

DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 320120A1 VMX-PW-N

Product Specification

Version: 4

22.03.2024

GENERAL SPECIFICATION

MODULE NO. :

DEM 320120A1 VMX-PW-N

CUSTOMER

VERSION NO.	CHANGE DESCRIPTION	DATE
0	Original version	27.07.2023
1	Update drawing on page3 and increase the life of the backlight	31.07.2023
2	Update Operating Temperature	24.10.2023
3	Change Part-Number	01.11.2023
4	Add UL Number on the FPC	22.04.2024

PREPARED BY: LM

DATE: 22.03.2024

APPROVED BY: MH

DATE: 22.03.2024

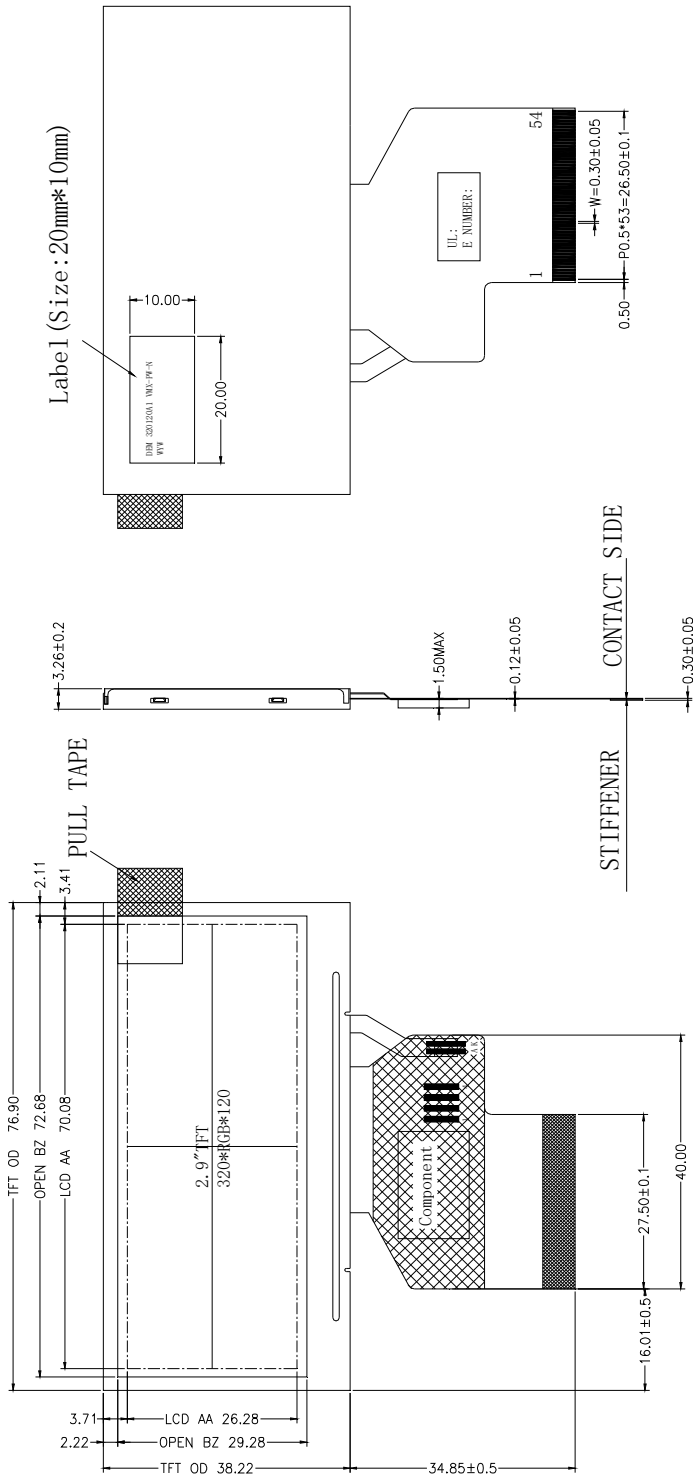
CONTENTS

1. GENERAL SPECIFICATIONS.....	2
2. EXTERNAL DIMENSIONS	3
3. BLOCK DIAGRAM	4
4. PIN ASSIGNMENT	5
5. OPTICAL CHARACTERISTICS	6
6. ABSOLUTE MAXIMUM RATINGS.....	9
7. ELECTRICAL CHARACTERISTICS.....	9
8. RELIABILITY TEXT.....	14
9. LCD MODULES HANDLING PRECAUTIONS.....	15
10. OTHERS	15

1. GENERAL SPECIFICATIONS

ITEM	STANDARD VALUE	UNIT
LCD SIZE	2.9"	Inch
LCD TYPE	TFT/IPS/NORMALLY BLACK/TRANSMISSIVE	-
MODULE SIZE	76.90 x 38.22 x 3.26	mm
ACTIVE AREA	70.08 x 26.28	mm
PIXEL PITCH	0.219 x 0.219	mm
NUMBER OF PIXELS	320 x RGB x 120	-
DRIVER IC	ST7272A (Sitronix)	-
INTERFACE TYPE	18-BIT-RGB	-
TOP POLARIZER TYPE	Anti-glare (All Directions)	-
VIEWING DIRECTION	IPS	O'clock
GRAY SCALE INVERSION DIRECTION	-	O'clock
BACKLIGHT TYPE	6-DIES WHITE LED	-
TOUCH PANEL	WITHOUT	-

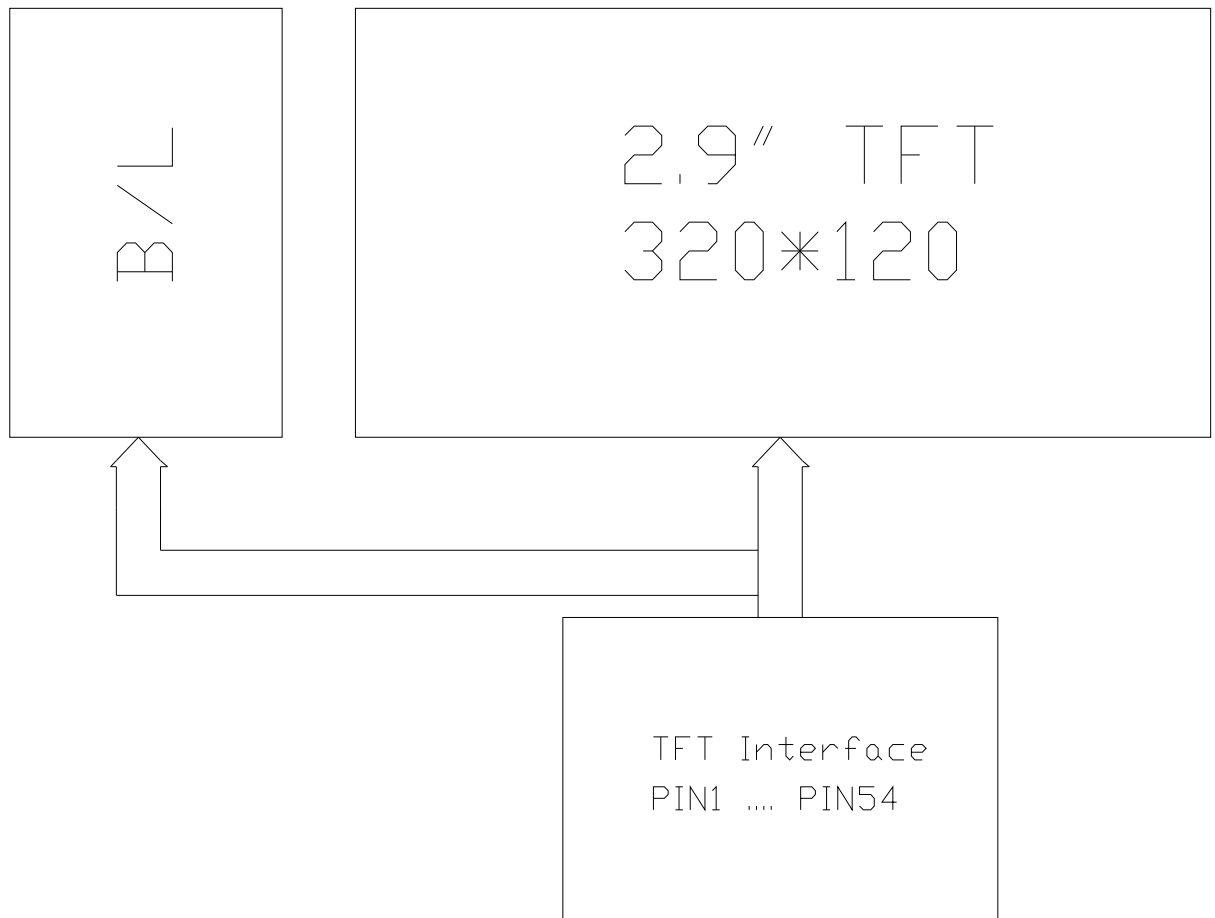
2. EXTERNAL DIMENSIONS



Vf = 16.8 – 19.8V, If = 20mA
 Brightness 300cd/m²(TYP)

- Remarks:
1. Unmarked tolerance is ±0.3
 2. All materials comply with RoHs

3. BLOCK DIAGRAM



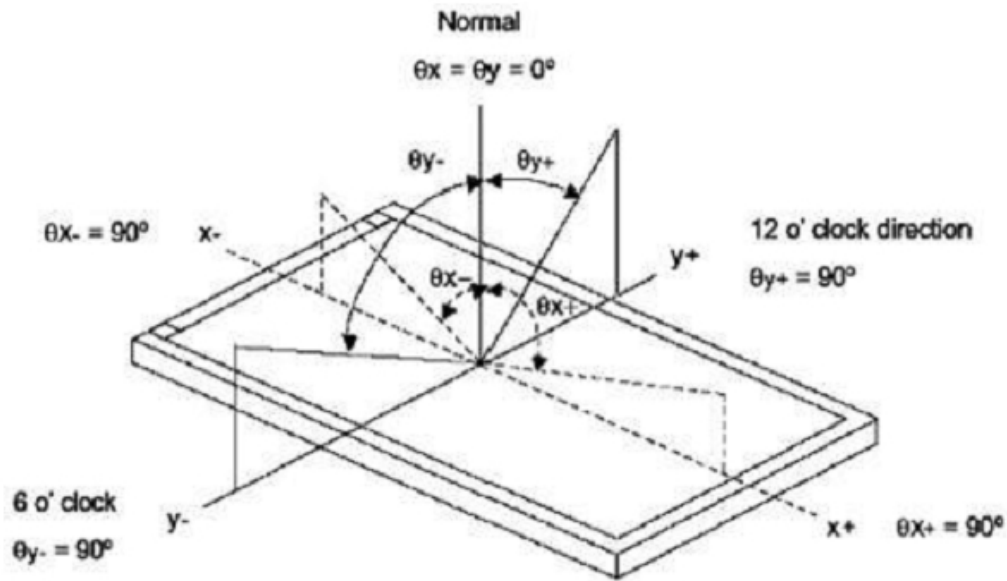
4. PIN ASSIGNMENT

Pin No.	Symbol	Description
1~2	VBL-	Backlight LED Cathode
3~4	VBL+	Backlight LED Anode.
5	Y1(YU)(NC)	No connection
6	X1(XR)(NC)	No connection
7	NC	No connection
8	RESET	Reset pin
9	CS(NC)	No connection
10	SCL(NC)	No connection
11	SDA(NC)	No connection
12	SDO(NC)	No connection
13	NC	No connection
14~19	B0~B5	Data bus
20~21	NC	No connection
22~27	G0~G5	Data bus
28~29	NC	No connection
30~35	R0~R5	Data bus
36	HSYNC	Line Synchronous Signal
37	VSYNC	Frame Synchronous Signal
38	DOTCLK	Dot-clock signal and oscillator source
39	GND	Ground
40	IOVCC	Power supply
41~42	VDD	Booster input voltage pin
43	Y2(YD)(NC)	No connection
44	X2(XL)(NC)	No connection
45~51	NC	No connection
52	DEN	Display enable pin for controller
53~54	GND	Ground

5. OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE	
			MIN	TYP.	MAX			
Luminance	L	$I_L=20\text{mA}$	-	300	-	Cd/m ²	-	
Contrast Ratio	CR	$\theta =0^\circ$	640	800	-	-	-	
Response Time	T _{ON}	25°C	-	30	40	ms	-	
	T _{OFF}			30	40			
CIE COLOUR COORDINATE	RED	RX	VIEWING NORMAL ANGLE	0.60	0.62	0.64	-	-
		RY		0.34	0.36	0.38	-	-
	GREEN	GX		0.35	0.37	0.39	-	-
		GY		0.57	0.59	0.61	-	-
	BLUE	BX		0.12	0.14	0.16	-	-
		BY		0.08	0.10	0.12	-	-
	WHITE	WX		0.31	0.33	0.35	-	-
		WY		0.35	0.37	0.39	-	-
VIEWING ANGLE	Hor.	θ_{x+}	CR \geq 10	70	80	-	Degree	-
		θ_{x-}		70	80	-		-
	Ver.	θ_{y+}		70	80	-		-
		θ_{y-}		70	80	-		-
Uniformity	Un	-	-	80	-	-	%	-

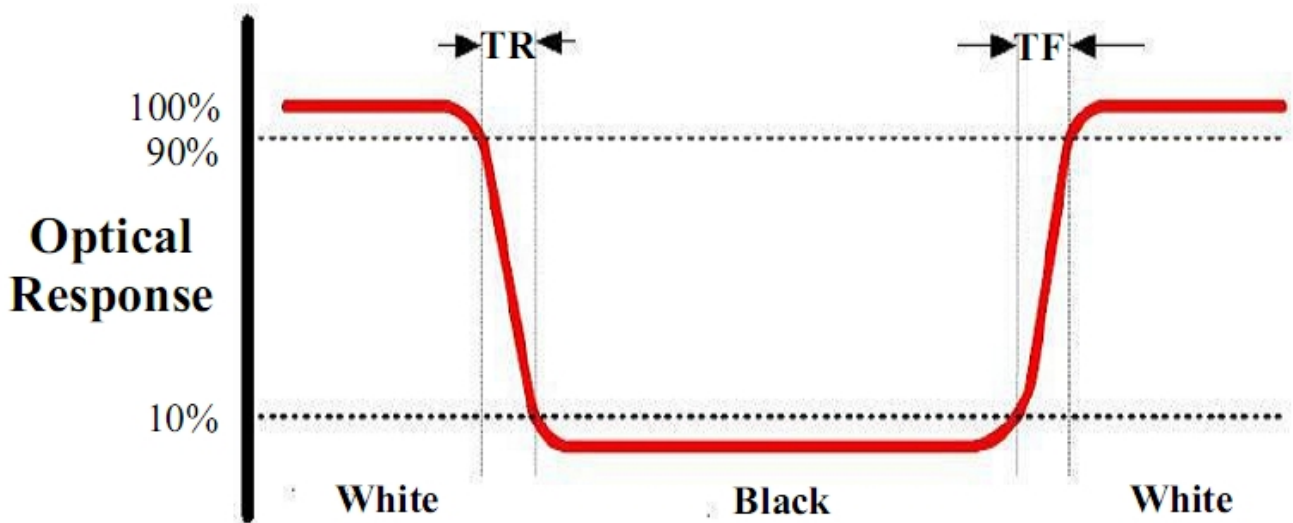
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

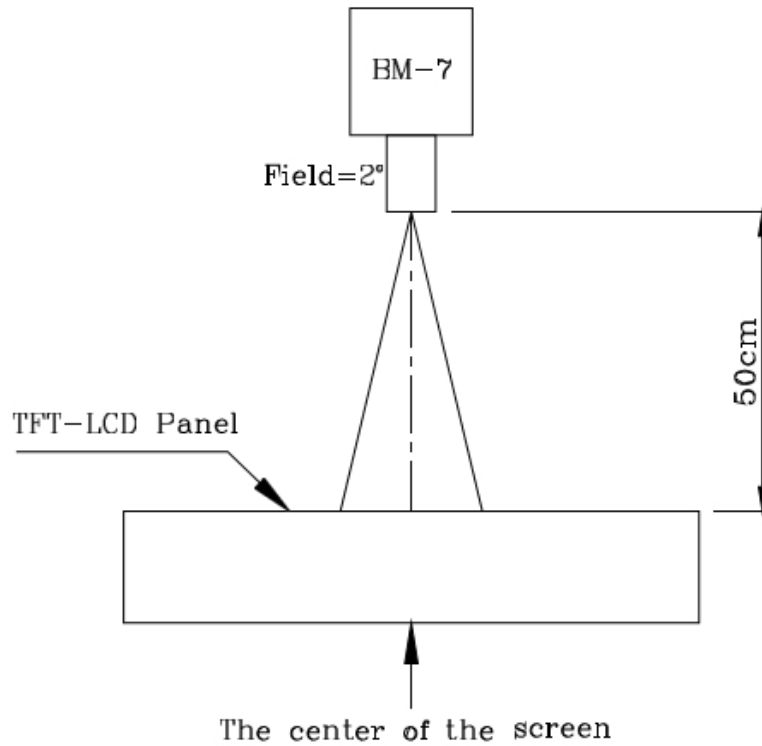
Note 3: Definition of Response Time (T_r, T_f)



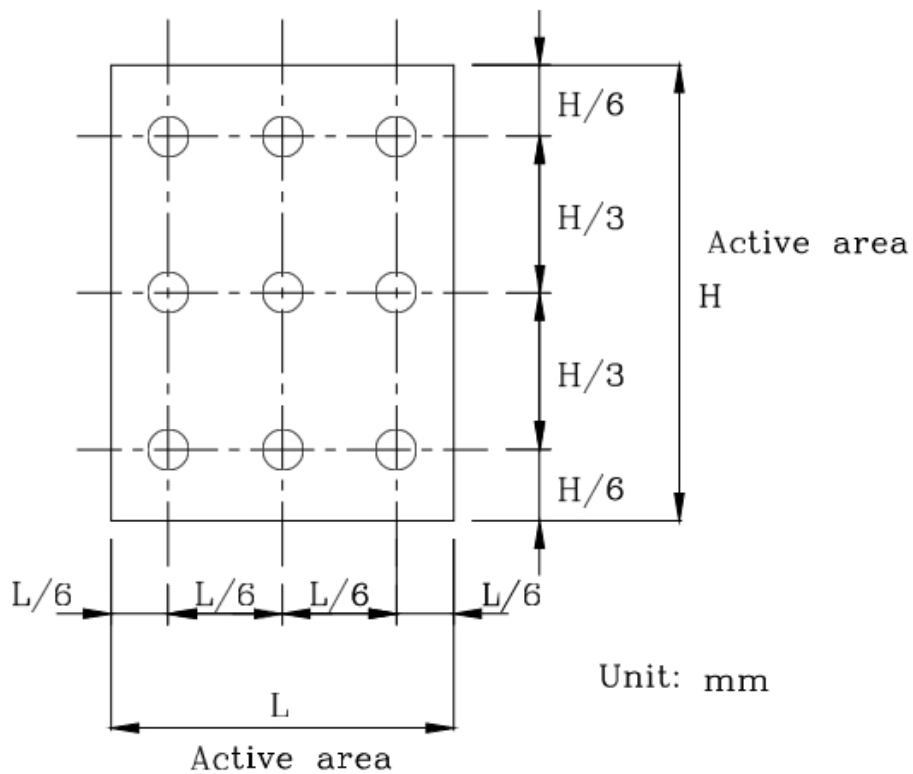
Note 4: Definition of Luminance

① The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



② The Brightness Test Point Setup



6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage	VDD	-0.3	4.0	V
Supply Voltage for Logic	VDDI	-0.3	4.0	V
Supply Current (One LED)	I _{LED}		30	mA
Operating Temperature	Top	-30	+85	°C
Storage Temperature	Tst	-30	+85	°C

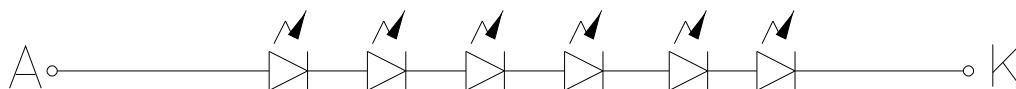
7. ELECTRICAL CHARACTERISTICS

7.1 Input power

ITEM	SYMBOL	Min	TYP	MAX	UNIT
Supply Voltage for Analog	VDD	3.0	3.3	3.6	V
Supply Voltage for Logic	VDD	3.0	3.3	3.6	V
Input Voltage	V _{IL}	GND	-	0.3VDD	V
	V _{IH}	0.7VDD	-	VDD	V
Input Leakage Current	I _{LKG}	-1	-	1	μA

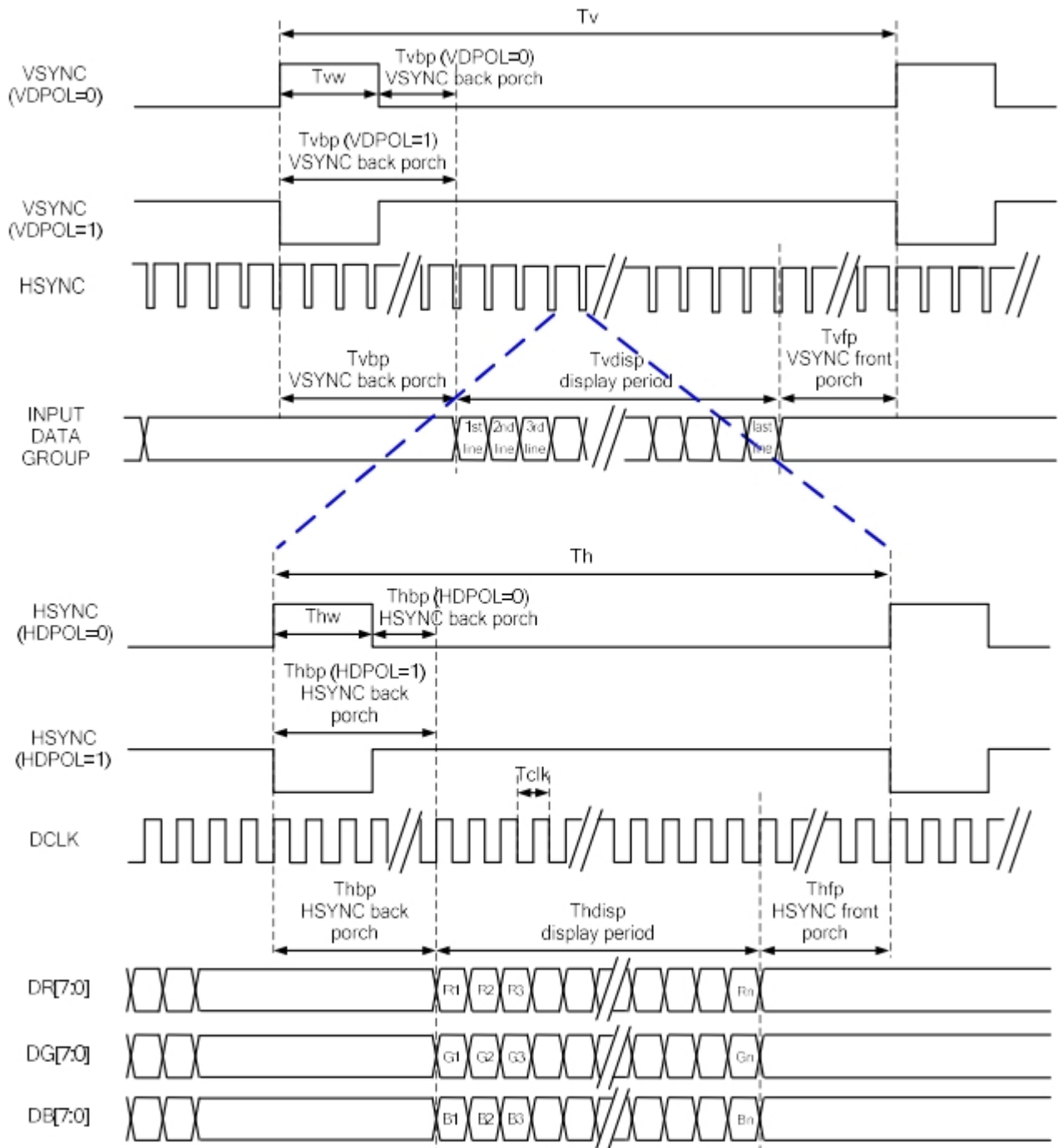
7.2 Backlight Driving Conditions

ITEM	SYMBOL	SPECIFICATIONS			UNIT	Remark
		MIN	TYP.	MAX		
Voltage for LED Backlight	V _f	16.8	18.3	19.8	V	IL=20mA
Current for LED Backlight	I _L	-	20	-	mA	-
Power Consumption	P	-	0.366	-	W	-
LED Lifetime	-	-	50000	-	H _r	-

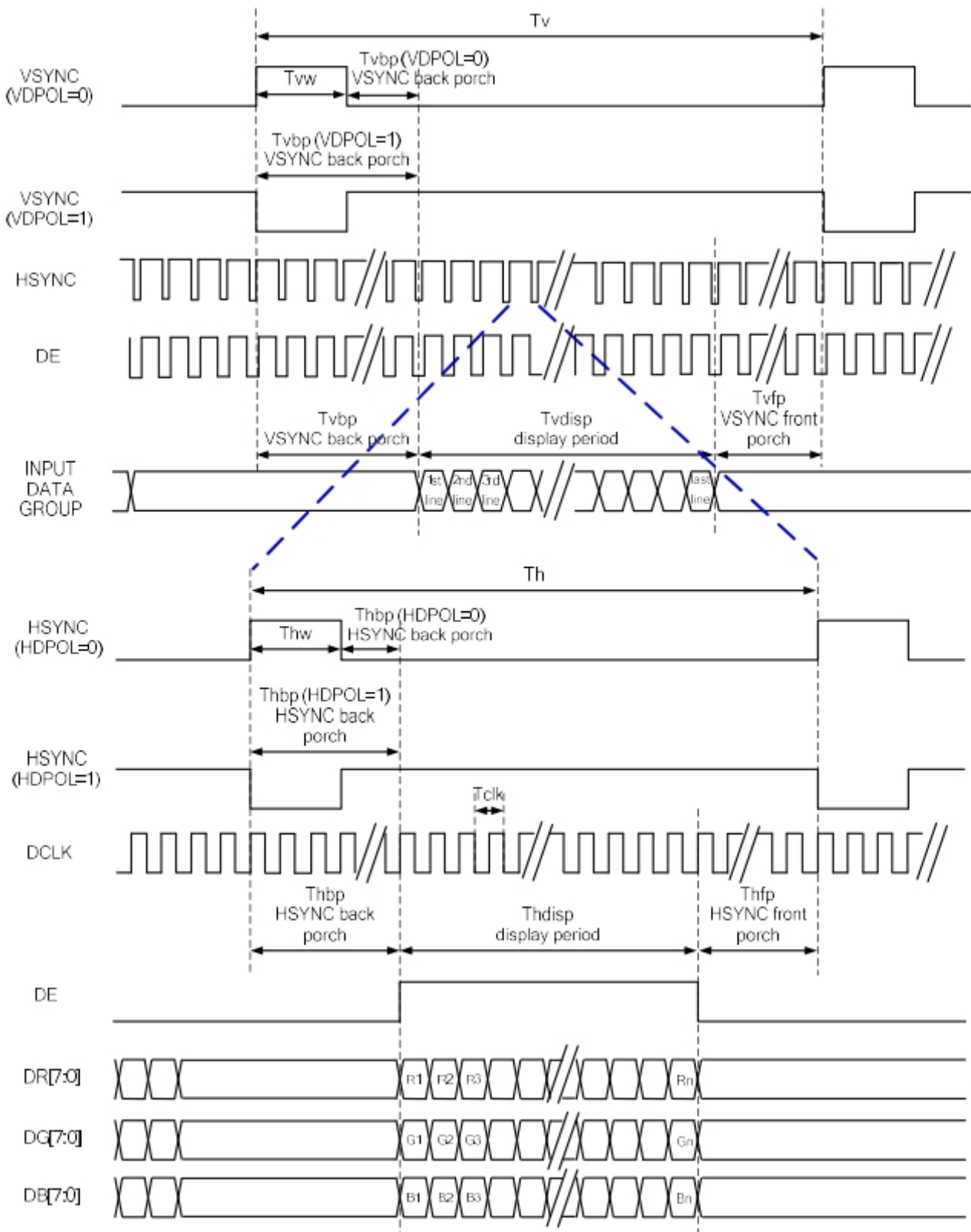


7.3 TIMING CHARACTERISTICS

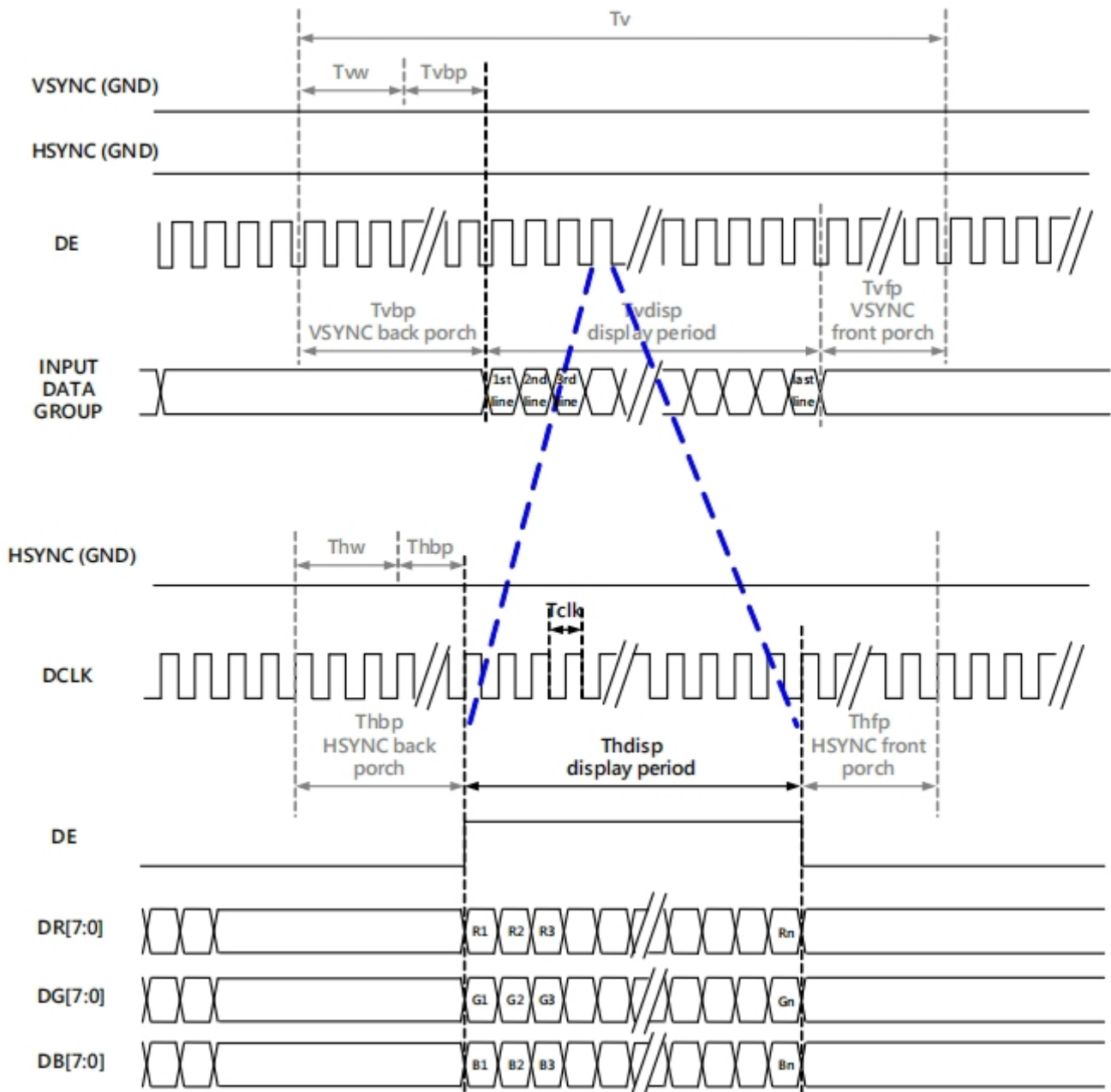
7.3.1 SYNC MODE



7.3.2 SYNC DE-MODE



7.3.3 DE MODE



7.3.4 Parallel 24 bit RGB Timing Table

Parallel 24-bit RGB Input Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
DCLK Frequency	Fclk	5	6	8	MHz		
DCLK Period	Tclk	125	167	200	ns		
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= 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.

8. RELIABILITY TEXT**8.1 Standard Specification for Reliability of LCDModule**

NO.	TEST ITEM	CONDITIONS
1	HIGH TEMPERATURE STORAGE	TA=+85°C 240H
2	LOW TEMPERATURE STORAGE	TA=-30°C 240H
3	HIGH TEMPERATURE OPERATION	TA=+80°C 240H
4	LOW TEMPERATURE OPERATION	TA=-30°C 240H
5	MOISTURE STORAGE	+60°C, 90%RH, MAX OF 240H
6	THERMAL SHOCK STORAGE	-30°C for 30 minutes → normal temperature for 5 minutes → +85°C for 30 minutes → normal temperature for 5 minutes.as one cycle
7	PACKING VIBRATION	Frequency range:10Hz ~55Hz Amplitude of vibration: 1.5mm Sweep time: 12,min,X,Y,Z 2hours for each direction
8	ESD	Air: ±8KV 150Pf/300 Ω 5 times
		Contact: ±4KV 150Pf/300 Ω 5 times

9. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If
- The substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Storage precautions
When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

10. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
 - Exposed area of the printed circuit board
 - Terminal electrode sections.