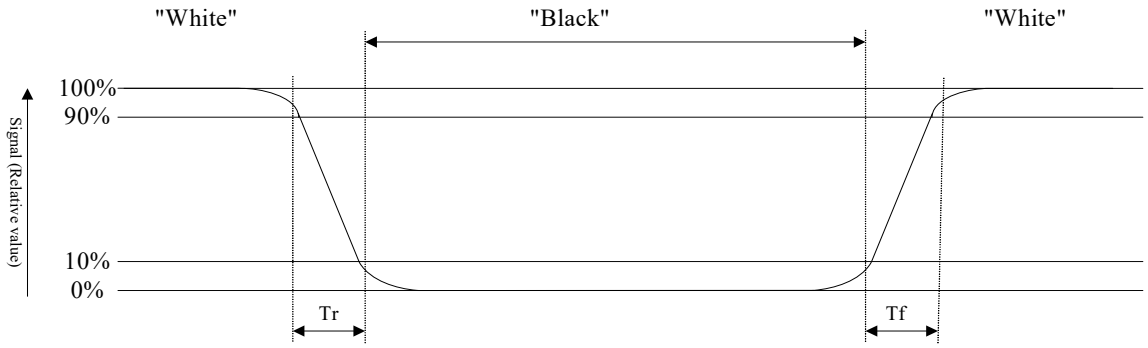
To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module)

Note 2: Definition of response time:

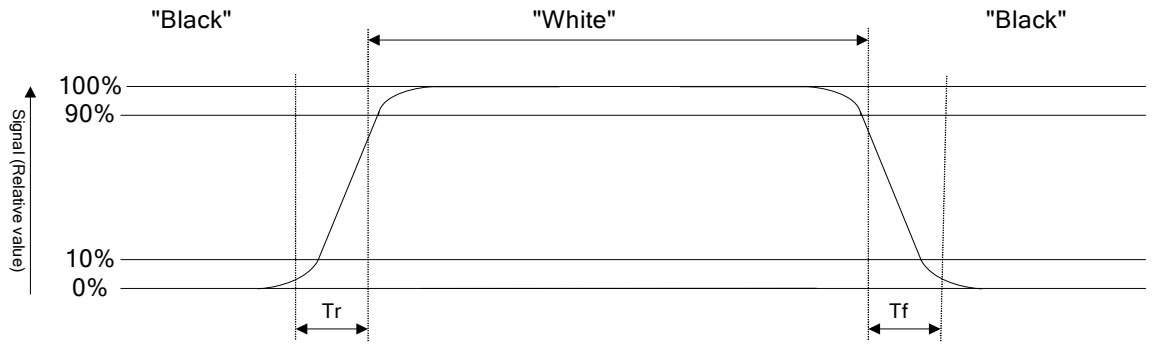
The output signals of photo detector are measured when the input signals are changed from “black” to “white” (falling time) and from “white” to “black” (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:

Normally White



Normally Black



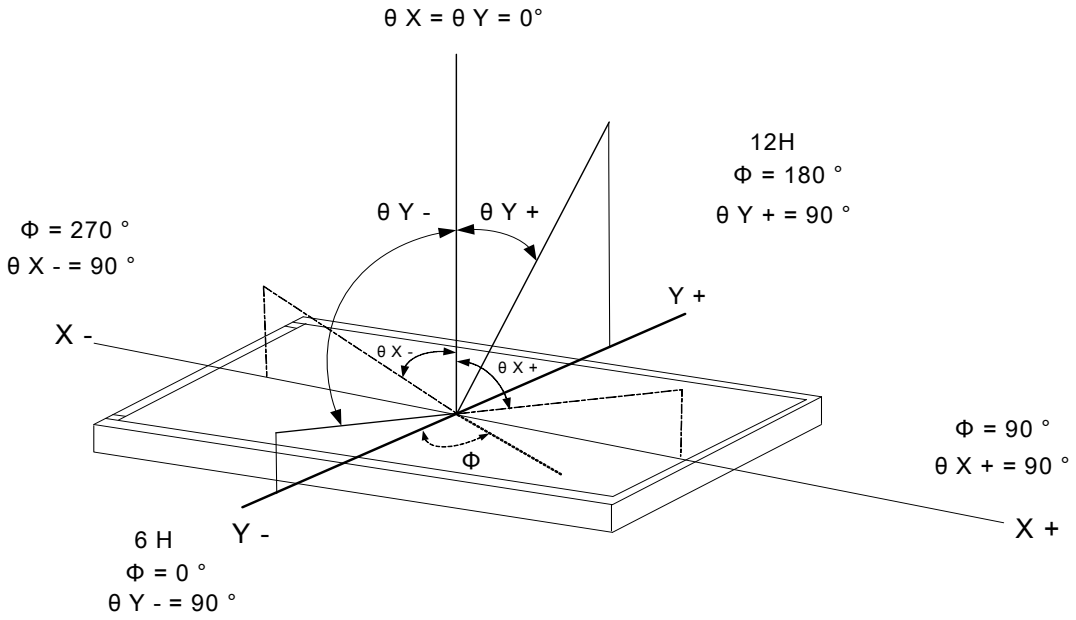
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at “White” state}}{\text{Photo detector output when LCD is at “Black” state}}$$

Note 4: Definition of viewing angle:

Refer to figure as below:



1.6 Backlight Characteristics

Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
LED Forward Current	I_F	-	30*8	mA	
LED Reverse Voltage	V_R	-	5.0	V	
Power Dissipation	PD		2400	mW	

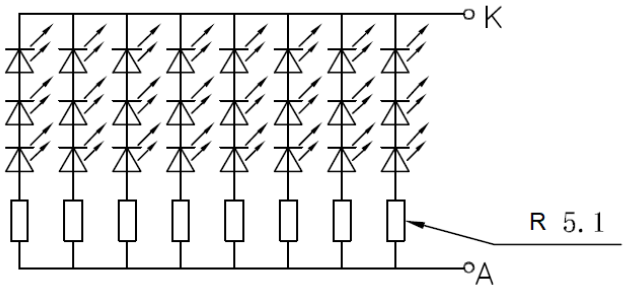
Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 160 mA	8.4	9.0	10.2	V
Average Brightness (Without LCD)	IV		6300	7560	-	cd/m^2
CIE Color Coordinate (Without LCD)	X		0.25	-	0.31	-
	Y		0.26	-	0.32	
Color	White					

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =160mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =160 mA. The LED life time could be decreased if operating I_L is larger than 160mA.

B/L Internal Circuit Diagram



Other Description

Item	Conditions	Description
Life Time	Ta =25℃ IF=160 mA	20,000 hrs

1.7 Touch Panel Characteristics

Features

Item	Standard Value
Touch Panel Size	7.0”
Touch type	Capacitive Touch Panel
Input Method	True Multi-Touch Capacitive Touch Panel True Multi-touch with up to 5 Points of Absolution
Output Interface	I²C
IC	FocalTech--FT5446

I²C Address

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	1	1	0	0	0	**R/W**

Bit 0: 0 for Write / 1 for Read

Mechanical Specifications

Item	Standard Value	Unit
Viewing Area	Refer to drawing	mm

Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	TPVDD	-	-0.3	3.6	V
Operating Temperature	T_{OP}	Non condenssing	-20	70	°C
Storage Temperature	T_{ST}	Non condenssing	-30	80	°C

DC Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	TPVDD	25°C	3.0	3.3	3.3	V

Optical Characteristics

Item	Standard Value	Unit
Total light transmittance	85% or more	-
Hardness	⩾6H	-

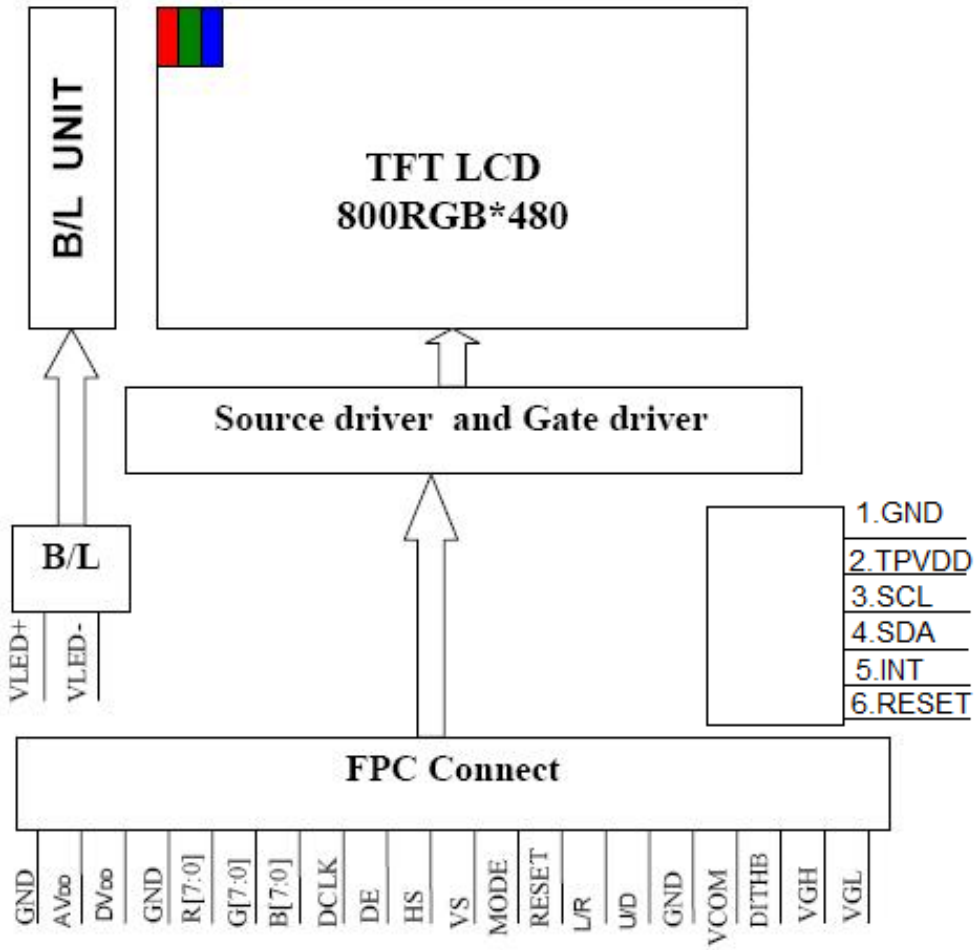
2. Module Structure

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



2.2 Interface Pin Description

TFT LCM Interface

Pin#	Name	Description
1	VLED+	Power For LED backlight (+).
2	VLED+	Power For LED backlight (+).
3	VLED-	Power For LED backlight (-).
4	VLED-	Power For LED backlight (-).
5	GND	Power ground.
6	VCOM	No Function,Not Connection
7	DVDD	Power for Digital Circuit.
8	MODE	No Function,Not Connection
9	DE	Input data enable control. When DE mode, active High to enable data
10	VS	Vertical sync signal. Negative polarity
11	HS	Horizontal sync signal. Negative polarity
12	B7	Blue Data (MSB).
13	B6	Blue Data.
14	B5	Blue Data.
15	B4	Blue Data.
16	B3	Blue Data.
17	B2	Blue Data.
18	B1	Blue Data.
19	B0	Blue Data (LSB).
20	G7	Green Data (MSB).
21	G6	Green Data.
22	G5	Green Data.
23	G4	Green Data.
24	G3	Green Data.
25	G2	Green Data.
26	G1	Green Data.
27	G0	Green Data (LSB).
28	R7	Red Data (MSB).
29	R6	Red Data.

Pin#	Name	Description
30	R5	Red Data.
31	R4	Red Data.
32	R3	Red Data.
33	R2	Red Data.
34	R1	Red Data.
35	R0	Red Data (LSB).
36	GND	Power Ground
37	DCLK	Sample clock. Latch data at DCLK falling edge.
38	GND	Power Ground.
39	L/R	Horizontal scan direction control.
40	U/D	Vertical scan direction control
41	VGH	No Function,Not Connection
42	VGL	No Function,Not Connection
43	AVDD	No Function,Not Connection
44	RESET	Global reset pin. Low active.
45	NC	No connection.
46	VCOM	No Function,Not Connection
47	DITHB	No Function,Not Connection
48	GND	Power Ground.
49	NC	No connection.
50	NC	No connection.

Capacitive Touch Panel(CTP) Interface

Pin No.	Symbol	Function
1	GND	Ground.
2	TPVDD	Power Supply Voltage (3.3V)
3	SCL	I2C Clock
4	SDA	I2C Data
5	INT	Active Low
6	RESET	Active low global reset signal input.

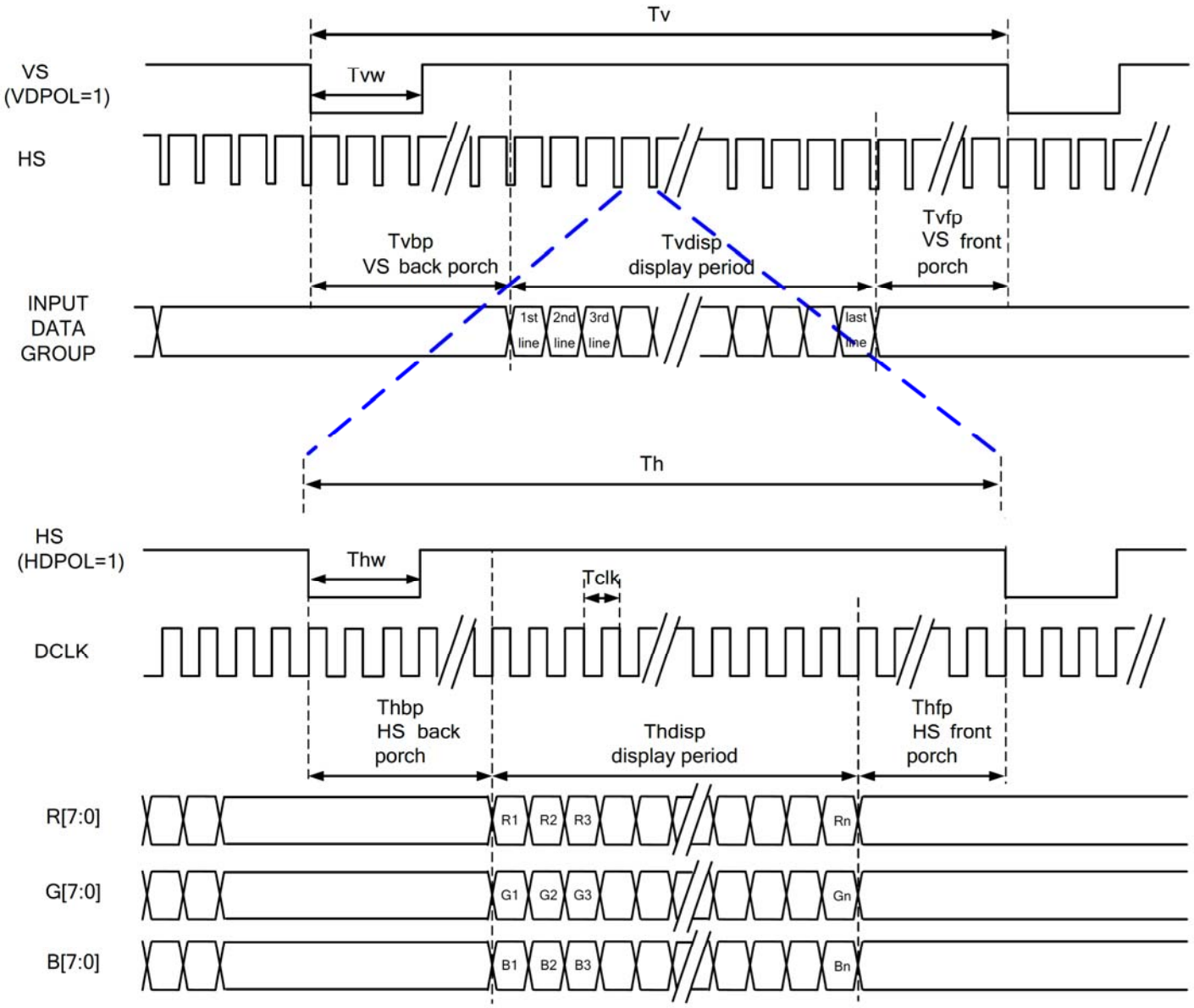
2.3 Timing Characteristics

2.3.1 RGB Mode Selection Table

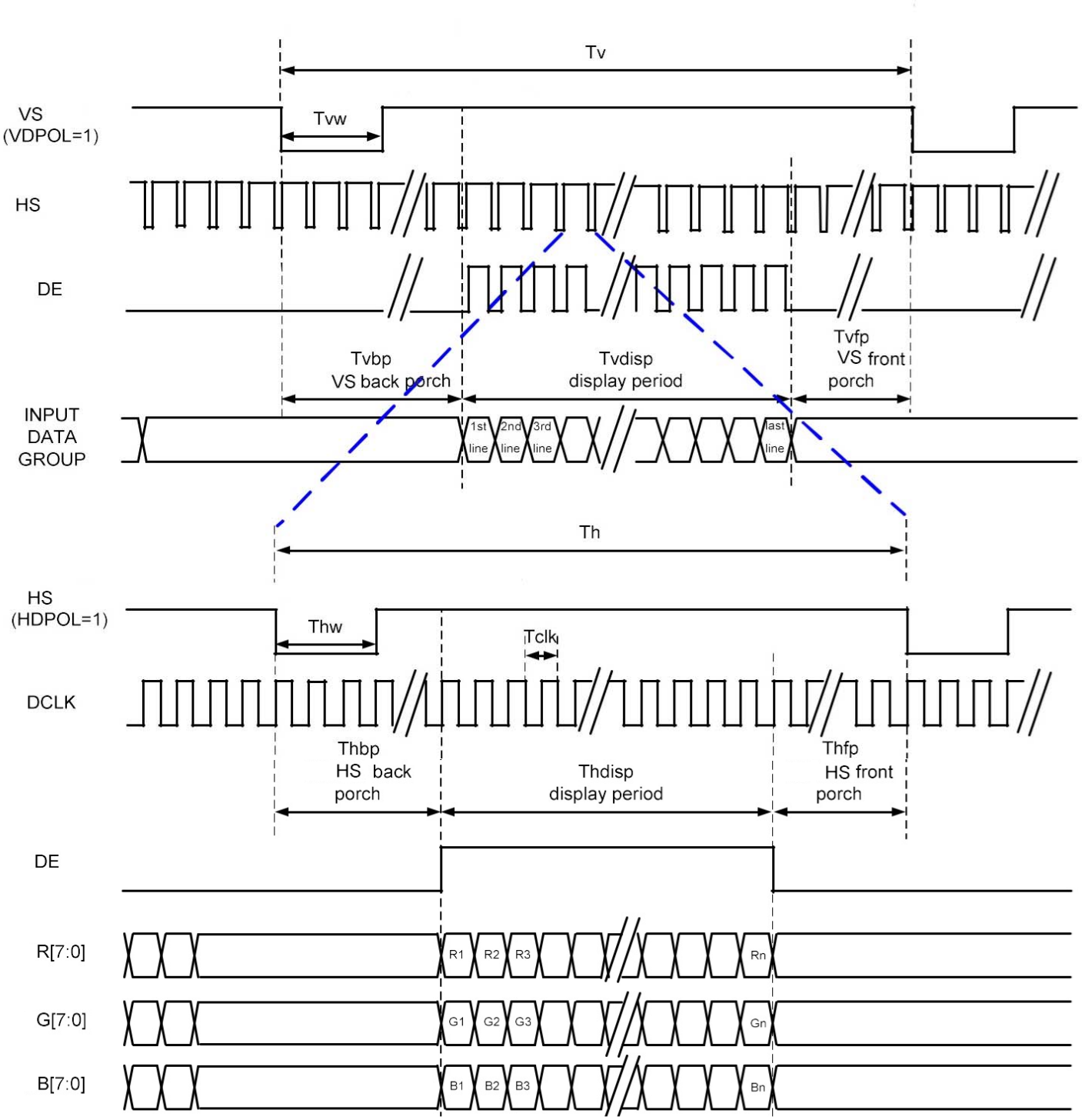
RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: “Input” means these signals are driven by host side

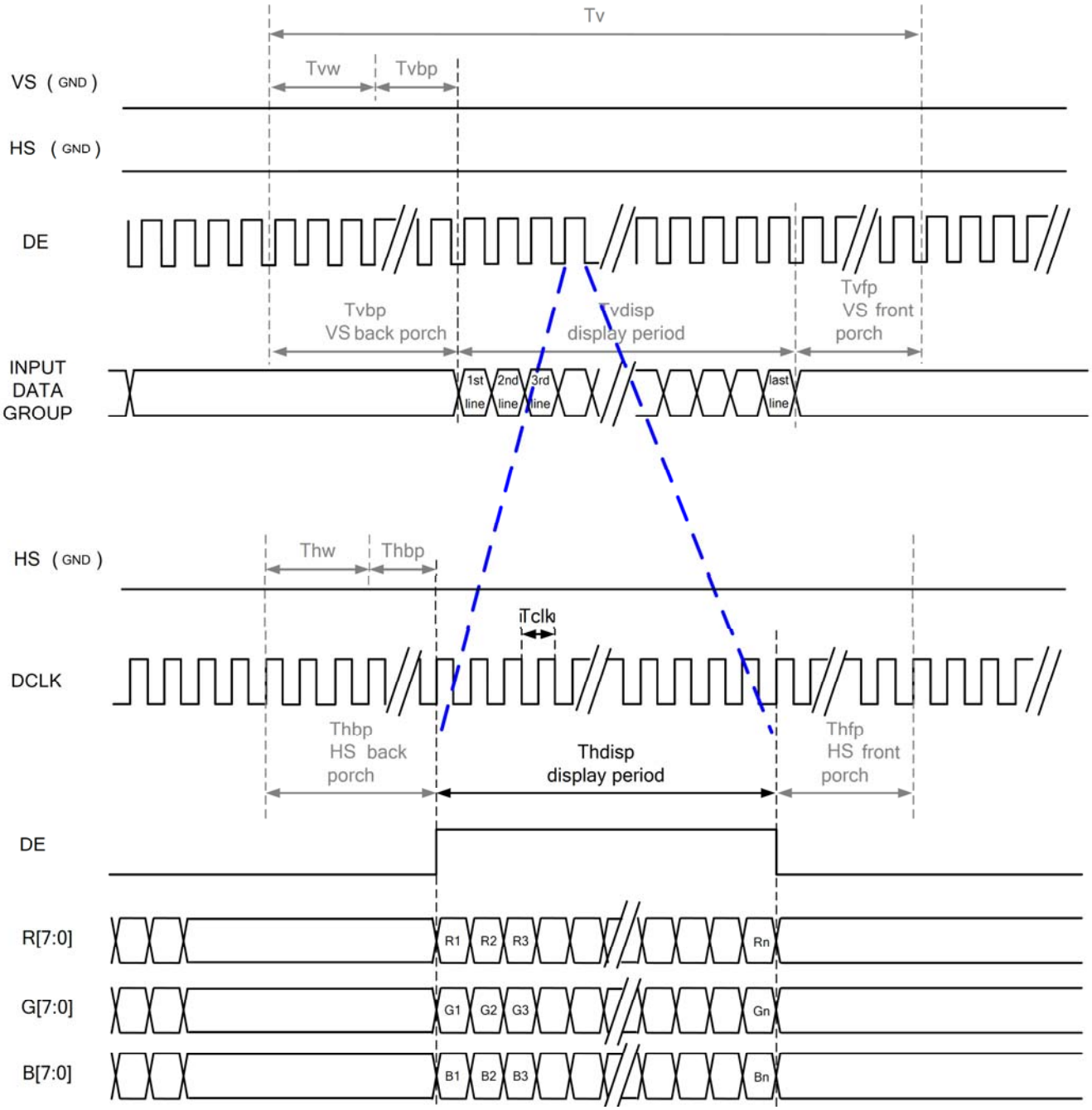
2.3.2 SYNC Mode



2.3.3 SYNC-DE Mode



2.3.4 DE Mode

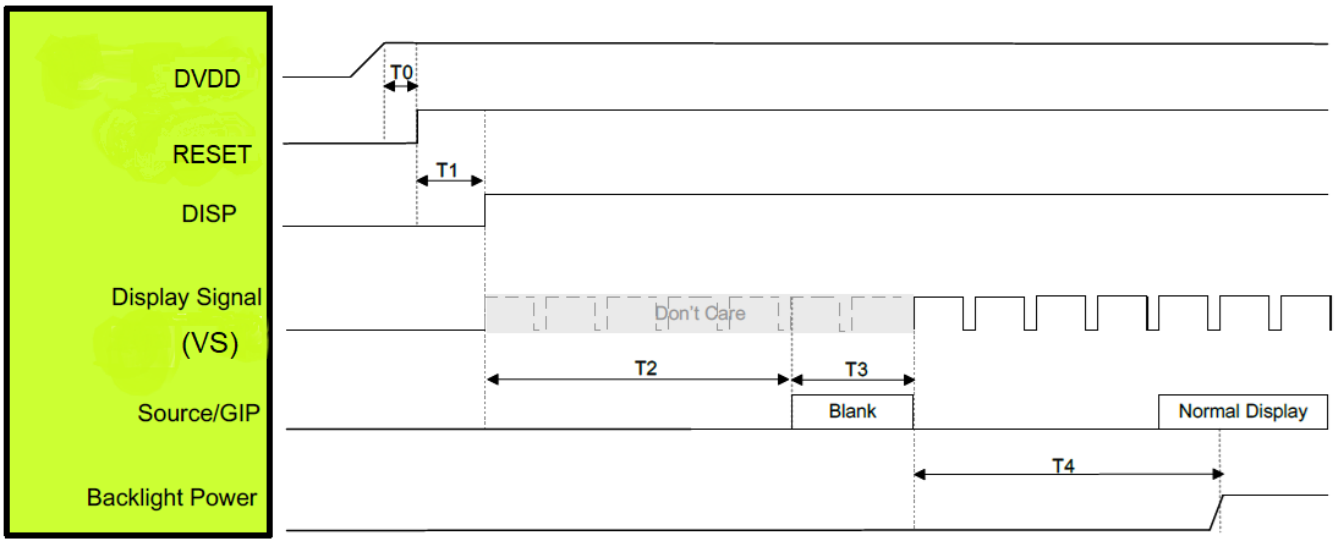

Tv
Tvw
Tvbp
VS (GND)
HS (GND)
DE
Tvbp
VS back porch
Tvdisp
display period
Tvfp
VS front
porch
INPUT
DATA
GROUP
1st
line
2nd
line
3rd
line
last
line
HS (GND)
Thw
Thbp
iTclk
DCLK
Thbp
HS back
porch
Thdisp
display period
Thfp
HS front
porch
DE
R[7:0]
R1
R2
R3
Rn
G[7:0]
G1
G2
G3
Gn
B[7:0]
B1
B2
B3
Bn

2.3.5 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Interface Timing Table							
Item		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Remark**
DCLK Frequency		Fclk	23	25	27	MHz	
HS	Period Time	Th	808	816	896	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	4	8	24	DCLK	
	Front Porch	Thfp	4	8	24	DCLK	
	Pulse Width	Thw	2	4	8	DCLK	
VS	Period Time	Tv	496	512	528	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	8	16	24	HSYNC	
	Front Porch	Tvfp	8	16	24	HSYNC	
	Pulse Width	Tvw	2	4	8	HSYNC	

2.3.6 Power On Sequence

1 Power Mode



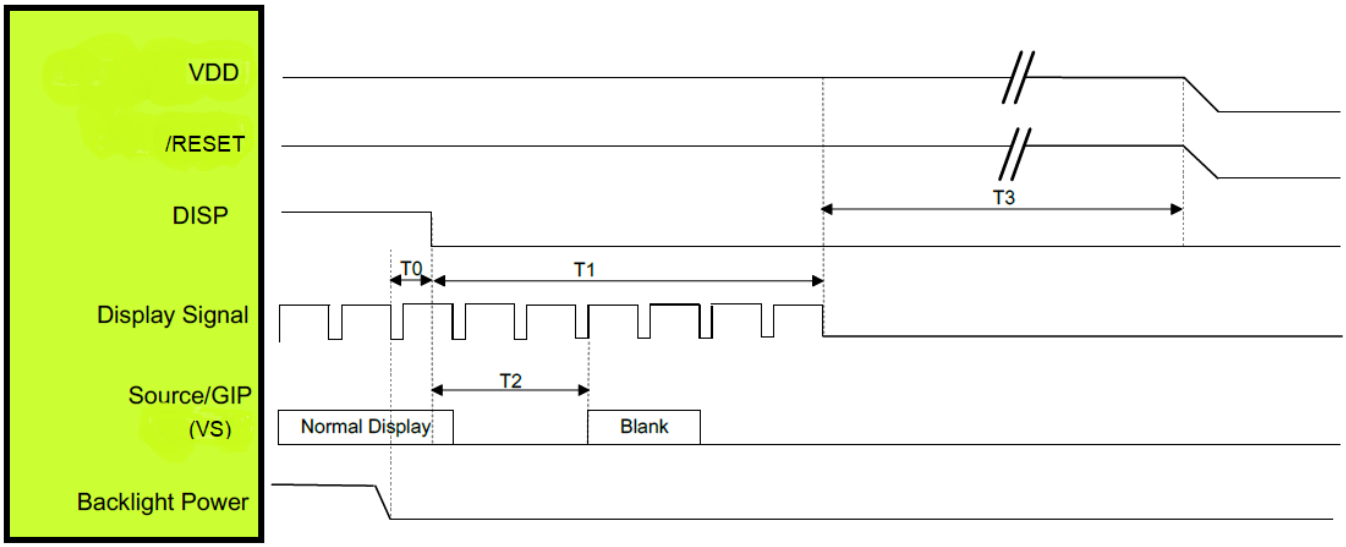
Symbol	Description	Min. Time	Unit
T0	System power stability to /RESET signal	≧1	ms
T1	/RESET= “High” to DISP=”High”	≧10	ms
T2	DISP=“High” to Source/GIP scan blank	85	ms
T3	IC scan blanking signal	≧33	ms
T4	Display Signal output to Backlight Power on	≧100	ms

Note: 1. When DISP pull “H” or “L”, IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

2. RGB interface Display signal: DCLK; VS; HS; DE; R[7:0]; G[7:0]; B[7:0] .

2.3.7 Power Off Sequence

1 Power Mode



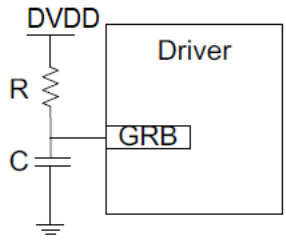
Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	≧1	ms
T1	DISP="Low" to IC internal voltage discharge complete	≧100	ms
T2	DISP="Low" to Source/GIP scan blank (base on Display Signal Frame Rate 60Hz)	≦50	ms
T3	IC internal voltage discharge is completed to VDD off	≧0	ms

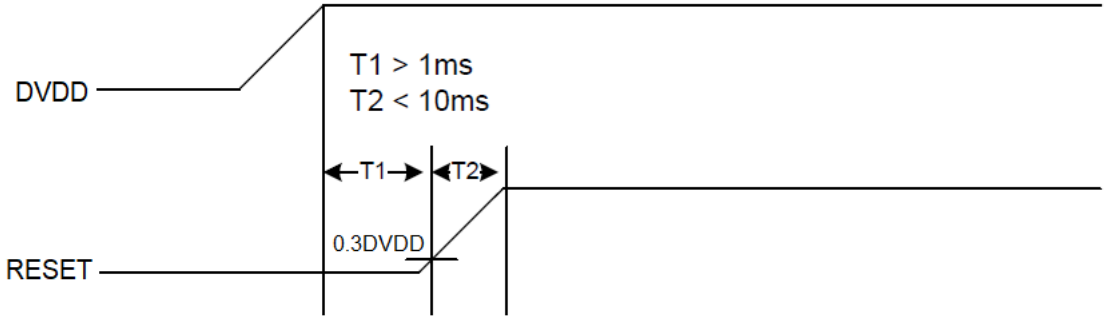
Note: 1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

2. RGB interface Display signal: DCLK; VS; HS; DE; R[7:0]; G[7:0]; B[7:0] .

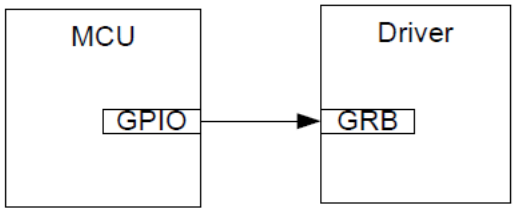
2.5 Reset timing

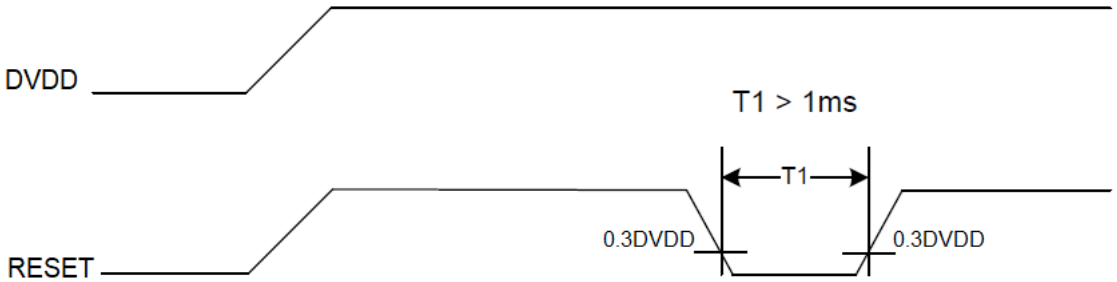
1.The /RESET pin with external RC circuit.





(2) The GRB pin controlled by MCU.





3. Reliability Test

3.1 Reliability Test Condition (Ver.B01)

<table>
<tr><th>NO.</th><th>TEST ITEM</th><th>TEST CONDITION</th></tr>
<tr><td>1</td><td>High Temperature Storage Test</td><td>Keep in +80 ±5℃ 240 hrs</td></tr>
<tr><td>2</td><td>High Temperature Operating Test</td><td>Keep in 70 ±5℃ 240 hrs</td></tr>
<tr><td>3</td><td>Low Temperature Storage Test</td><td>Keep in -30 ±5℃ 240 hrs</td></tr>
<tr><td>4</td><td>Low Temperature Operating Test</td><td>Keep in -20 ±5℃ 240 hrs</td></tr>
<tr><td>5</td><td>High Temperature / High Humidity Storage Test</td><td>Keep in 60 ℃ / 90% R.H duration for 240 hrs (Excluding the polarizer)</td></tr>
<tr><td>7</td><td>Temperature Cycling Storage Test</td><td>-30℃ → +25℃ → +80℃ → +25℃
(30mins) (5mins) (30mins) (5mins)
20 Cycle</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">ESD Test</td><td>Air Discharge:
Apply 2 KV with 5 times Discharge for each polarity +/-</td><td>Contact Discharge:
Apply 250 V with 5 times discharge for each polarity +/-</td></tr>
<tr><td colspan="2">1. Temperature ambiance: 15℃～35℃
2. Humidity relative: 30%～60%
3. Energy Storage Capacitance(Cs+Cd): 150pF±10%
4. Discharge Resistance(Rd): 330Ω±10%
5. Discharge, mode of operation:
Single Discharge (time between successive discharges at least 1 sec)
(Tolerance if the output voltage indication: ±5%)</td></tr>
<tr><td>9</td><td>Vibration Test (Packaged)</td><td colspan="2">1. Sine wave 10～55 Hz frequency (1 min/sweep)
2. The amplitude of vibration: 1.5 mm
3. Each direction (X, Y, Z) duration for 2 hrs</td></tr>
<tr><td>10</td><td>Drop Test (Packaged)</td><td colspan="2"><table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table>Drop Direction :※1 corner / 3 edges / 6 sides each 1time</td></tr>
</table>

◎Result Evaluation Criteria :

Under the display quality test conditions with normal operations with normal operation state.
Do not change these conditions as such changes may affect practical display function.
(Normal operation state)
Temperature：+20~30°C
Humidity：50~70%
Atmospheric pressure：86~106Kpa

4. PRECAUTION RELATING PRODUCT HANDLING

4.1 SAFETY

4.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

4.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

4.2 HANDLING

4.2.1 Avoid any strong mechanical shock which can break the glass.

4.2.2 Avoid static electricity which can damage the CMOS LSI－When working with the module, be sure to ground your body and any electrical equipment you may be using.

4.2.3 Do not remove the panel or frame from the module.

4.2.4 The polarizing plate of the display is very fragile. So, please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)

4.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

4.2.6 Do not touch the display area with bare hands, this will stain the display area.

4.2.7 Do not use ketonic solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

4.2.8 To control temperature and time of soldering is 320 ± 10℃ and 3 ~ 5 sec.

4.2.9 To avoid liquid (include organic solvent) stained on LCM.

4.2.10 Caution! (LCM products with Capacitive Touch Panel)
Strong EMI-sources such as switch-mode power supplies (SPS) can lead to touch malfunction (e.g., ghost-touches). Therefore, the touch needs to be thoroughly tested inside the target application.

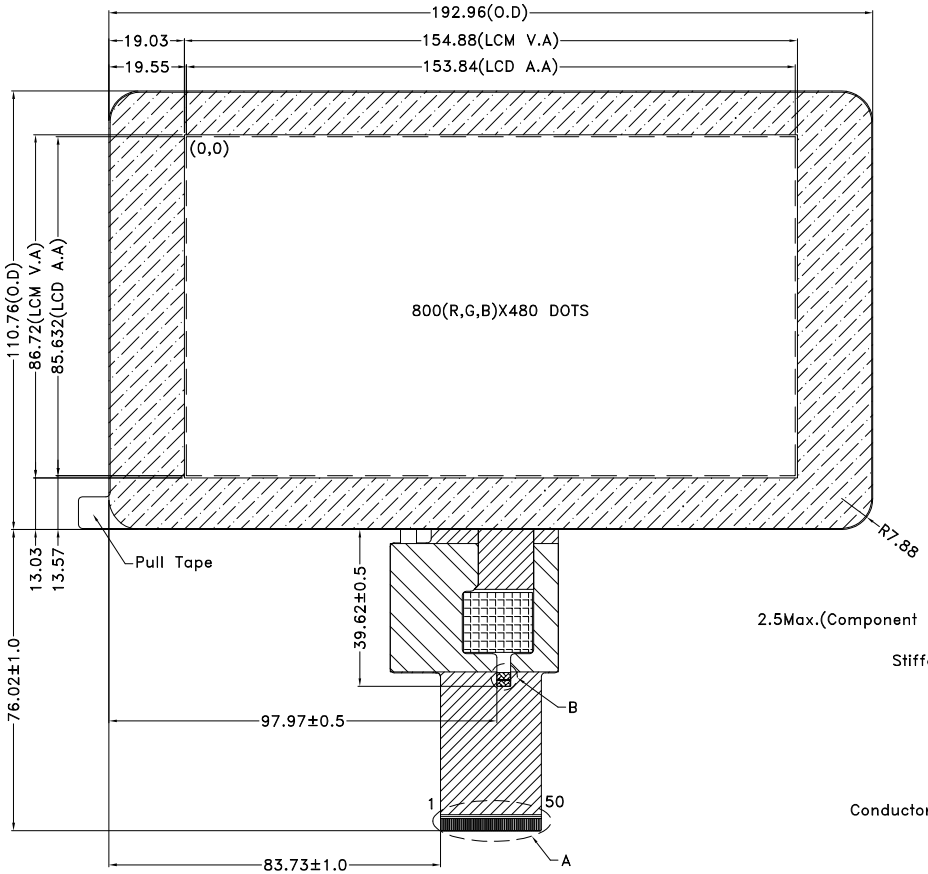
4.2.11 CAUTION: Continuously displaying same static image will result in high possibility of image sticking/image burn-in effect due to TFT panel characteristic.

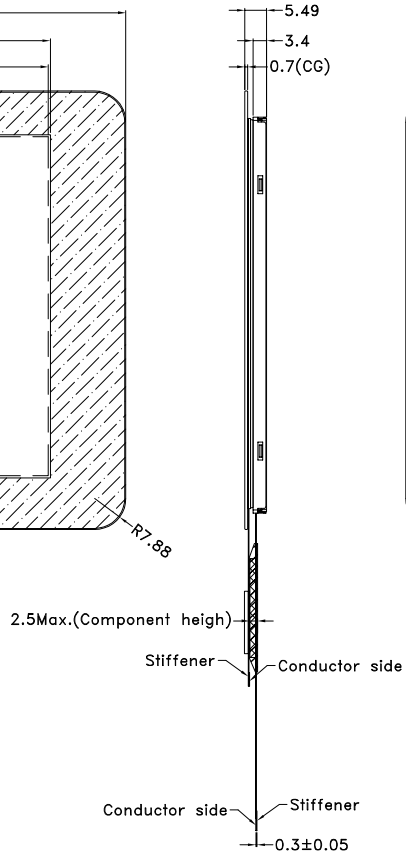
4.2.12 Double-sided tape designed to be attached with the customer's mechanical device, please follow up the rules and regulations published by the original manufacturer of double-side tape for the attachment operation.

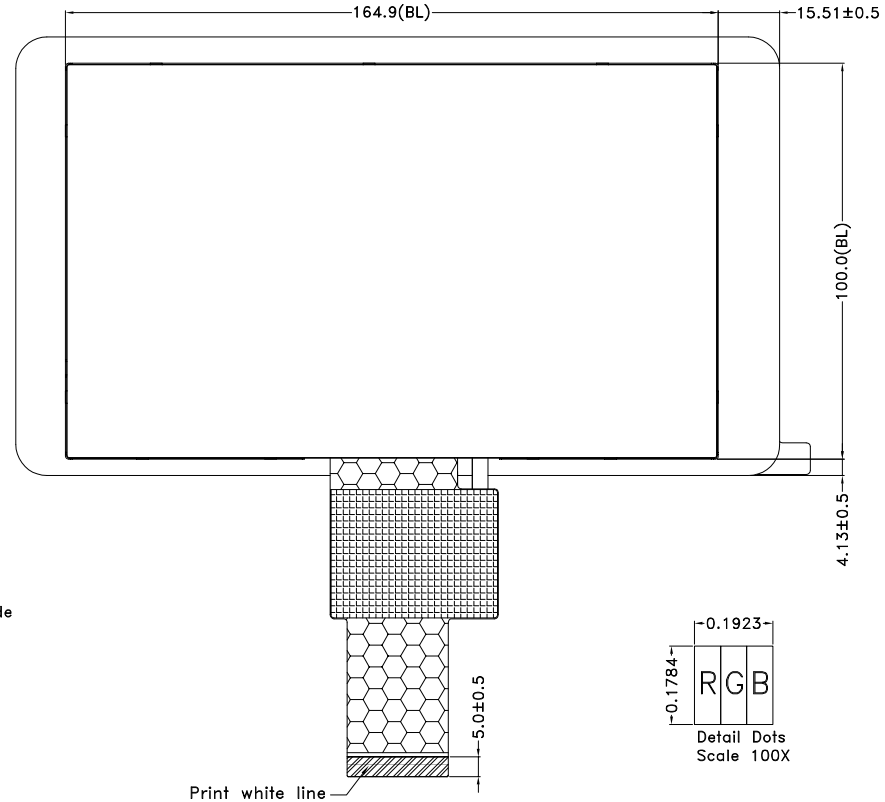
4.3 STORAGE

4.3.1 Store the panel or module in a dark place where the temperature is 25℃ ± 5℃ and the humidity is below 65% RH.

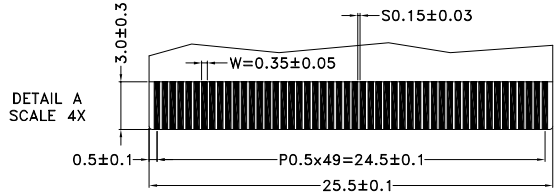
4.3.2 Do not place the module near organics solvents or corrosive gases.

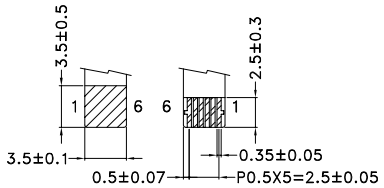






NOTES:
1.LCD TYPE: IPS LCD
2.LCD DISPLAY: Normally Black/Transmissive
3.The tolerance unless classified ±0.3mm
4.LCM FPC Matching Connector:FH12A-50S-0.5SH (Hirose) OR EQUIVALENT
5.▨ Aluminum Foil Conductive Adhesive Tape
6.TP FPC Matching Connector : HIROSE FH34S-6S-0.5SH OR EQUIVALENT





REV	REV BY	REVISER	DATE
007			
006			
005			
004			
003			
002			
001	NEW DRAWING		2024/02/20

Design		(3)	Surface		
Check		Unit	MM	Material	
Approve		Scale	1:1	Thickness	
		Page	1/1	Quantity	

Precision / Tolerance Length(Min) (mm)	Level
1 ~ 4	-
4 ~ 16	-
16 ~ 63	-
63 ~ 250	-
250 ~ 1000	-