

LCD MODULE SPECIFICATION

Model:	UE024QV-RH40-L010
Version:	V1.0
Date:	20190328

☒ **Preliminary Specification** 样品规格书

☐ **Final Specification** 量产规格书

Customer Confirmation 客户确认

Approved by	Notes

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VIEWE Confirmation 优奕确认

Prepared by	Reviewed by	Approved by

REVISION HISTORY

Revision 版本号	Date 日期	Contents of Revision Change 修改内容	Remark 备注
V1.0	2019.3.28	Preliminary release	

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1. GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: 40PIN 3SPI - RGB 9bits_2Lane
- 3) Driver IC: GC9307
- 4) Operation Temperature: 20~70℃
- 5) Storage Temperature: -30~80℃
- 6) Backlight Type: White LED
- 7) Display mode: NORMALLY BLACK
- 8) Pixel Density: 166PPI
- 9) LED life time: 30,000 Hours

1.2 Mechanical Specification

Item 项目	Specification 规格	Unit 单位	Remark 备注
Pixel Driving element	IPS TFT	-	-
Screen Size	2.4	Inch	Diagonal
Resolution	240(W)*(RGB)*320(H)	Dots	-
Interface	3SPI - RGB 9bits	-	40PIN
Module Power Consumption	0.4	Watt	Typ.
Active Area	36.72(W)*48.96(H)	mm	-
Pixel pitch (W*H)	0.153(W)*0.153(H)	mm	-
Module Size (W*H*D)	42.00(W)*58.00(H)*2.20(D)	mm	Tolerance: ±0.1
Luminance	300	cd/m ²	Typ.
Viewing Direction	ALL	O'clock	-
Display Color	262K	Colors	9bits

2. ABSOLUTE MAXIMUM RATINGS

Item 项目	Symbol 符号	Min. 最小值	Max. 最大值	Unit 单位	Remark 备注
Power supply voltage	VCC	-0.5	3.6	V	Note1
Power supply voltage	IOVCC	-0.5	3.6	V	Note1
LED forward current	I _F	-0.001	30	mA	For each led, Note1
LED Reverse Voltage	V _R	-	5	V	For each led, Note1
Operating temperature	T _{op}	-20	70	°C	Note1,2
Storage temperature	T _{st}	-30	80	°C	Note1,2
Humidity	H _{st}	10	90	%RH	Note1,3

(Ta=+25°C, GND=0V)

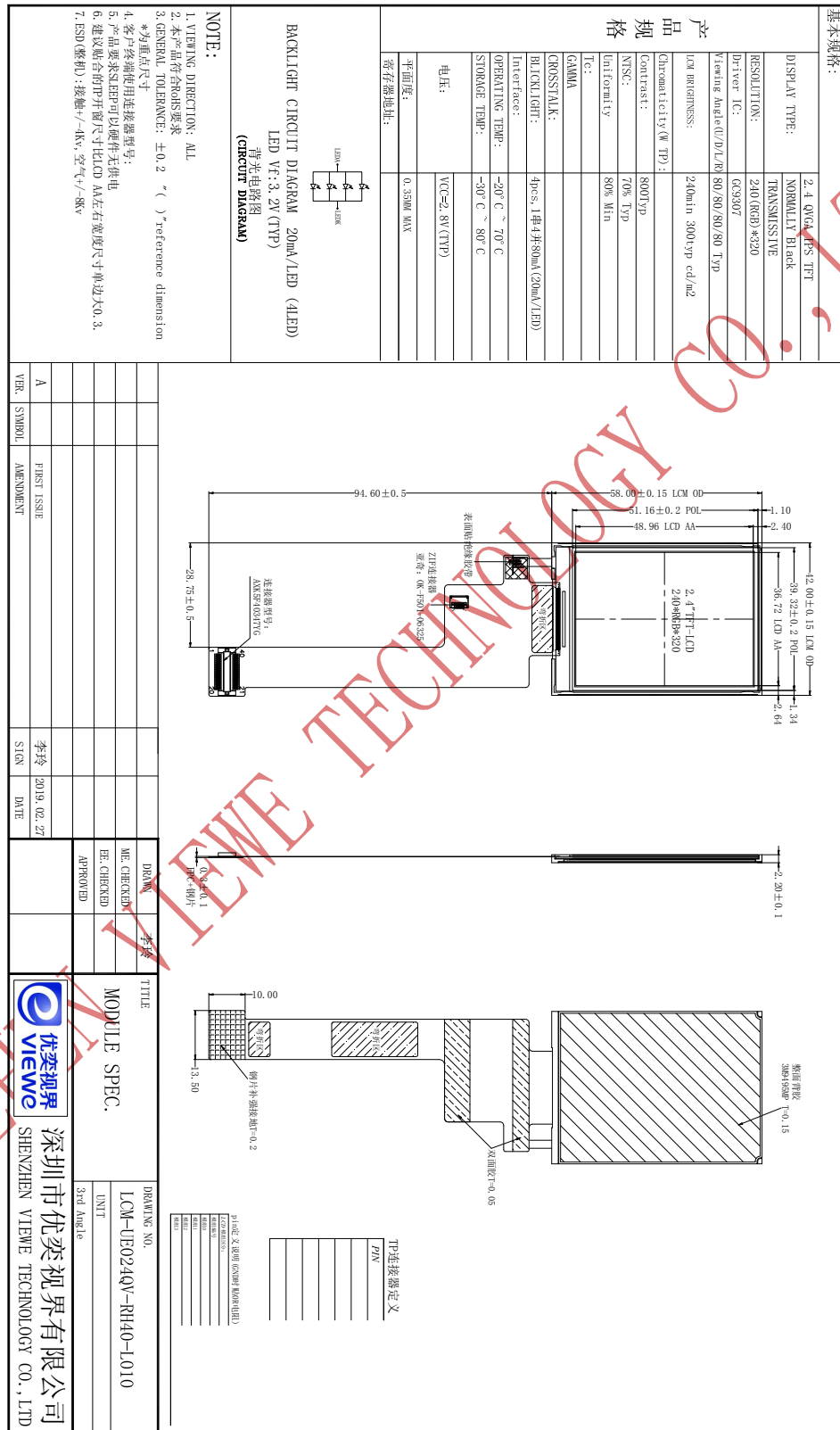
Note1: If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

Note2: In case of temperature below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

Note3: Temp. ≤ 60°C , 90% RH MAX.

Temp. > 60°C , Absolute humidity shall be less than 90% RH at 60°C.

3. MECHANICAL DRAWING



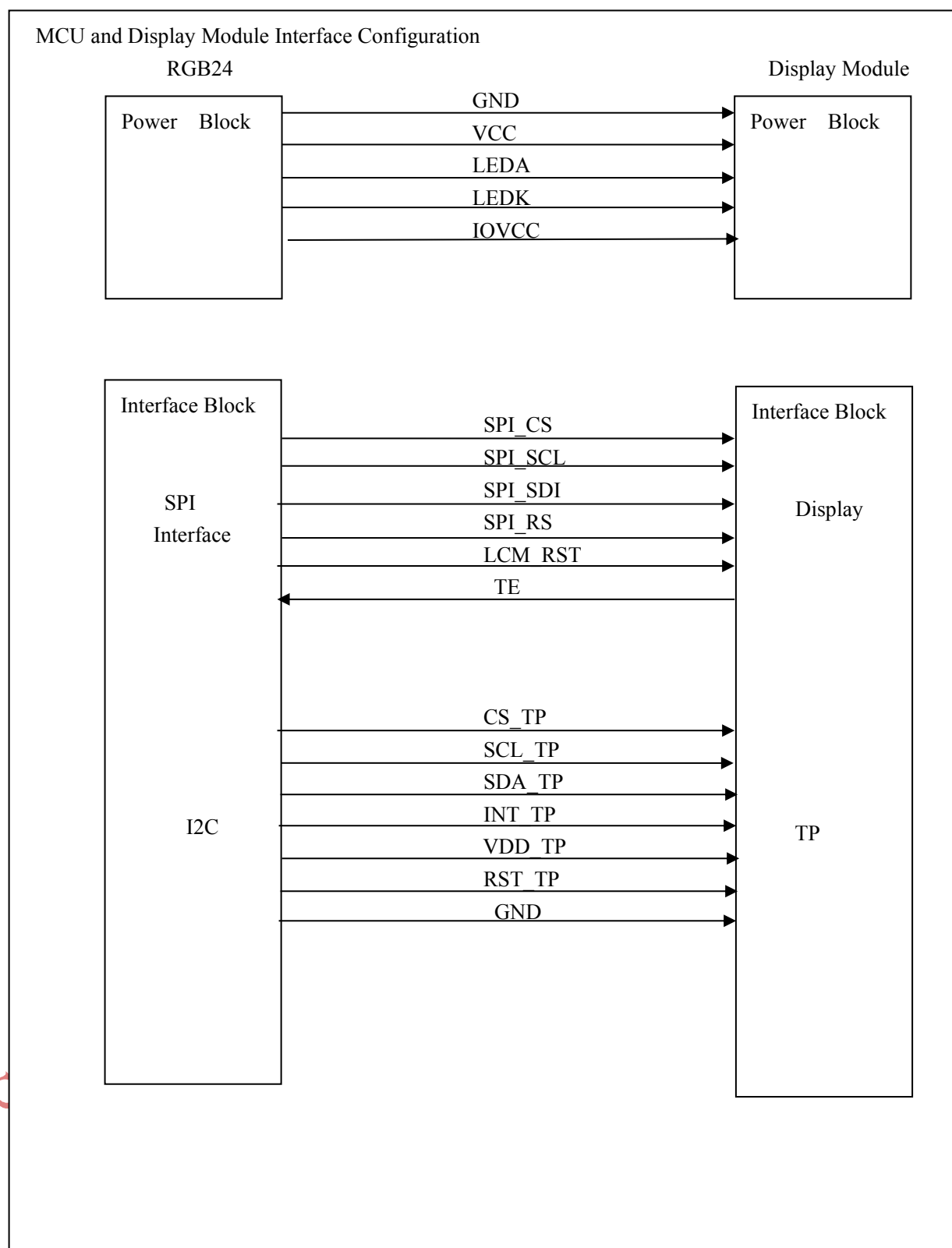
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

Pin No. 序号	Symbol 符号	I/O	Description 描述
1	GND	P	Power Ground
2-6	NC	-	Dummy
7	GND	P	Power Ground
8	LED+	P	Power supply for backlight anode
9-10	NC	-	Dummy
11	SPI_CS	I	Chip select input pin (“Low” enable), for initial RGB I/F。
12	SPI_SCL	I	serial interface clock, for initial RGB I/F。
13	SPI_SDI	I/O	Serial in/out signal, for initial RGB I/F。
14	SPI_RS	I	Serves as a read signal and MCU read data at the rising
15	GND	I	Power Ground
16	RST_TP	I	TP_This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.
17	SDA_TP	I	Blue data input.
18	SCL_TP	I	I2C clock signals for TP
19	INT_TP	O	Interrupt signals for TP
20	VDD_TP	P	TP_Power supply to the internalr (3.3V)
21	VCC	P	Power supply to the internal logic power regulator(3.3V)
22	IOVCC	P	Power supply for digital circuits and IO pads(1.8V)
23	LCM_RST	I	The signal will reset the LCM, Signal is active low.
24	GND	P	Power Ground
25	TE	O	Tearing effect output pin to synchronize MPU to frame writing, activated by S/W command.
26-30	NC	-	Dummy
31	GND	P	Chip select pin for SPI interface.
32-35	LED--	P	Power supply for backlight cathode
36-40	NC	I	Dummy

I: Input; O: Output; P: Power

4.2 Block Diagram



5. ELECTRICAL CHARACTERISTICS

5.1 TFT-LCD Panel Driving Section

Item 项目	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 备注
Power Supply Voltage	VCC	3.0	3.3	3.6	V	-
Power Supply Voltage	IOVCC	1.6	1.8	3.6	V	-
Power Supply Current	I _{VDD}	-	30	-	mA	Note1
Logic Input High Voltage	V _{IH}	0.7VCC	-	VCC	V	-
Logic Input Low Voltage	V _{IL}	0	-	0.3VCC	V	-
Panel Power Consumption	P _{VDD}	-	0.099	-	Watt	Note1
Module Power Consumption	P _{LCM}	-	0.4	-	Watt	Note1,2

(Ta=+25°C, GND=0V)

Note1: Measurement Conditions (Video Mode): Full Screen Red Pattern, VDD=3.3V, 60Hz Refresh.

Note2: P_{LCM} = P_{VDD} + P_{BL}, About P_{BL} information, inference to 5.2 Back Light Driving Section.

5.2 Back Light Driving Section

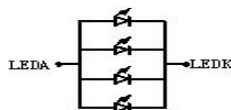
Item 项目	Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 备注
Forward Voltage	V _F	2.8	3.2	3.3	V	Note1
Forward Current	I _F	-	80	-	mA	Note1
Backlight Power consumption	P _{BL}	-	0.256	-	Watt	Note1
LED life time	-	30000	-	-	Hrs	Note2
LED Quantity	-	4			PCS	

(Ta=+25°C, GND=0V)

Note1: The LED driving condition is defined for each LED module (1 LED Serial, 4 LED Parallel)。

For each LED : I_F=20mA, V_F=3.2V(Typ.)/3.4V(Max.), Ta=25°C。

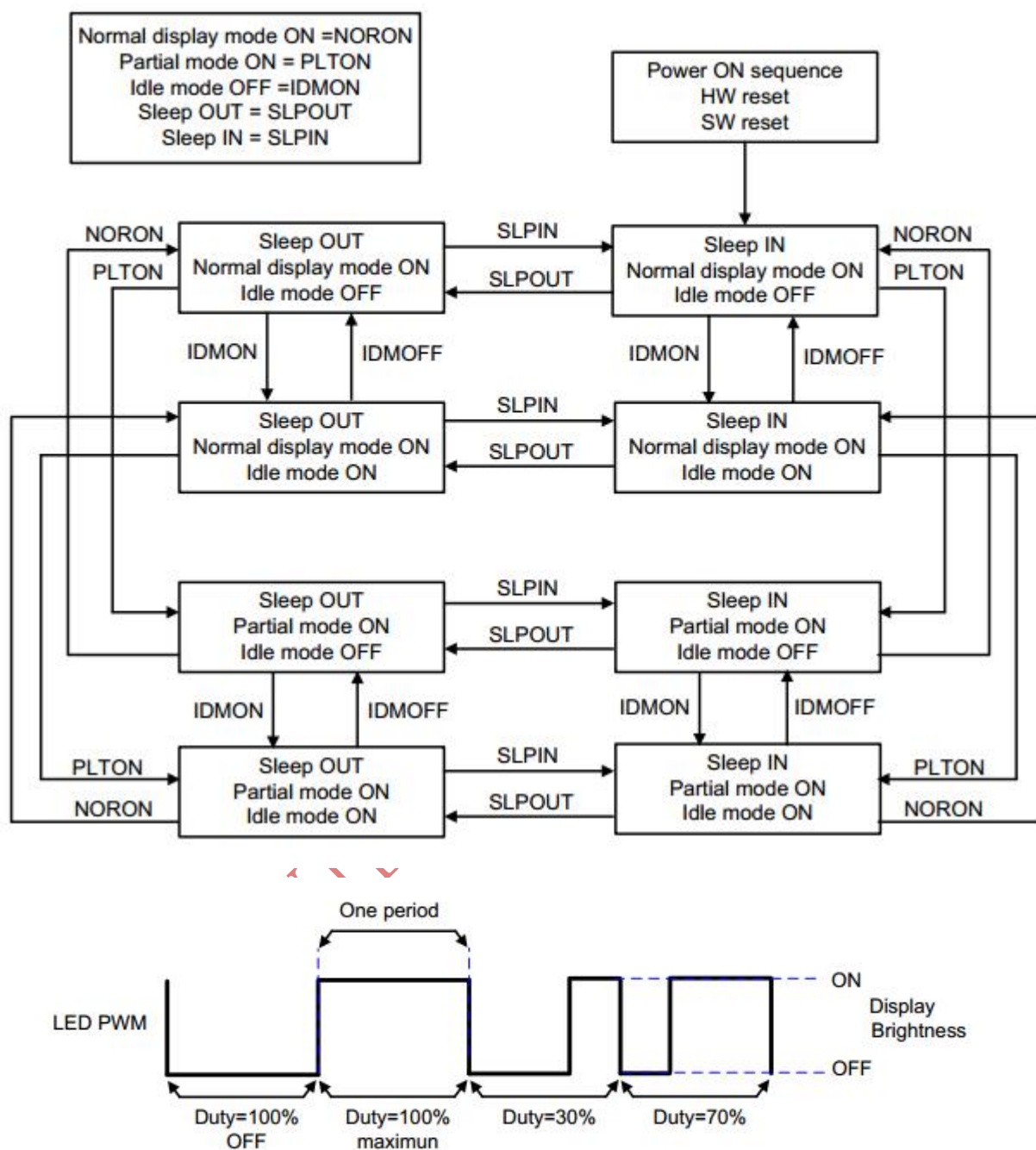
Note2: The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_{LED}=20mA(Per Led). The LED life time could be decreased if operating I_{LED} is larger than 20mA.



BACKLIGHT CIRCUIT DIAGRAM 20mA/LED (4LED)

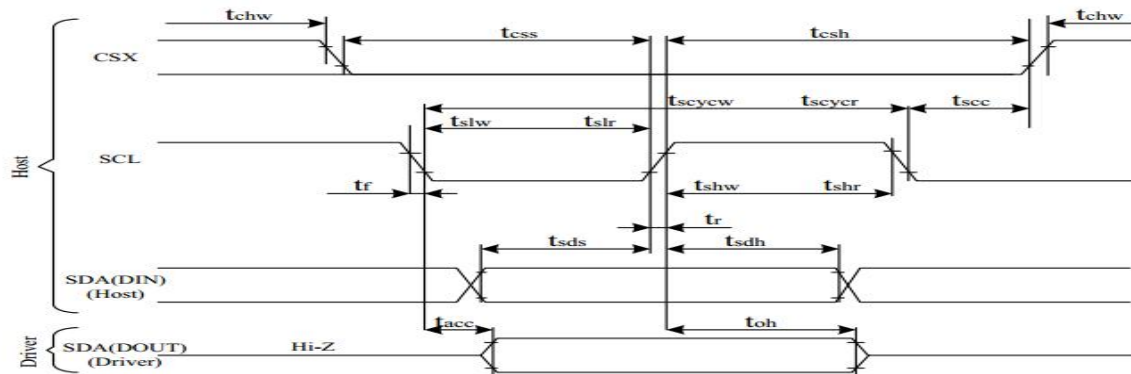
LED V_f: 3.2V (TYP)

背光电路图



5.4 Timing Characteristics

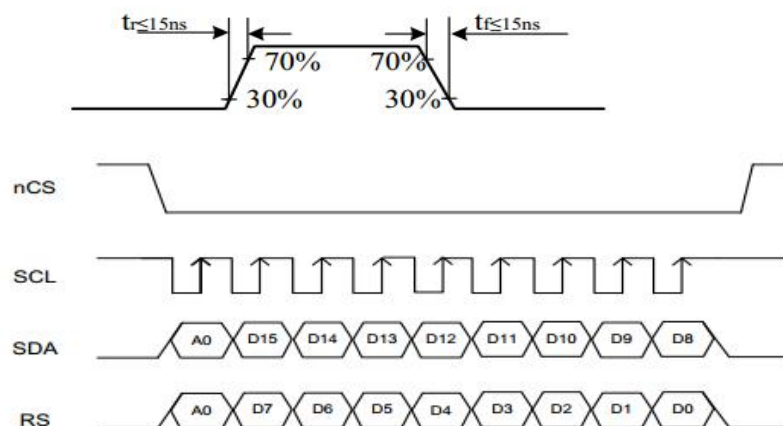
5.4.1 Timing Parameters



Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	10	-	ns	
	tshw	SCL "H" Pulse Width (Write)	5	-	ns	
	tslw	SCL "L" Pulse Width (Write)	5	-	ns	
	tscyrc	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA/SDI (Input)	tsds	Data setup time (Write)	5	-	ns	
	tsdh	Data hold time (Write)	5	-	ns	
SDA/SDO(Output)	tacc	Access time (Read)	10	-	ns	
CSX	tsccl	SCL-CSX	10	-	ns	
	tchwh	CSX "H" Pulse Width	10	-	ns	
	tcss	CSX-SCL Time	20	-	ns	
	tcsh		40	-	ns	

Note: $T_a = 25^\circ\text{C}$, $\text{IOVCC} = 1.65\text{V to } 3.3\text{V}$, $\text{VCI} = 2.5\text{V to } 3.3\text{V}$, $\text{VSSA} = \text{VSSC} = 0\text{V}$

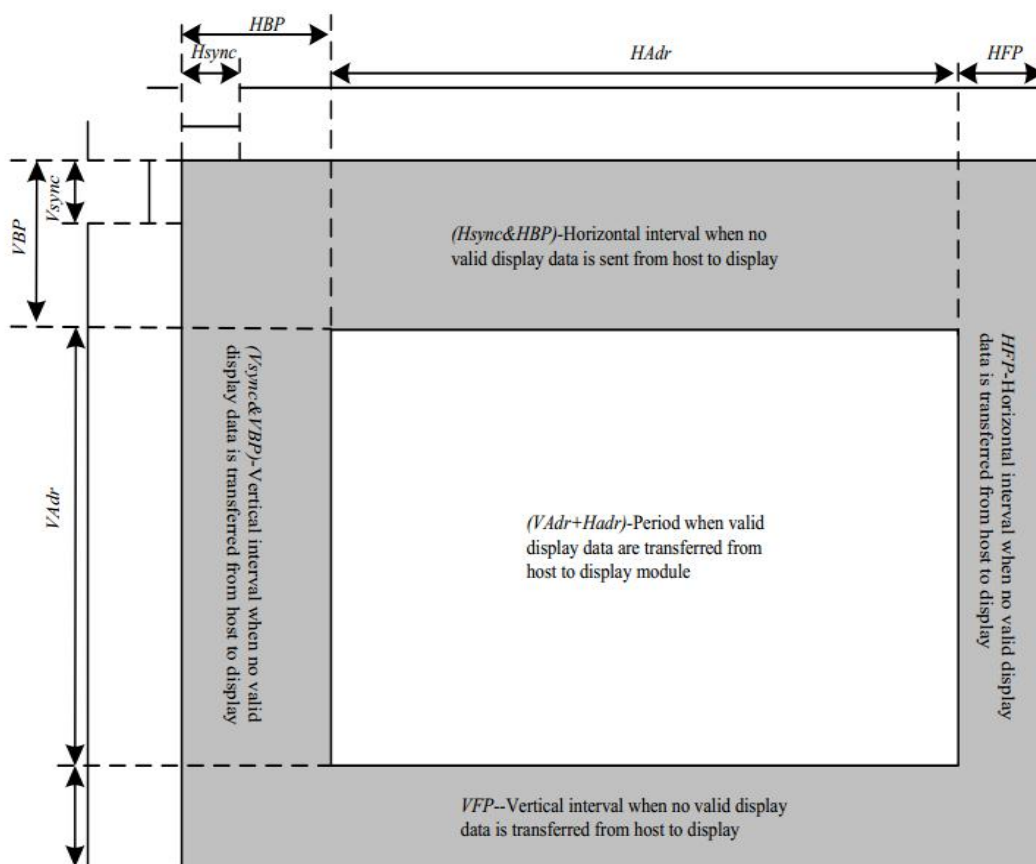
Figure98.



Five data formats are supported in 2-data-line mode, which is indicated by 2data_mdt (E9h[2:0]) .

5.5 Timing Diagram

5.5.1 Horizontal&Vertical Timing



Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
Horizontal Synchronization	Hsync		2	10	16	DOTCLK
Horizontal Back Porch	HBP		2	20	24	DOTCLK
Horizontal Address	HAdr		-	240	-	DOTCLK
Horizontal Front Porch	HFP		2	10	16	DOTCLK
Vertical Synchronization	Vsync		1	2	4	Line
Vertical Back Porch	VBP		1	2	-	Line
Vertical Address	VAdr		-	320	-	Line
Vertical Front Porch	VFP		3	4	-	Line

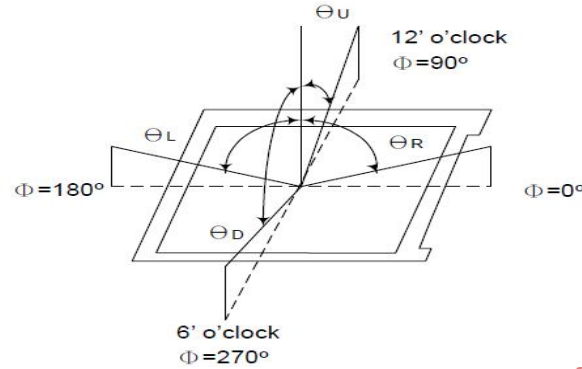
6. OPTICAL CHARACTERISTICS

Parameter 参数	Symbol 符号	Condition 条件	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 备注
Contrast Ratio	C/R	$\theta = 0^\circ$	640	800	-	-	Note(4)
NTSC Ratio	S	$\theta = 0^\circ$	-	70	-	%	Note(7)
Luminance	L	$\theta = 0^\circ$	-	300	-	cd/m ²	Note(5)
Luminance uniformity	U _W	$\theta = 0^\circ$	70	80	-	%	Note(3)
Response Time	T _R + T _F	25 °C	-	30	35	ms	Note(2)
Color Coordination	W _X	$\theta = 0^\circ$ (Center) Normal viewing angle B/L On	-0.03	0.310	+0.03	NTSC (x,y)	Note(6)
	W _Y			0.336			
	R _X			0.647			
	R _Y			0.317			
	G _X			0.275			
	G _Y			0.582			
	B _X			0.140			
	B _Y			0.088			
Viewing Angle	θ_L	C/R>10	70	80	-	Degree	Note(1)
	θ_R		70	80	-		
	θ_U		70	80	-		
	θ_D		70	80	-		

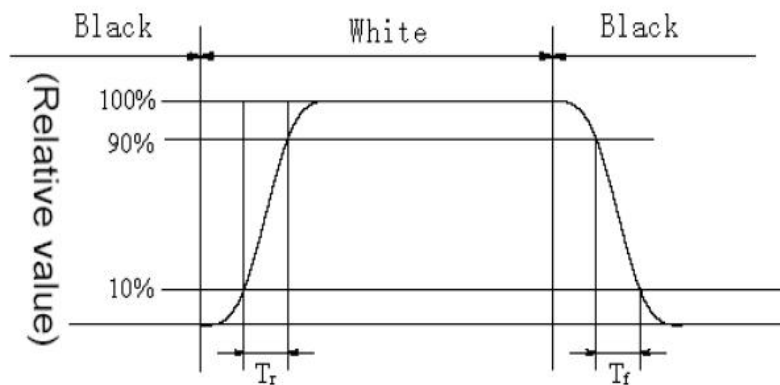
Test Conditions:

1. VDD=3.3V, I_F=40mA (Backlight current), the ambient temperature is +25℃.
2. The test systems refer to Note 8.

Note1: Definition of Viewing Angle: The viewing angle range that the CR>10

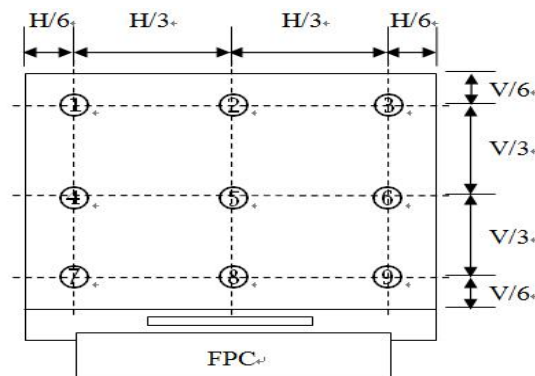


Note2: Definition of Response time: Sum of T_R and T_F



Note 3: Definition of Luminance Uniformity: Active area is divided into 9 measuring areas, every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity} = \frac{\text{Min Luminance of white among 9-points}}{\text{Max Luminance of white among 9-points}} \times 100\%$$



Note4: Definition of Contrast Ratio (CR): measured at the center point of panel

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

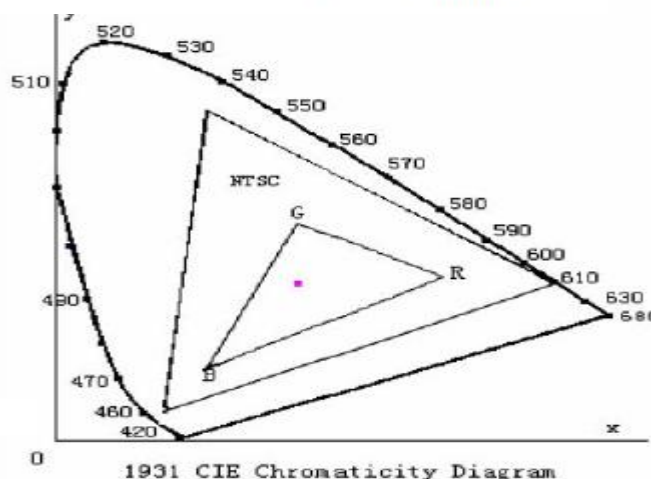
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

Color coordinates of white & red, green, blue measured at center point of LCD.

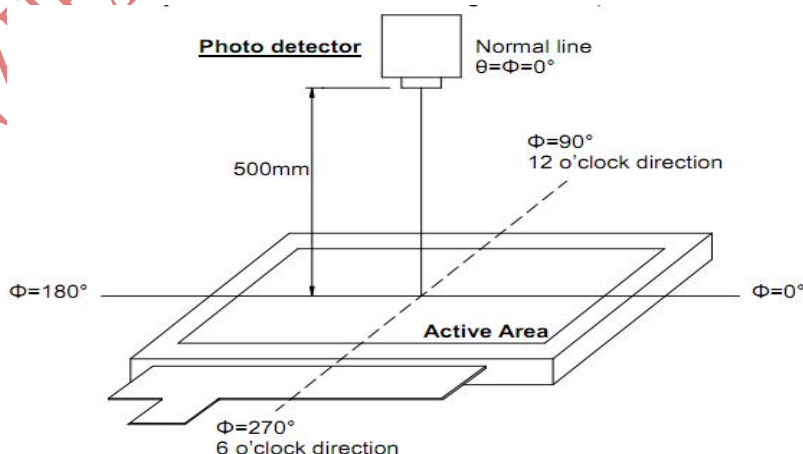
Note 7: Definition of NTSC ratio:

$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$



Note 8: Definition of measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, Field of view: 1°/Height: 500mm.)



7. RELIABILITY

Item 项目	Test Condition 测试条件	Remark 备注
High Temperature Storage	Ta =+80°C / 240Hours	Note1,2,3
Low Temperature Storage	Ta =-30°C / 240Hours	Note1,2,3
High Temperature Operating	Ta =+70°C / 240Hours	Note1,2,3
Low Temperature Operating	Ta =-20°C / 240Hours	Note1,2,3
Temperature Cycle storage Test	-30°C/30min ↔ +80°C /30min for 30cycles, Transfer time less than 5min	Note2,3
Thermal humidity storage Test	80°C x 90%RH / 240Hours	Note2,3
Package Vibration Test	Frequency: 10Hz~55Hz, Amplitude: 1.5mm, 1 hrs for each direction of X, Y, Z	Note2
Packing shock test	Drop to the ground from 60cm height, 1 corner, 3 edges, 6 surfaces.	Note2

Inspection after Test:

Note1: Ta is the ambient temperature of samples.

Note 2: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

8. PACKAGE DRAWING

