

LCD MODULE

SPECIFICATION

Model:	UE050FH-RB30-L087A
Version:	V1.0
Date:	20201203

Customer Confirmation 客户确认

Approved by	Notes

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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	2020.12.03	Preliminary release	

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1. GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: MIPI
- 3) Driver IC: HX8399C
- 4) Operation Temperature: -20~70℃
- 5) Storage Temperature: -30~80℃
- 6) Backlight Type: White LED
- 7) Display mode: Normally Black
- 8) Pixel Density: 295 PPI
- 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	ADS TFT	-	-
Screen Size	5.0	Inch	Diagonal
Resolution	1080(W)*3(RGB)*1080(H)	Dots	-
Interface	MIPI	-	4 lanes
Module Power Consumption	1.1	Watt	Typ.
Active Area	127.008(W)*127.008(H)	mm	-
Pixel pitch (W*H)	0.1176(W)*0.1176(H)	mm	-
CTP_Module Size (W*H*D)	136.531(W)*132.208(H)*1.98(D)	mm	Typ
Luminance	430	cd/m ²	Typ.
Viewing Direction	ALL	O'clock	
Display Color	16.7M	Colors	24bits

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 supply1 voltage	IOVCC	-0.3	3.6	V	Note1
Power supply2 voltage	VSP	-0.3	6.6	V	Note1
Power supply3 voltage	VSN	0	-6.6	V	Note1
LED forward current	I _F	-0.001	20	mA	For each led,Note1
LED Reverse Voltage	V _R	-	5	V	For each led,Note1
Operating temperature	T _{op}	-20	60	°C	Note1,2
Storage temperature	T _{st}	-30	75	°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

NO.	SIZE	UNIT	DESCRIPTION
1	1080	mm	Panel Width
2	1080	mm	Panel Height
3	1080	mm	Panel Depth
4	1080	mm	Panel Thickness
5	1080	mm	Panel Weight
6	1080	mm	Panel Power
7	1080	mm	Panel Temperature
8	1080	mm	Panel Humidity
9	1080	mm	Panel Lifetime
10	1080	mm	Panel Warranty
11	1080	mm	Panel Maintenance
12	1080	mm	Panel Installation
13	1080	mm	Panel Operation
14	1080	mm	Panel Troubleshooting
15	1080	mm	Panel Safety
16	1080	mm	Panel Compliance
17	1080	mm	Panel Certification
18	1080	mm	Panel Documentation
19	1080	mm	Panel Support
20	1080	mm	Panel Training
21	1080	mm	Panel Upgrade
22	1080	mm	Panel Replacement
23	1080	mm	Panel Recycling
24	1080	mm	Panel Disposal
25	1080	mm	Panel Security
26	1080	mm	Panel Access
27	1080	mm	Panel Control
28	1080	mm	Panel Monitoring
29	1080	mm	Panel Alerting
30	1080	mm	Panel Reporting
31	1080	mm	Panel Archiving
32	1080	mm	Panel Backup
33	1080	mm	Panel Restore
34	1080	mm	Panel Transfer
35	1080	mm	Panel Migration
36	1080	mm	Panel Integration
37	1080	mm	Panel Interfacing
38	1080	mm	Panel Configuration
39	1080	mm	Panel Optimization
40	1080	mm	Panel Performance
41	1080	mm	Panel Reliability
42	1080	mm	Panel Availability
43	1080	mm	Panel Scalability
44	1080	mm	Panel Flexibility
45	1080	mm	Panel Portability
46	1080	mm	Panel Compatibility
47	1080	mm	Panel Interoperability
48	1080	mm	Panel Conformance
49	1080	mm	Panel Compliance
50	1080	mm	Panel Certification

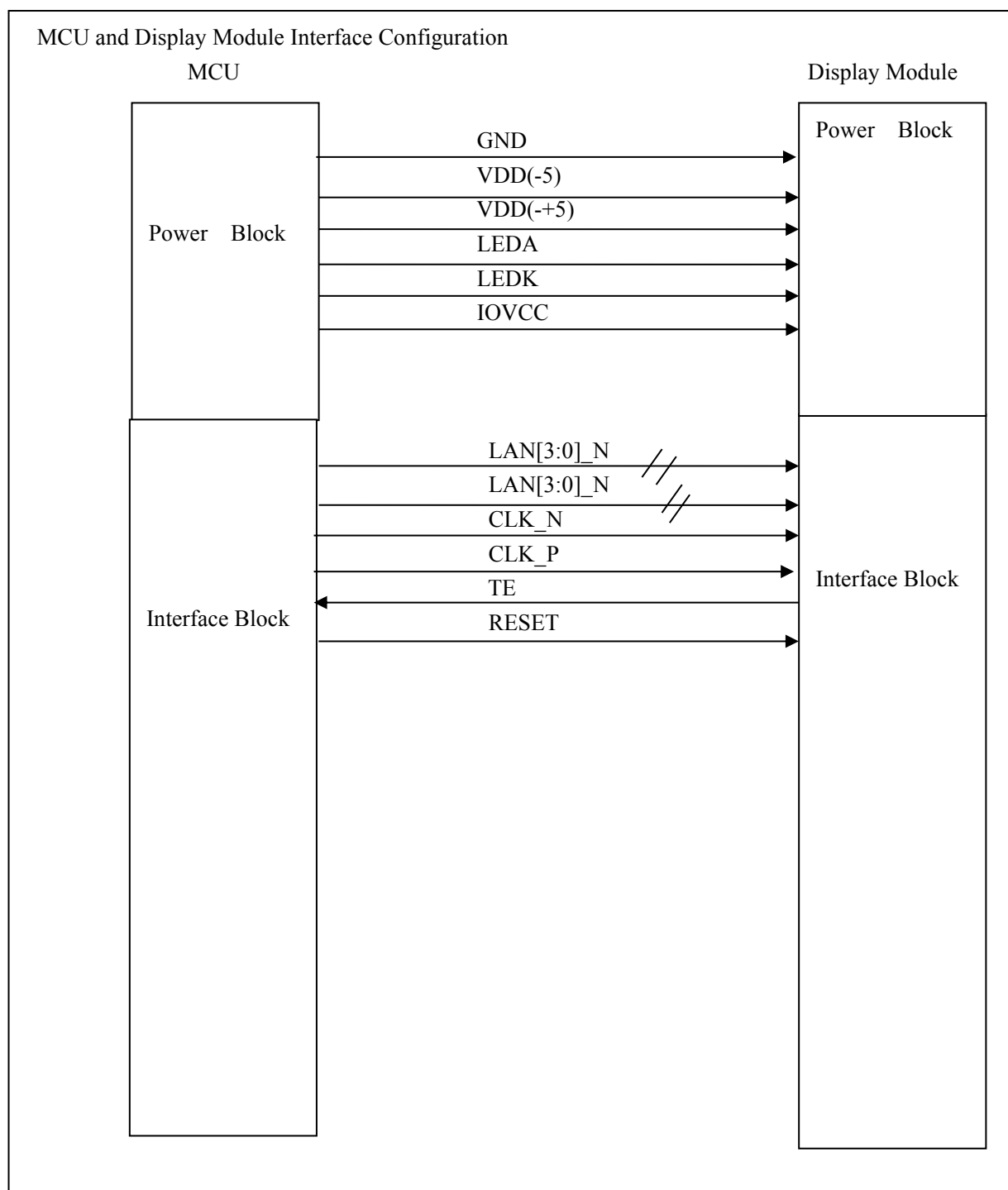
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

Pin No. 序号	Symbol 符号	I/O	Description 描述
1-2	GND	P	Power Ground
3	LAN2 P	I	MIPI-DSI data lane 2 positive-end input pin
4	LEDK	P	Power supply for backlight cathode
5	LAN2 N	I	MIPI-DSI data lane 2 negative-end input pin
6	LEDK	P	Power supply for backlight cathode
7-8	GND	P	Power Ground
9	LAN1 P	I	MIPI-DSI data lane 1 positive-end input pin
10	LEDA	P	Power supply for backlight anode
11	LAN1 N	I	MIPI-DSI data lane 1 negative-end input pin
12	LEDA	P	Power supply for backlight anode
13-14	GND	P	Power Ground
15	CLK P	I	MIPI-DSI clock lane positive-end input pin
16	ID PIN2	O	LCD ID2 to 1.8V
17	CLK N	I	MIPI-DSI clock lane negative-end input pin
18	ID PIN1	O	LCD ID1 to GND
19-20	GND	P	Power Ground
21	LAN0 P	I/O	MIPI-DSI data lane 0 positive-end input pin
22	IOVCC	P	Power supply to interface pins(1.8V)
23	LAN0 N	I/O	MIPI-DSI data lane 0 negative-end input pin
24	IOVCC	P	Power supply to interface pins(1.8V)
25-26	GND	P	Power Ground
27	LAN3 P	I	MIPI-DSI data lane 3 positive-end input pin
28	NC	-	No connected
29	LAN3 N	I	MIPI-DSI data lane 3 negative-end input pin
30	VDD(-5)	P	Negative input analog power for driver IC use
31	GND	P	Power Ground
32	VDD(-5)	P	Negative input analog power for driver IC use
33-35	NC	-	No connected
36	VDD(+5)	P	Positive input analog power for driver IC use
37	GND	P	Power Ground
38	VDD(+5)	P	Positive input analog power for driver IC use
39-41	NC	-	No connected
42	GND	P	Power Ground
43	NC	-	No connected
44	LEDPWM	I	Backlight pwm output
45	NC	-	No connected
46	TE	O	Tearing effect outputsignal. If not used, please let this pin open
47	GND	P	Power Ground
48	RESET	I	The signal will reset the LCM, Signal is active low.
49-50	GND	P	Power Ground

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 Supply1 Voltage	IOVCC	1.65	1.8	3.3	V	-
Power Supply2 Voltage	VSP	4.8	5	6	V	-
Power Supply3 Voltage	VSN	-6	-5	-4.8	V	-
Logic Input High Voltage	V _{IH}	0.7IOVCC	-	IOVCC	V	-
Logic Input Low Voltage	V _{IL}	0	-	0.3IOVCC	V	-
Panel Power Consumption	P _D	-	0.16	-	Watt	Note1
Module Power Consumption	P _{LCM}	-	1.1	-	Watt	Note1,2

(Ta=+25°C,GND=0V)

Note1:Measurement Conditions (Video Mode): Full Screen Red Pattern,VDD=1.8V,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	-	37.2	38.4	V	Note1
Forward Current	I _F	-	25	-	mA	Note1
Backlight Power consumption	P _{BL}	-	0.93	0.96	Watt	Note1
LED life time	-	30000	-	-	Hours	Note2
LED Quantity					PCS	

(Ta=+25°C,GND=0V)

Note1: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.

5.3 Power On/Off Sequence

The Power supply On/Off, Sleep In/Out and Display On/Off sequence is illustrated below.

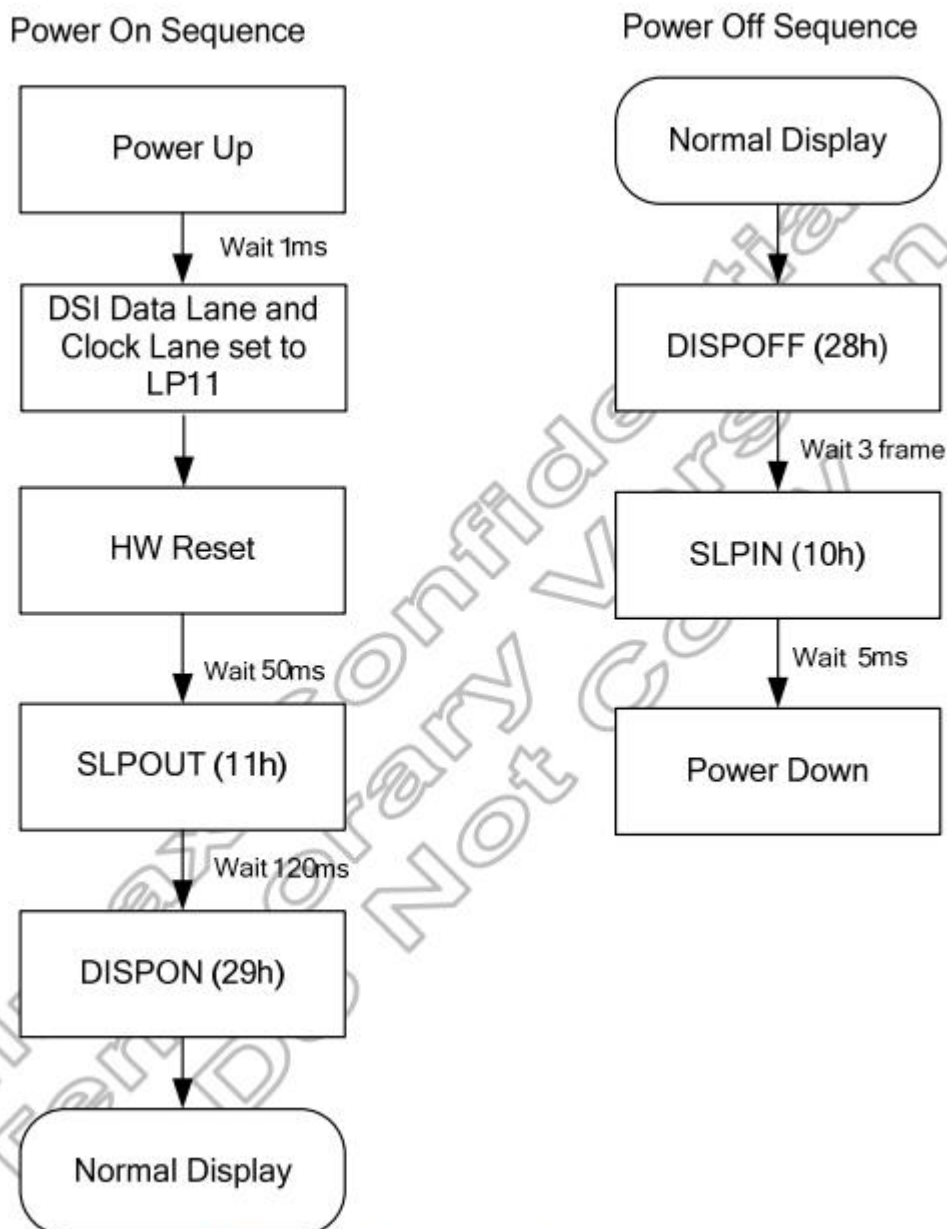


Figure 5.29: Power on/off sequence

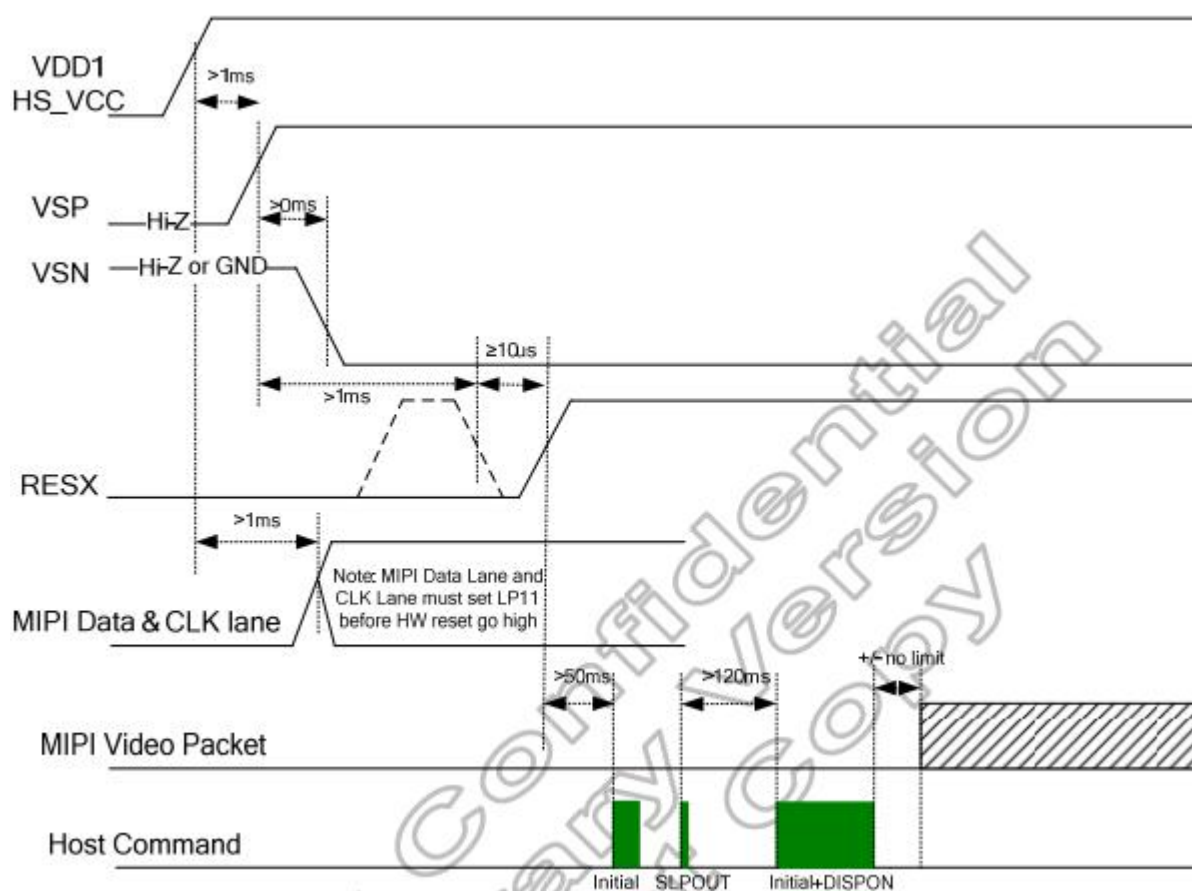


Figure 5.34: VSP/VSX/VDD1 input power on sequence (PCCS[2:0]=011)

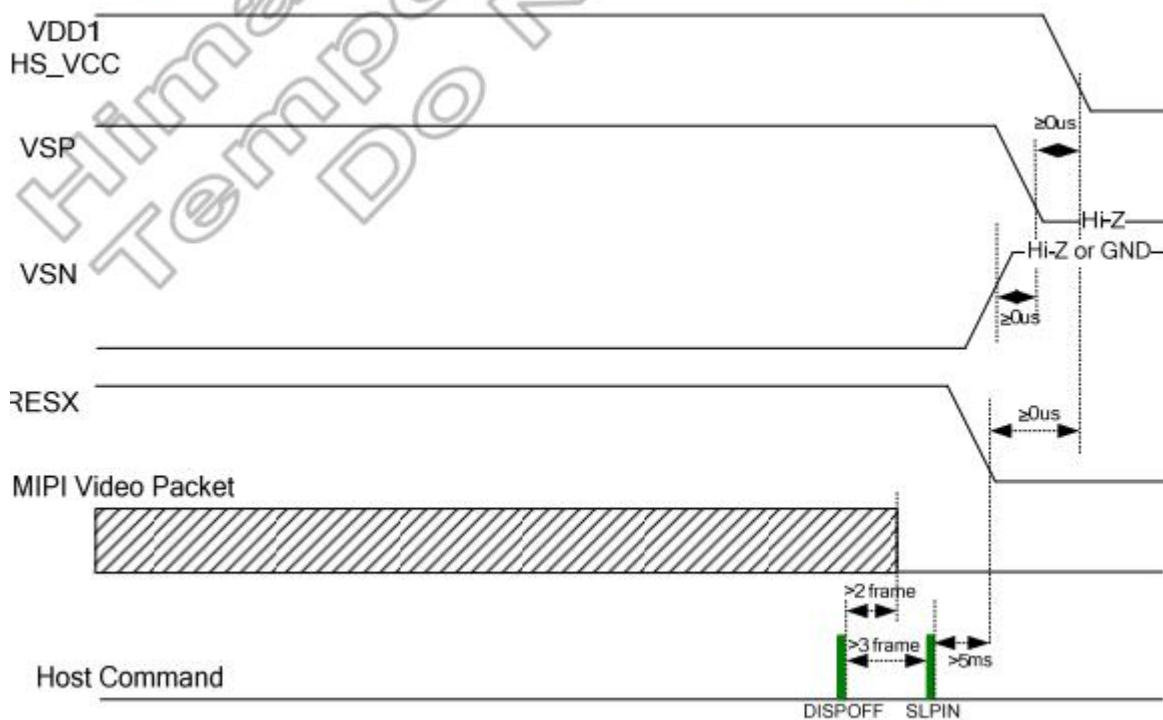
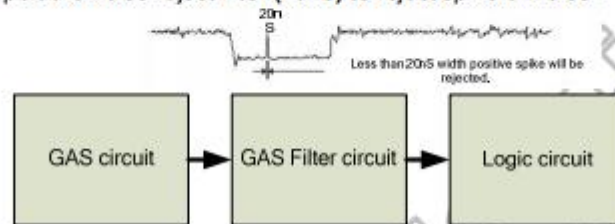


Figure 5.35: VSP/VSX/VDD1 input power off sequence (PCCS[2:0]=011)

Uncontrolled power off

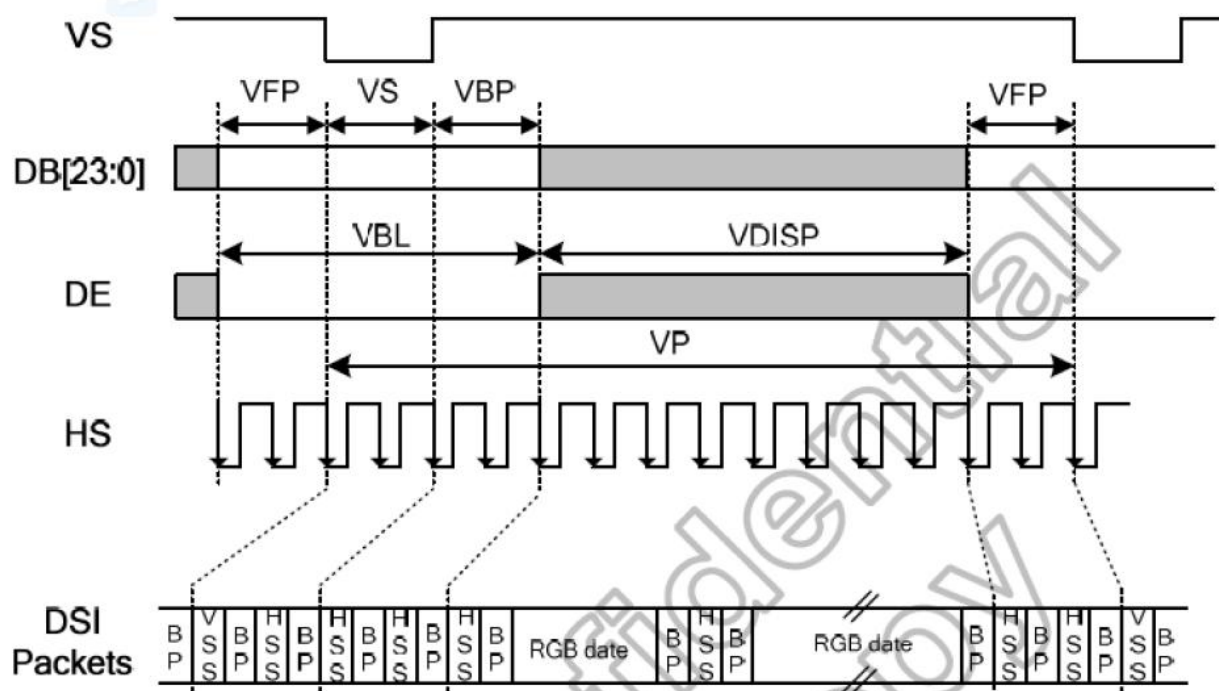
The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for the display module or the display module will not cause any damages for the host or lines of the interface. At an uncontrolled power off the display will go blank and there will not be any visible effects within 1 second on the display (**blank display**) and remains blank until "Power on Sequence" powers it up.

Note: (1) HX8399-C is support the noise reject filter (**20ns**) to reject spike or noise.



5.5 Timing Diagram

Vertical Timing

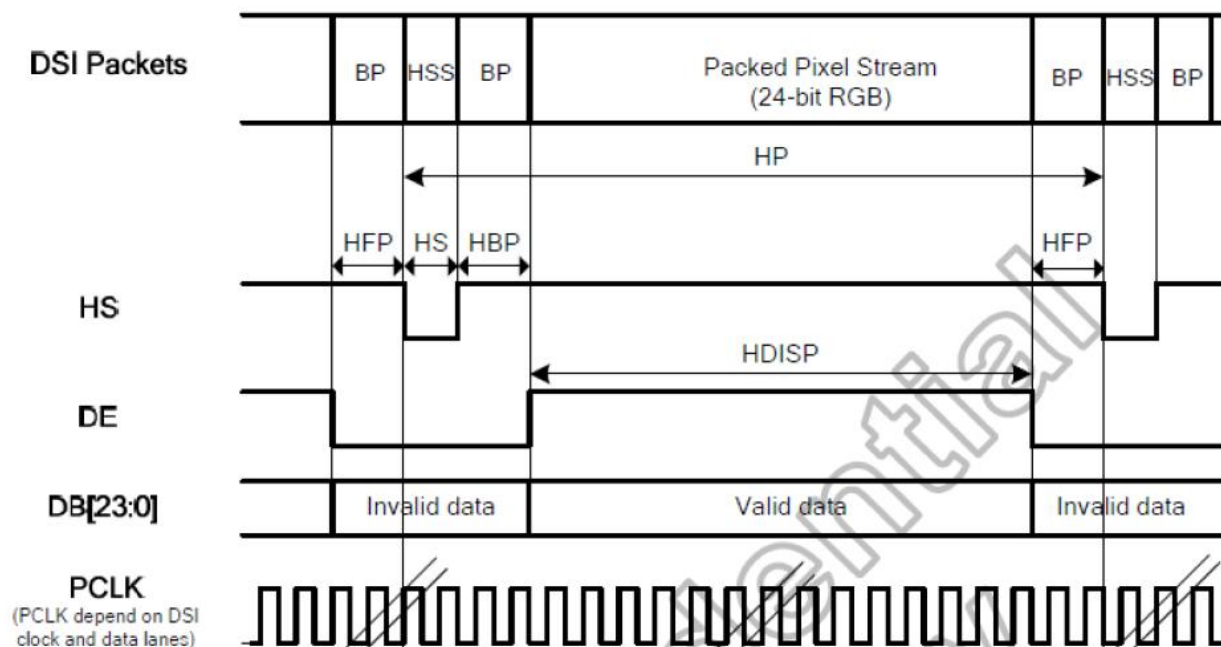


Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note ⁽¹⁾	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note ⁽¹⁾	Line
Vertical data start point	-	VS+VBP	4	-	Note ⁽¹⁾	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

Horizontal Timing



Horizontal Resolution=H_RES(1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3 = HS_VCC =2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS cycle	HP	-	H_RES+66	-	-	DCK
HS low pulse width	HS	-	25	-	-	DCK
Horizontal back porch	HBP	-	25	-	-	DCK
Horizontal front porch	HFP	-	16	-	-	DCK
Horizontal data start point	-	HS+HBP	50 Note ⁽¹⁾	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	66	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

Note: (1) HS+HBP must larger than 50 PCLK.

5.5.1 Timing Parameters

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Vertical low pulse width	VS	-	-2	-	-	Line
Vertical front porch	VFP	-	-2	-	-	Line
Vertical back porch	VBP	-	-2	-	-	Line
Vertical active area	-	-	-	1080	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz
HS low pulse width	HS	-	-25	-	-	DCK
Horizontal back porch	HBP	-	-25	-	-	DCK
Horizontal front porch	HFP	-	-16	-	-	DCK
Horizontal active area	HDISP	-	-	1080	-	DCK

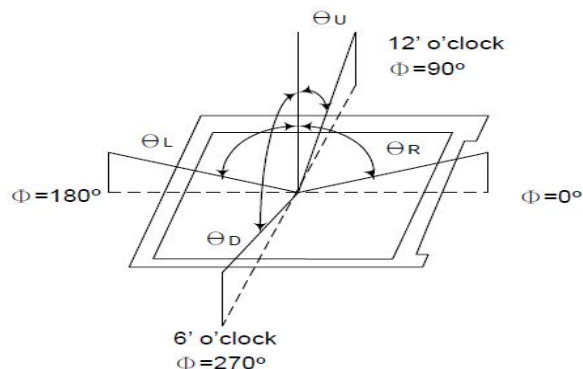
6. OPTICAL CHARACTERISTICS

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	$\theta = 0^\circ$	800	1300	-	-	Note(4)
NTSC Ratio	S	$\theta = 0^\circ$	65	70		%	Note(7)
Luminance	L	$\theta = 0^\circ$	300	350	-	cd/m ²	Note(5)
Luminance uniformity	U _w	$\theta = 0^\circ$	70	-	-	%	Note(3)
Response Time	T _R + T _F	25 °C	-	-	40	ms	Note(2)
Color Coordination	W _X	$\theta = 0^\circ$ (Center) Normal viewing angle B/L On	-+0.04	0.306	+0.04	NTSC (x,y)	Note(6)
	W _Y			0.318			
	R _X			0.686			
	R _Y			0.304			
	G _X			0.264			
	G _Y			0.629			
	B _X			0.147			
	B _Y			0.047			
Viewing Angle	θ_L	C/R>10	70	80	-	Degree	Note(1)
	θ_R		70	80	-		
	θ_U		70	80	-		
	θ_D		70	80	-		

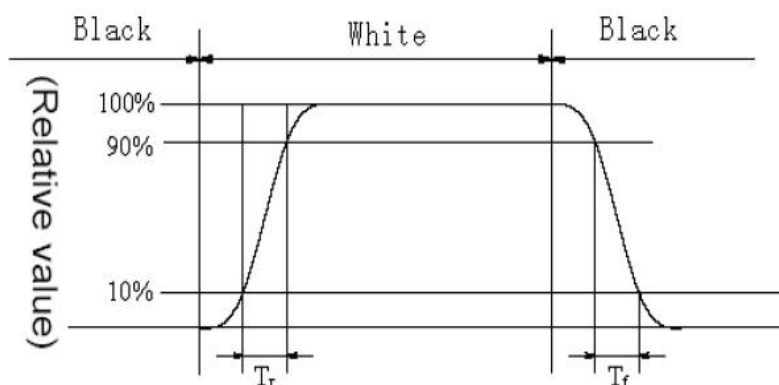
Test Conditions:

1. the ambient temperature is +25 °C.
2. The test systems refer to Note 8.

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

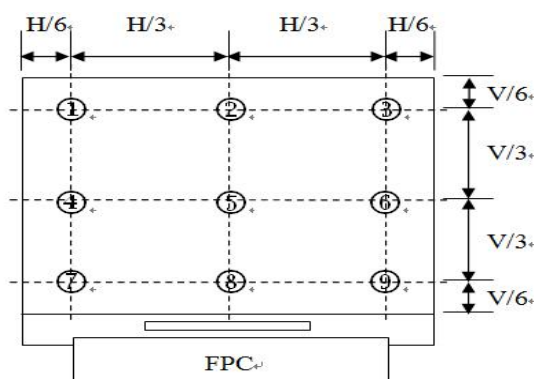


Note2: Definition of Response time: Sum of T_R and T_F



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

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

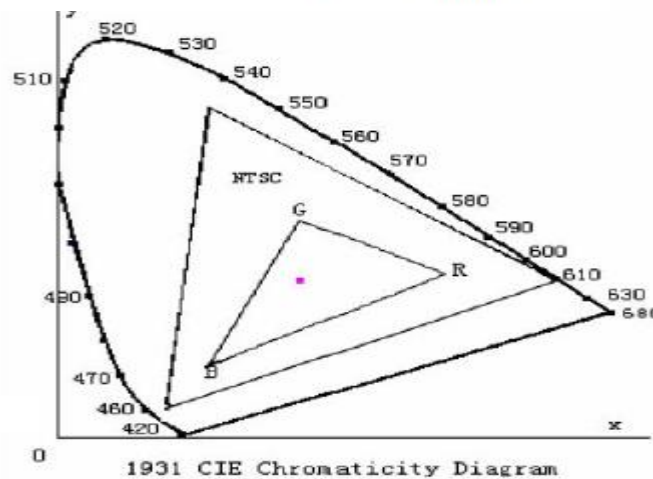
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1 point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

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

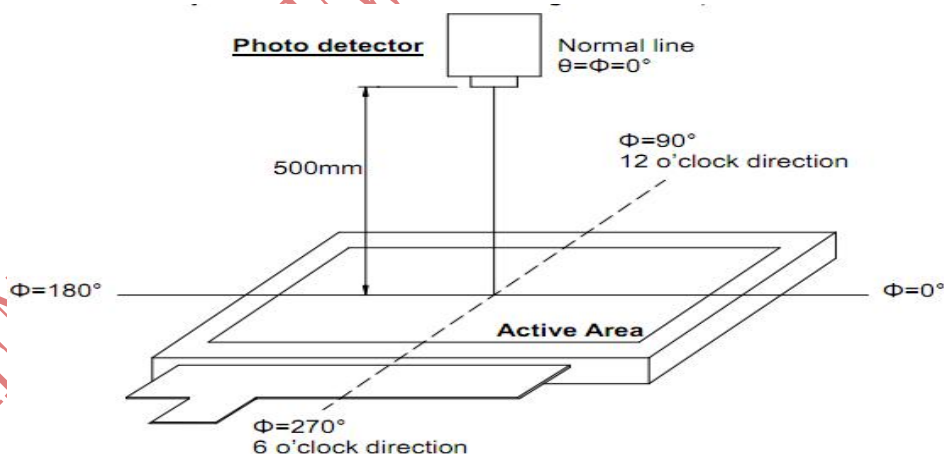
Note 7: Definition of NTSC ratio:

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



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 =+75°C / 96Hours	Note1,2,3
Low Temperature Storage	Ta =-30°C / 96Hours	Note1,2,3
High Temperature Operating	Ta =+60°C / 96Hours	Note1,2,3
Low Temperature Operating	Ta =-20°C / 96Hours	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	60°C x 90%RH / 96Hours	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 1m height, 1 corner, 3 edges, 6 surfaces.	Note2
ESD test	Contact=4KV, Air=8KV	

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.

8. PACKAGE DRAWING

