MODEL NO. : TM035PDH03

ISSUED DATE: 2011-10-17

VERSION : Ver 1.0

■**Preliminary Specification**
□**Final Product Specification**

Customer :_____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2011-10-17	Preliminary Specification Release	Jifa que

1 General Specifications

Feature		Spec
Display Spec.	Size	3.5 inch
	Resolution	320(RGB) x 480
	Interface	CPU/RGB
	Color Depth	65/262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.153x0.153
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Clear
	Viewing Direction	6’ clock
	Gray Scale Inversion Direction	12’ clock
Mechanical Characteristics	LCM (W x H x D) (mm)	55.26X84.69X2.20
	Active Area(mm)	48.96X73.44
	With/Without TSP	Without TSP
	Weight (g)	22.35
	LED Numbers	6 LEDs (parallel)
Electronic	Driver IC	HX8357C

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : Requirements on Environmental Protection: Q/S0002

Note 3 : LCM weight tolerance : +/- 5%

2 Input/Output Terminals

2.1 TFT LCD Panel

Connector type: FH23-45S-0.3SHW(05)

No	Symbol	I/O	Description	Comment
1	FLM	O	Output a frame head pulse signal If no used, please open this pin	
2	GND	P	Ground	
3	ENABLE	I	Data enable signal in RGB mode If no used, please fix this pin at GND level	
4	DOTCLK	I	Pixel clock signal in RGB mode If no used, please connect this pin to GND	
5	VSYNC	I	Vertical sync. signal in RGB mode If no used, please connect this pin to GND	
6	GND	P	Ground	
7	HSYNC	I	Horizontal sync, signal in RGB mode If no used, please connect this pin to GND	
8	IM0	I	MPU system interface mode select	
9	IM1	I		
10	IM2	I		
11	IOVCC	p	IO POWER	
12	VCC	P	Analog POWER	
13	SDI	I/O	Serial data in/out pin in DBI Type C 9bit mode Serial data input pin in DBI Type B 8bit mode If no used, please connect this pin to GND	
14	SDO	O	Serial data output pin If no used, please connect this pin to GND	
15	DB17	I/O	Data Bus	
16	DB16	I/O	Data Bus	
17	DB15	I/O	Data Bus	
18	DB14	I/O	Data Bus	
19	DB13	I/O	Data Bus	
20	DB12	I/O	Data Bus	
21	DB11	I/O	Data Bus	
22	DB10	I/O	Data Bus	
23	DB9	I/O	Data Bus	
24	DB8	I/O	Data Bus	
25	DB7	I/O	Data Bus	
26	DB6	I/O	Data Bus	
27	DB5	I/O	Data Bus	
28	DB4	I/O	Data Bus	

29	DB3	I/O	Data Bus	
30	DB2	I/O	Data Bus	
31	DB1	I/O	Data Bus	
32	DB0	I/O	Data Bus	
33	/RESET	I	Reset pin	
34	RD	I	Read strobe signal If no used, please connect this pin to IOVCC	
35	/WR/SCL	I	(WR) Write data enable pin in DBI Type B (SCL) Write data enable pin in DBI Type C If no used, please connect this pin to IOVCC	
36	RS	I	Data/command selection pin	
37	/CS	I	Chip select signal	
38	LEDK6	p	LED CATHODE	
39	LEDK5	p	LED CATHODE	
40	LEDK4	p	LED CATHODE	
41	LEDK3	p	LED CATHODE	
42	LEDK2	p	LED CATHODE	
43	LEDK1	p	LED CATHODE	
44	LEDA	p	LED ANODE	
45	LCM_ID	O	1.8V	

Table 2.1 input terminal pin assignment

I/O definition：I-----Input; O---Output; P----Power

Note: no used I/O pin please fix to GND level

Note 2-1: Select the MPU system interface mode

IM2	IM1	IM0	Interface	WR/SCL	DATA Bus use	
					Command/ Parameter	GRAM
0	0	0	DBI TYPE-B 18-bit(DB_EN='0')	WR	DB7-DB0	DB17-DB0:18bits Data
0	0	1	DBI TYPE-B 9-bit	WR	DB7-DB0	DB8-DB0:9bits Data
0	1	0	DBI TYPE-B 16-bit	WR	DB7-DB0	DB15-DB0:16bits Data
0	1	1	DBI TYPE-B 8-bit	WR	DB7-DB0	DB7-DB0:8bits Data
1	0	1	DBI TYPE-C Option 1 (3wire)	SCL	SDA	
1	1	1	DBI TYPE-C Option 3 (4wire)	SCL	SDA	

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta = 25℃

Item	Symbol	Min	Max	Unit	**Remark**
Logic Supply Voltage	IOVCC	-0.3	4.6	V	
Analog Supply Voltage	VCC	-0.3	4.6	V	
Back Light Forward Current	ILED		25	mA	For each LED
Operating Temperature	TOPR	-20	70	℃	
Storage Temperature	TSTG	-30	80	℃	

Table 3.1 absolute maximum rating

4 Electrical Characteristics

4.1 LCD module

GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	2.8	3.3	V	
Analog Supply Voltage		VCC	2.5	2.8	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	-0.0	-	0.3* IOVCC	V	/CS,/RD,/WR/SCL,RS, ENABLE,VSYNC,HSYNC, DOTCLK, SDO.SDI,/RESET,IM0, IM1,IM2,DB[0~17]
	High Level	V_{IH}	0.7* IOVCC	-	IOVCC	V	
Output Signal Voltage	Low Level	V_{OL}	0.0	-	0.2* IOVCC	V	
	High Level	V_{OH}	0.8* IOVCC	-	IOVCC	V	
(Panel+LSI) Power Consumption		Black Mode (60Hz)	TBD	TBD	TBD	mW	
		Sleeping Mode	TBD	TBD	TBD	uW	

Table 4.1 LCD module electrical characteristics

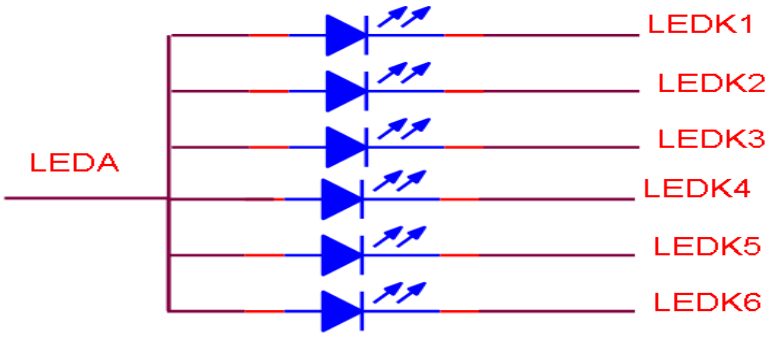
4.2 Backlight Unit

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	20	--	mA	
Forward Voltage	V_F	--	3.2	--	V	
Backlight Power Consumption	W_{BL}	--	384	--	mW	

Table 4.2 backlight unit electrical characteristics

Note 1: The figure below shows the connection of backlight LED.



Note 2: One LED :1/6x I_F =20mA, V_F =3.2V

Note 3: : I_F is defined for one channel LED.

Optical performance should be evaluated at Ta=25℃ only.

If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

4.3 Block Diagram

LCD module diagram

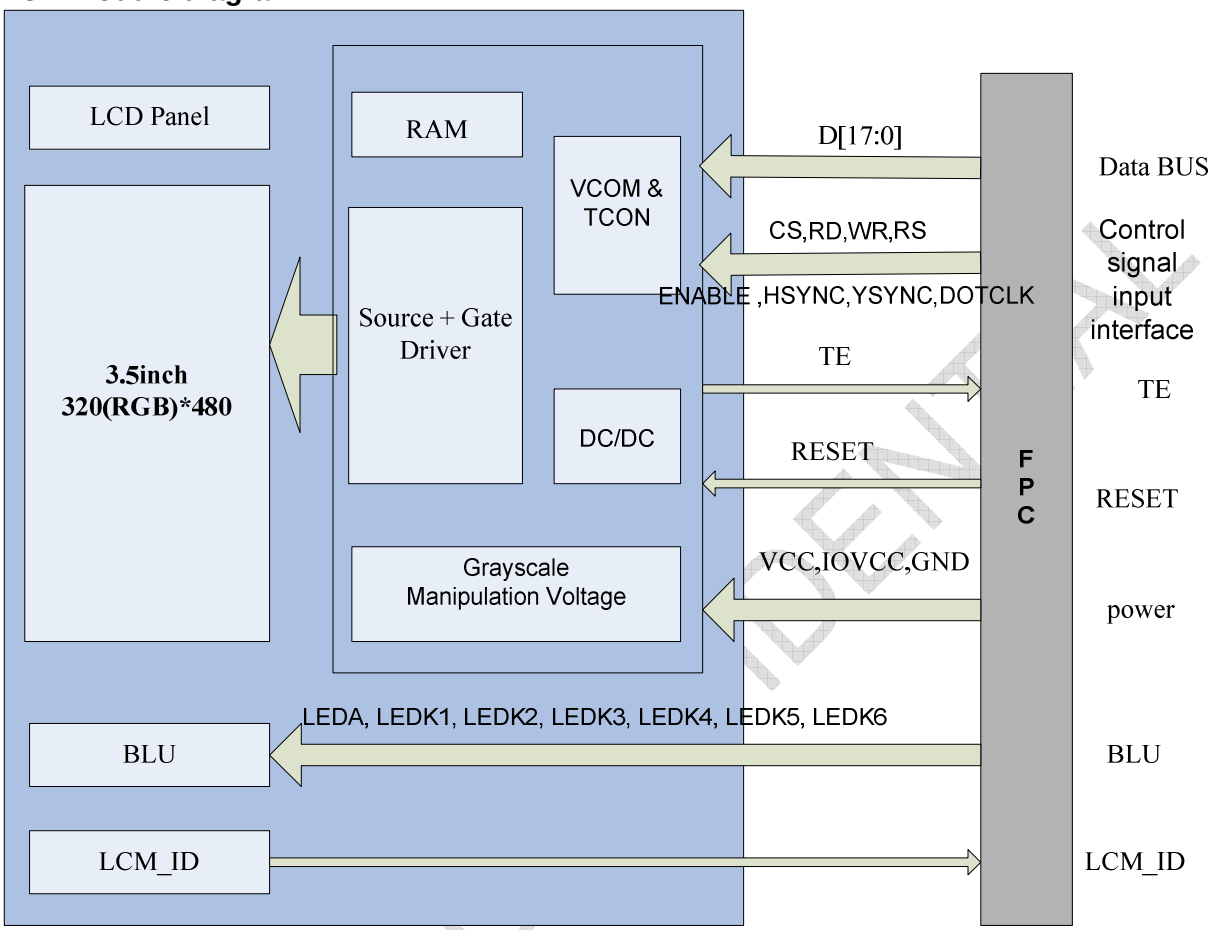


Figure 4.3 LCD module diagram

.5 Interface TIMING

5.1 DBI Type B interface（CPU18/16/9/8 bit）

5.1.1 DBI Type B Interface Timing Characteristics

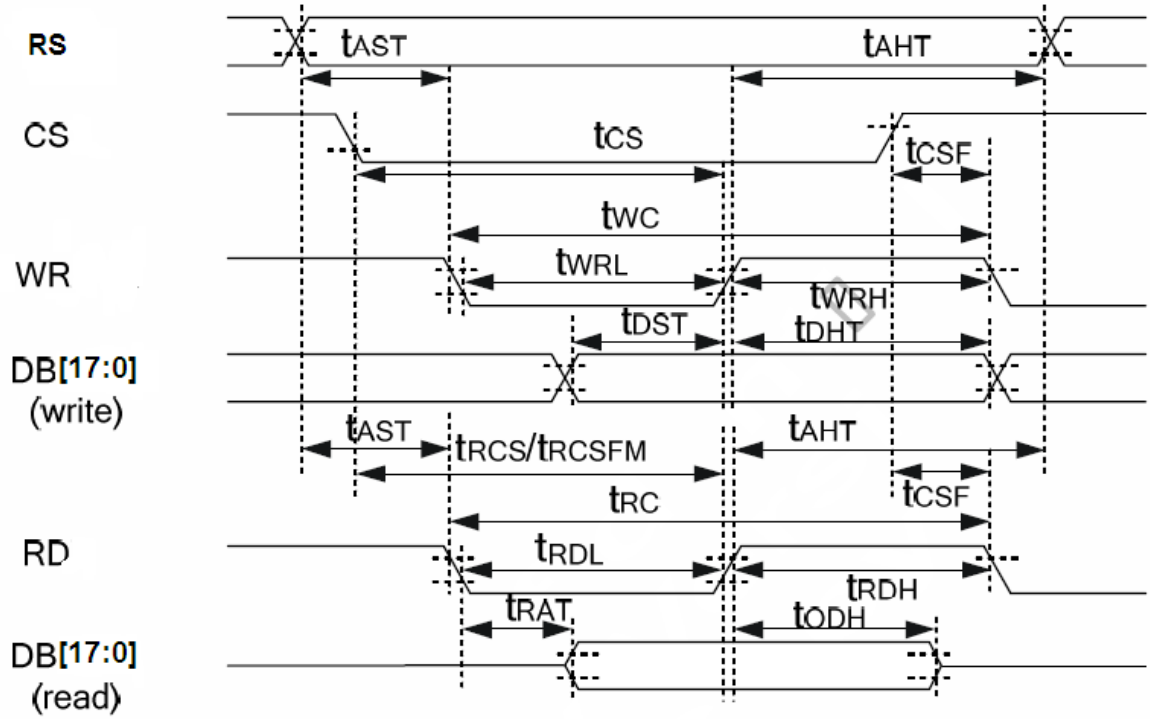


Figure 5.1.1 DBI Type B interface characteristics

(VSSA=0V, VDD1=1.8V, VDD3=2.8V, T_A=25℃)

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
RS	t_{AST}	Address setup time	0	-	ns	-
	t_{AHT}	Address hold time (Write/Read)	10	-		
CS	t_{CS}	Chip select setup time (Write)	10	-	ns	-
	t_{RCS}	Chip select setup time (Read register)	45	-		
	t_{RCSFM}	Chip select setup time (GRAM)	355	-		
	t_{CSF}	Chip select wait time (Write/Read)	10	-		
WR	t_{WC}	Write cycle (write register)	50	-	ns	-
	t_{WC}	Write cycle (write GRAM@SLPOUT)	47	-		
	t_{WC}	Write cycle (write GRAM@SLPIN)	100	-		
	t_{WRH}	Control pulse “H” duration	15	-		
	t_{WRL}	Control pulse “L” duration	15	-		
RD	t_{RC}	Read cycle (read register)	160	-	ns	-
	t_{RC}	Read cycle (GRAM)	450	-		
	t_{RDH}	Control pulse “H” duration	90	-		
	t_{RDL}	Control pulse “L” duration(read register)	35	-		
	t_{RDL}	Control pulse “L” duration(GRAM)	345	-		
DB[17:0]	t_{DST}	Data setup time	10	-	ns	For maximum C_L=30pF For minimum C_L=8pF
	t_{DHT}	Data hold time	10	-		
	t_{RAT}	Read access time(read register)	-	40		
	t_{RAT}	Read access time(GRAM)	-	340		
	t_{ODH}	Output disable time	20	80		

Table 5.1.1 DBI Type B interface Parameter

5.1.2 DBI Type B write/read to register or GRAM

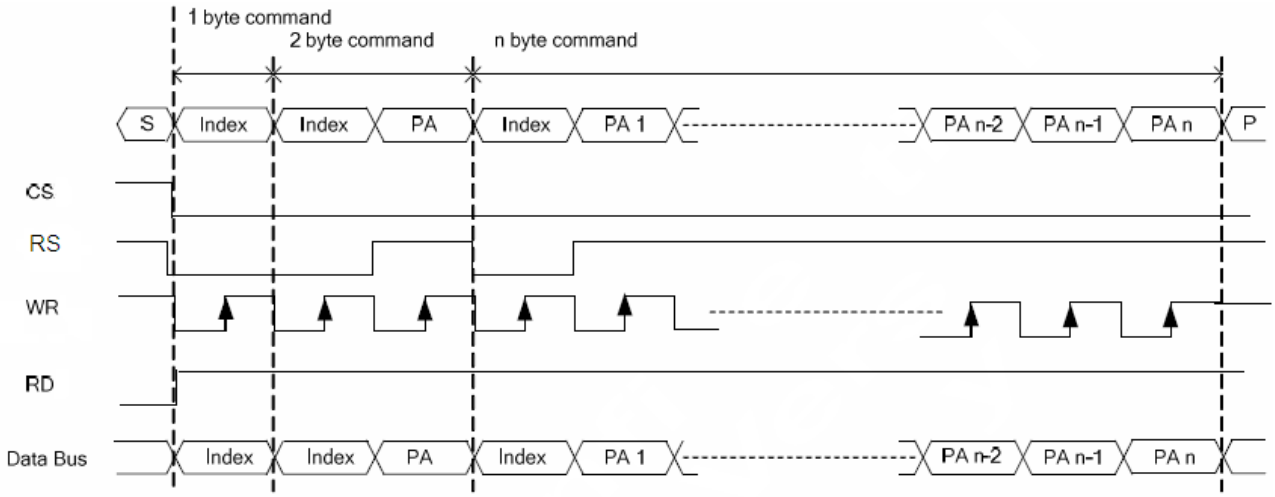


Figure 5.1.2 DBI Type B write to register or GRAM

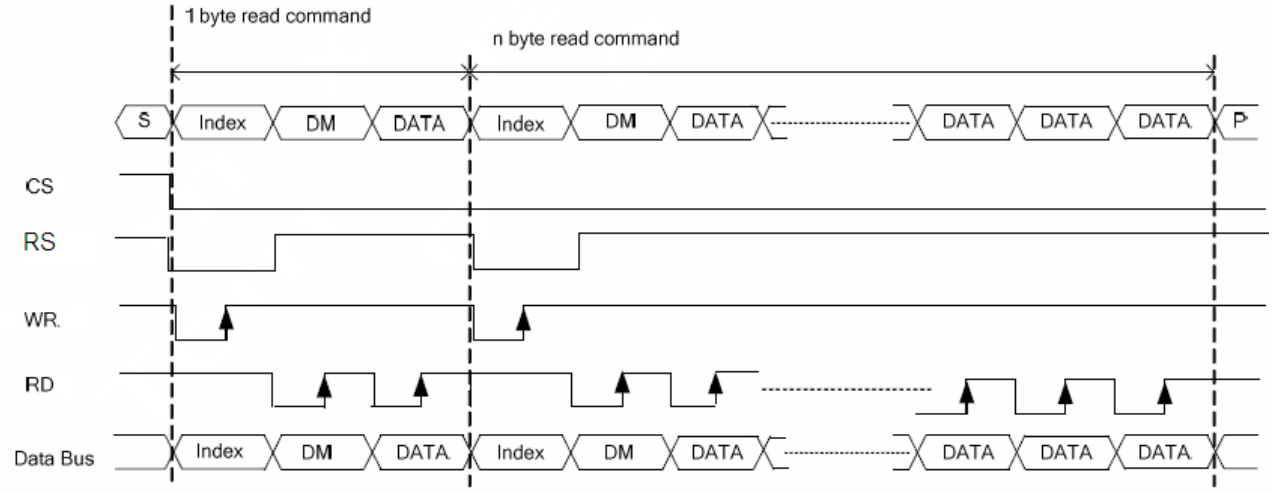


Figure 5.1.3 DBI Type B read to register or GRAM

5.1.3 DBI Type B Interface Data Color Coding

5.1.3.1 Data Color Coding for GRAM data Write

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Command
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	0	0	2CH
3AH	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
05h	x	x	x	x	x	x	x	x	x	x	R4	R3	R2	R1	R0	G5	G4	G3	65K-Color (1-pixel/ 2-bytes)
	x	x	x	x	x	x	x	x	x	x	G2	G1	G0	B4	B3	B2	B1	B0	
06h	x	x	x	x	x	x	x	x	x	x	R5	R4	R3	R2	R1	R0	x	x	262K-Color (1-pixel/ 3bytes)
	x	x	x	x	x	x	x	x	x	x	G5	G4	G3	G2	G1	G0	x	x	
	x	x	x	x	x	x	x	x	x	x	B5	B4	B3	B2	B1	B0	x	x	
07h	x	x	x	x	x	x	x	x	x	x	R7	R6	R5	R4	R3	R2	R1	R0	16.7M-Color (1-pixel/ 3bytes)
	x	x	x	x	x	x	x	x	x	x	G7	G6	G5	G4	G3	G2	G1	G0	
	x	x	x	x	x	x	x	x	x	x	B7	B6	B5	B4	B3	B2	B1	B0	

Table 5.1.2 8-Bits Interface GRAM Write Table

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Register
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	0	0	2CH
3AH	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
05h	x	x	x	x	x	x	x	x	x	x	R4	R3	R2	R1	R0	G5	G4	G3	65K-Color (1-pixel/ 2-bytes)
	x	x	x	x	x	x	x	x	x	x	G2	G1	G0	B4	B3	B2	B1	B0	
06h	x	x	x	x	x	x	x	x	x	R5	R4	R3	R2	R1	R0	G5	G4	G3	262K-Color (1-pixel/ 2bytes)
	x	x	x	x	x	x	x	x	x	G2	G1	G0	B5	B4	B3	B2	B1	B0	

Table 5.1.3 9-Bits Interface GRAM Write Table

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Command
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	0	0	2CH
3AH	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
05h	x	x	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B4	B3	B2	B1	B0	65K-Color
06h	x	x	R5	R4	R3	R2	R1	R0	x	x	G5	G4	G3	G2	G1	G0	x	x	262K-Color (2-pixels/ 3bytes)
	x	x	B5	B4	B3	B2	B1	B0	x	x	R5	R4	R3	R2	R1	R0	x	x	
	x	x	G5	G4	G3	G2	G1	G0	x	x	B5	B4	B3	B2	B1	B0	x	x	
07h	x	x	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	16.7M-Color (2-pixels/ 3bytes)
	x	x	B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0	
	x	x	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	

Table 5.1.4 16-Bits Interface GRAM Write Table

Register Command	DB17	DB16	DB15	DB14	DB13	DB12	DB11	DB10	DB9	DB8	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Register
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	0	0	2CH
3AH	DB17	DB16	DB15	DB14	DB13	DB12	DB11	DB10	DB9	DB8	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Color
06h	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	262K-Color

Table 5.1.5 18-Bits Interface GRAM Write Table

5.1.3.2 Data Color Coding for GRAM data Read

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Command
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	1	0	2EH
Read Data Format	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Dummy Read
	x	x	x	x	x	x	x	x	x	x	R5	R4	R3	R2	R1	R0	x	x	262K-Color (1-pixel/ 3bytes)
	x	x	x	x	x	x	x	x	x	x	G5	G4	G3	G2	G1	G0	x	x	
	x	x	x	x	x	x	x	x	x	x	B5	B4	B3	B2	B1	B0	x	x	

Table 5.1.6 8-Bits Interface GRAM Read Table

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Register
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	1	0	2EH
Read Data Format	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Dummy Read
	x	x	x	x	x	x	x	x	x	R5	R4	R3	R2	R1	R0	G5	G4	G3	262K-Color (1-pixel/ 2bytes)
	x	x	x	x	x	x	x	x	x	G2	G1	G0	B5	B4	B3	B2	B1	B0	

Table 5.1.7 9-Bits Interface GRAM Read Table

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Command
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	1	0	2EH
Read Data Format	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Dummy Read
	x	x	R5	R4	R3	R2	R1	R0	x	x	G5	G4	G3	G2	G1	G0	x	x	262K-Color (2-pixels/ 3bytes)
	x	x	B5	B4	B3	B2	B1	B0	x	x	R5	R4	R3	R2	R1	R0	x	x	
	x	x	G5	G4	G3	G2	G1	G0	x	x	B5	B4	B3	B2	B1	B0	x	x	

Table 5.1.8 16-Bits Interface GRAM Read Table

Register Command	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Register
	x	x	x	x	x	x	x	x	x	x	0	0	1	0	1	1	1	0	2EH
Read Data Format	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Color
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Dummy Read
	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	262K-Color

Table 5.1.9 18-Bits Interface GRAM Read Table

5.2 DBI Type C interface（3/4 SPI）

5.2.1 DBI Type B interface

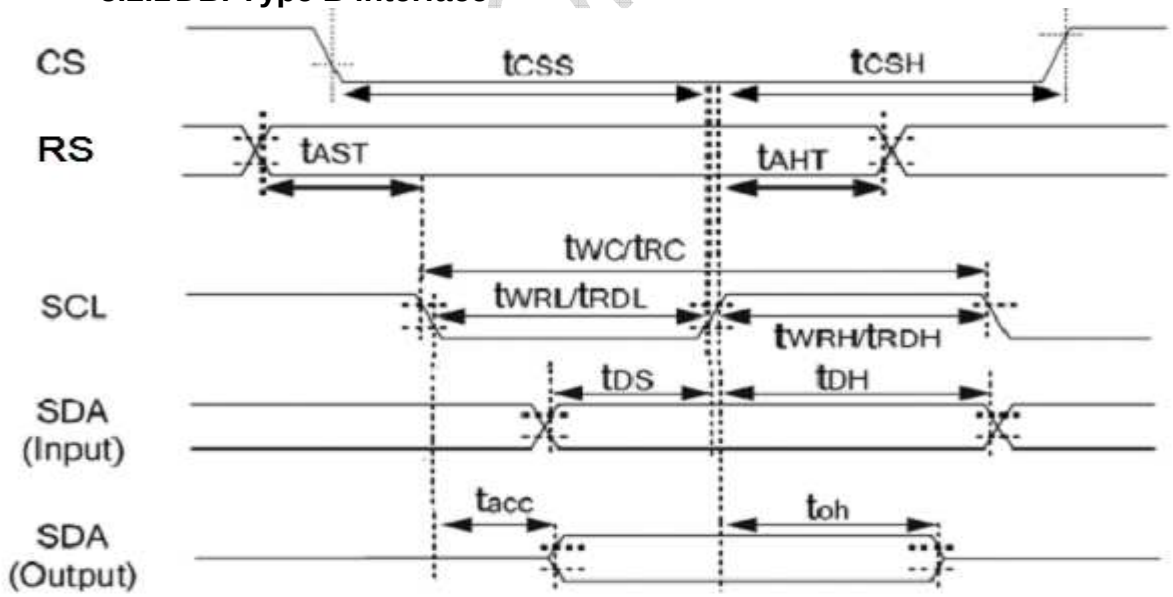


Figure 5.2.1 DBI Type C interface characteristics

(VSSA=0V, IOVCC=1.8V, VCI=2.8V, T_A = 25℃)

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CS	tCSS	Chip select setup time (Write)	15	-	ns	-
	tCSS	Chip select setup time (Read)	60	-		
	tCSH	Chip select hold time (Write)	15	-		
	tCSH	Chip select hold time (Read)	65	-		
RS	tAST	Address setup time	0	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-		
SCL (Write)	tWC	Write cycle	66	-	ns	-
	tWRH	Control pulse "H" duration	15	-		
	tWRL	Control pulse "L" duration	15	-		
SCL (Read)	tRC	Read cycle	150	-	ns	-
	tRDH	Control pulse "H" duration	60	-		
	tRDL	Control pulse "L" duration	60	-		
SDA (Input)	tDS	Data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tDH	Data hold time	10	-		
SDA (Output)	tACC	Read access time	10	50	ns	
	tOH	Output disable time	15	50		

Table 5.2.1 DBI Type C Interface Parameter

5.2.2 DBI Type C write mode

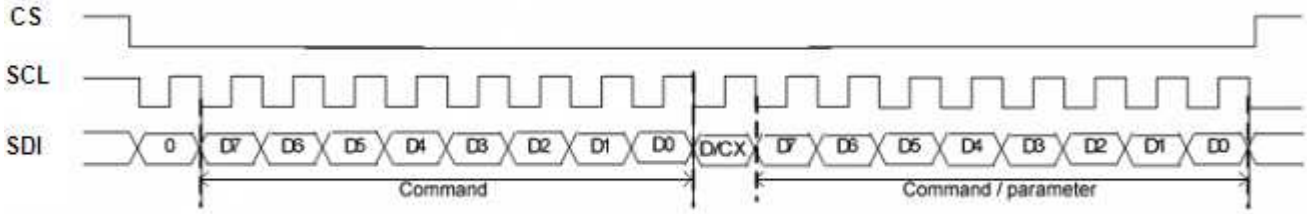


Figure 5.2.2 DBI Type C – 3 wire write mode

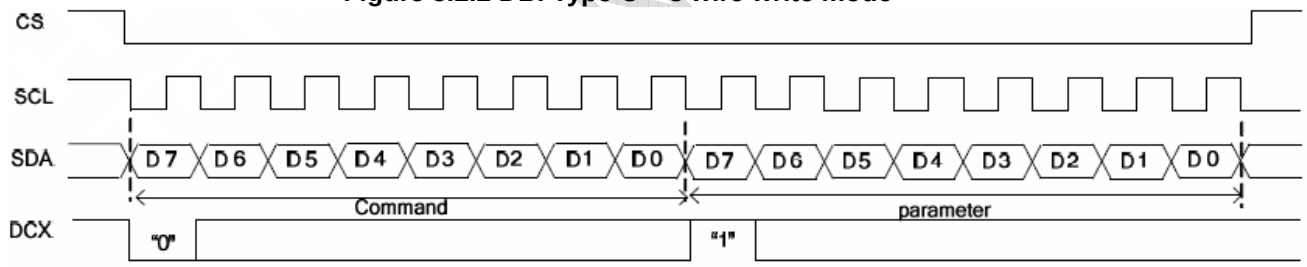


Figure 5.2.3 DBI Type C – 4wire write mode

5.2.3 DBI Type C read mode

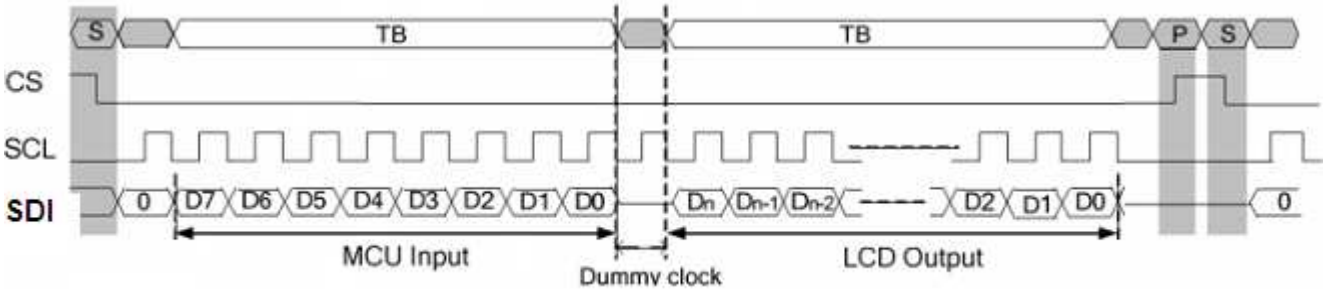


Figure 5.2.4 DBI Type C – 3 wire read mode

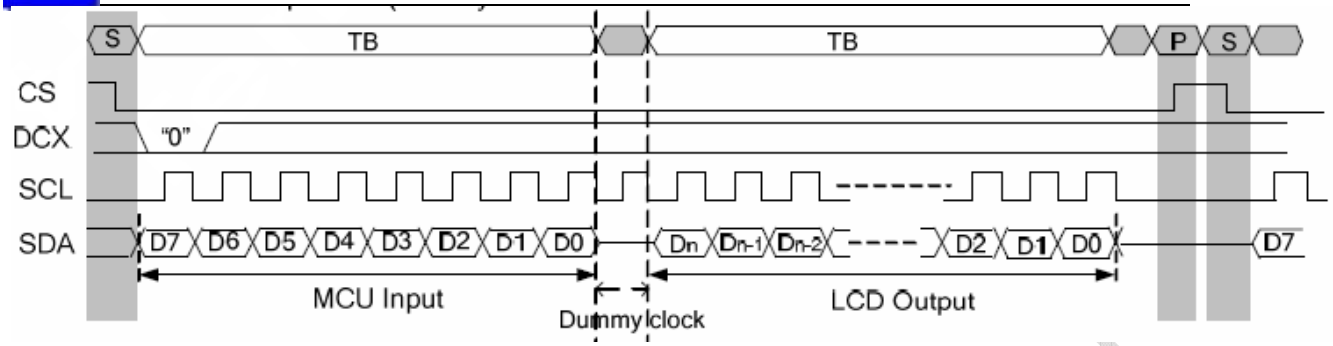


Figure 5.2.5 DBI Type C – 4wire read mode

5.3 DPI interface（RGB)

5.3.1 DPI Interface Timing Characteristics

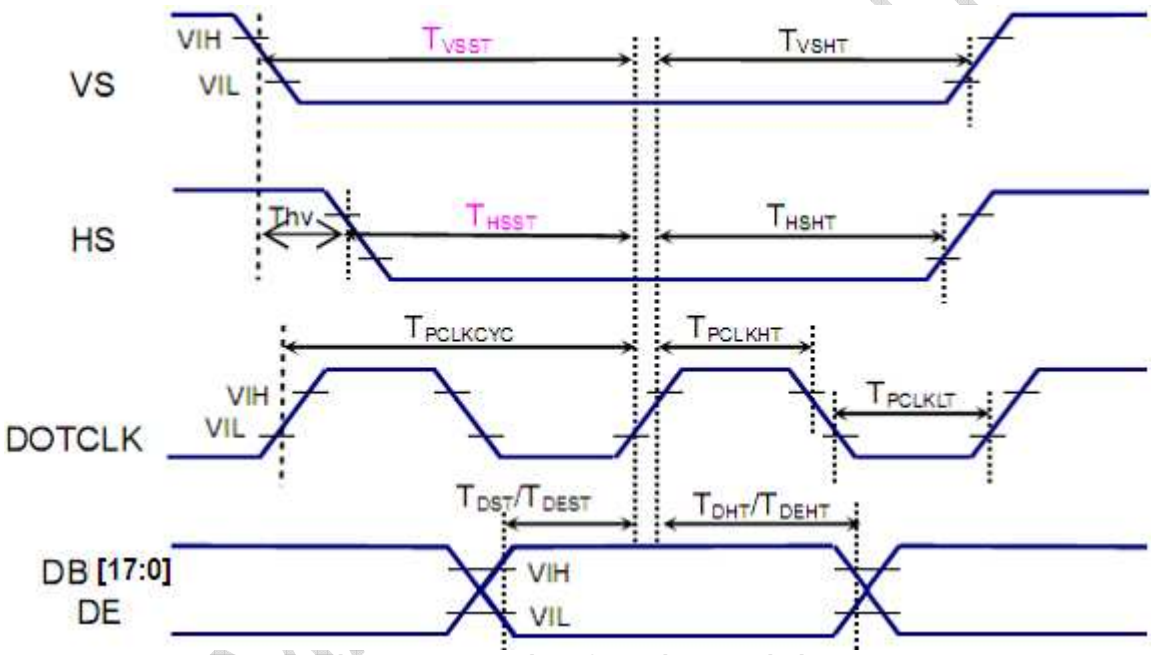


Figure 5.3.1 DPI interface characteristics

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70℃)

Item	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Pixel low pulse width	T_{CLKLT}		15	-	-	ns
Pixel high pulse width	T_{CLKHT}		15	-	-	ns
Vertical Sync. set-up time	T_{VSST}		15	-	-	ns
Vertical Sync. hold time	T_{VSSHT}		15	-	-	ns
Horizontal Sync. set-up time	T_{HSST}		15	-	-	ns
Horizontal Sync. hold time	T_{VSSHT}		15	-	-	ns
Data Enable set-up time	T_{DEST}		15	-	-	ns
Data Enable hold time	T_{DEHT}		15	-	-	ns
Data set-up time	T_{DST}		15	-	-	ns
Data hold time	T_{DHT}		15	-	-	ns
Phase difference of sync signal falling edge	Thv		0	-	320	Dotclk

Table 5.3.1 DPI interface Parameter

5.3.2 Signals Timing Chart

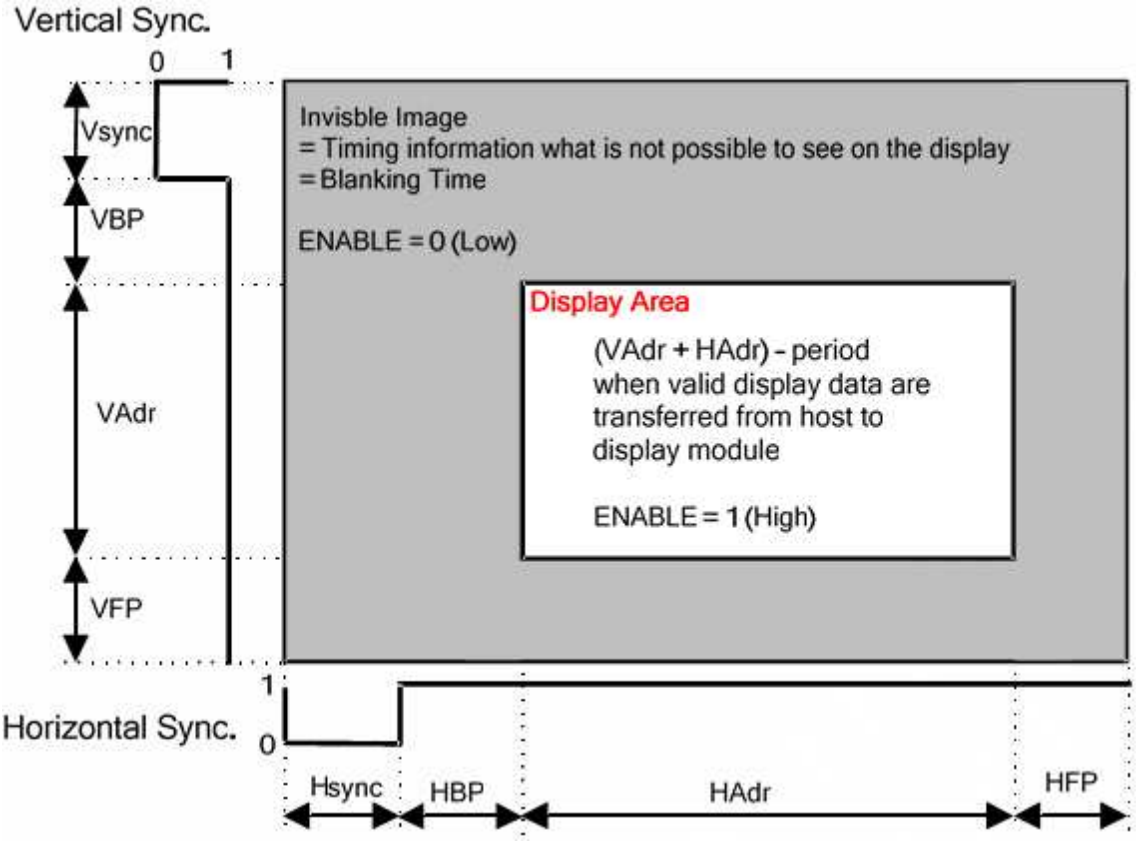


Figure 5.3.2 General Display Area Timing Diagram

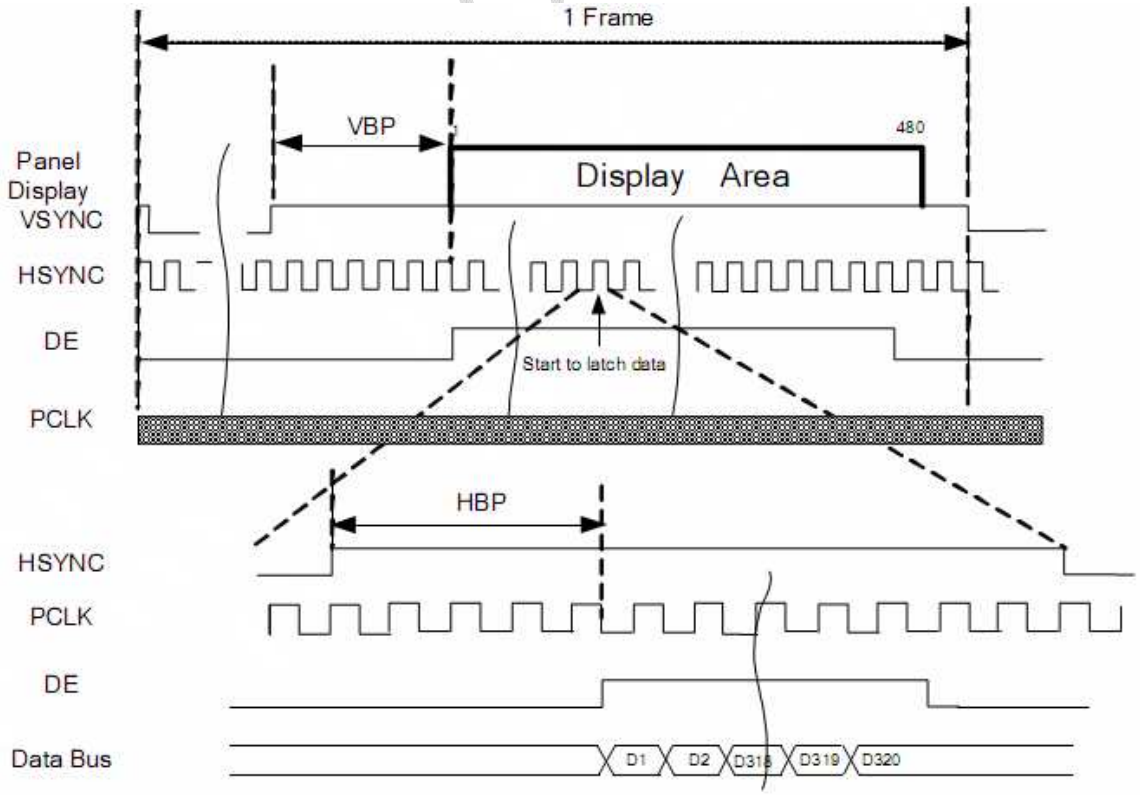


Figure 5.3.3 RGB Signals Timing Chart

Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
PCLK Cycle	$PCLK_{CYC}$		-	125	95.5	ns
Horizontal Synchronization	Hsync		2	2	-	PCLK
Horizontal Back Porch	HBP		3	3	-	PCLK
Horizontal Address	HAdr		-	320	-	PCLK
Horizontal Front Porch	HFP		3	3	-	PCLK
Vertical Synchronization	Vsync		2	2	-	Line
Vertical Back Porch	VBP		2	2	-	Line
Vertical Address	VAdr		-	480	-	Line
Vertical Front Porch	VFP		2	4	-	Line
Vsync setup time	VSST					Hz
Vsync hold time	VSHT					Hz
Hsync setup time	HSST					Hz
Hsync hold time	HSHT					Hz
Data setup time	DST					Hz
Data hold time	DHT					Hz
Vertical Frequency(*)				50	65	Hz
Horizontal Frequency(*)			-	-	-	KHz
PCLK Frequency(*)			-	8	10.5	MHz

Table 5.2Horizontal and Vertical input timing

5.4 Reset Timing Characteristics

Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width[1]	RESET	10	-	-	-	µs
tREST	Reset complete time[2]	-	5	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

Table 5.4 Reset Timing Parameter

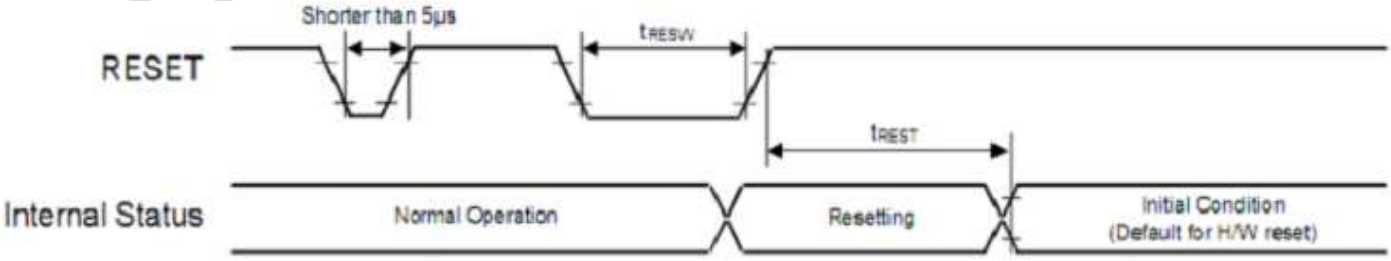
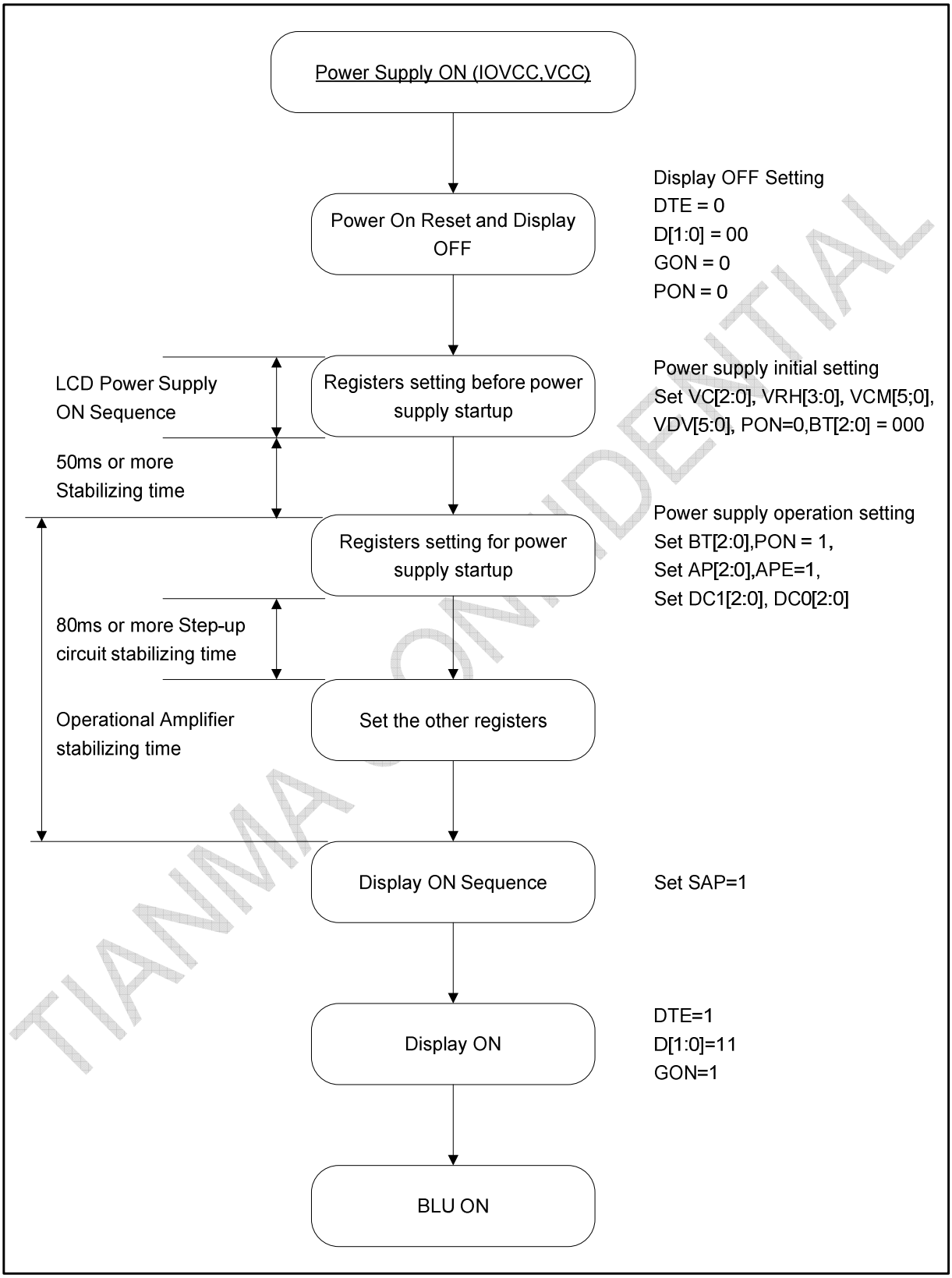


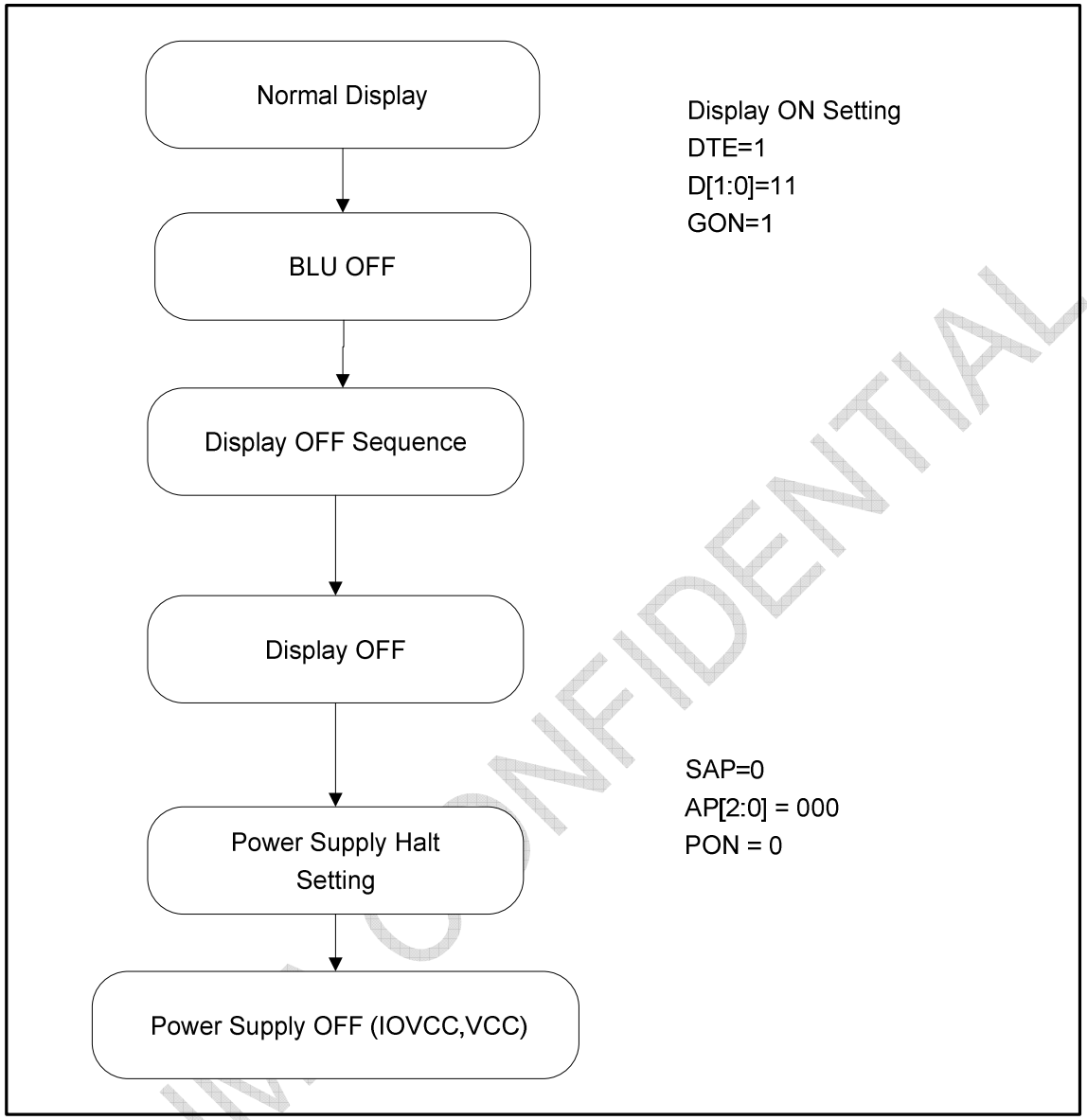
Figure 5.4 Reset Timing

5.5 Power On/Off sequence

5.5.1 Power on Sequence



5.5.2 Power off Sequence



6 Optical Characteristics

Ta=25℃

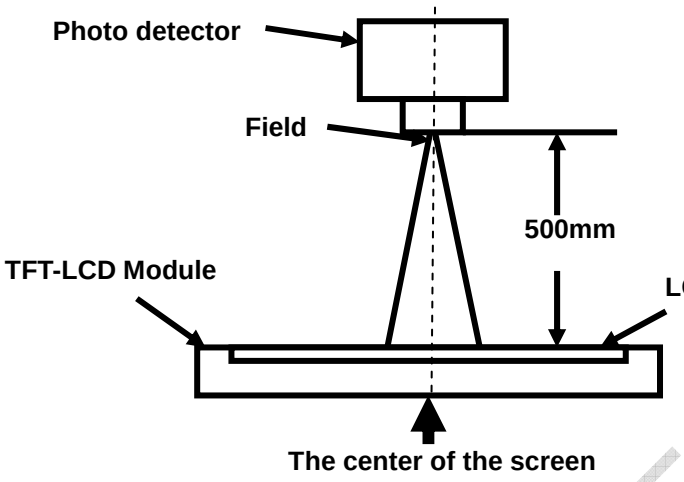
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note 2
		θB		50	60	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.235	0.285	0.335	-	Note5 Note1
		y		0.260	0.310	0.360		
	Red	x		0.562	0.612	0.662		
		y		0.283	0.333	0.383		
	Green	x		0.288	0.338	0.388		
		y		0.545	0.595	0.645		
	Blue	x		0.099	0.149	0.199		
		y		0.032	0.082	0.132		
Uniformity		U	-	-	80	-	%	Note1 Note6
NTSC		-	-	-	60	-	%	Note 5
Luminance		L		250	300		cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=120 mA(One LED current), the ambient temperature is 25℃
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical 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. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

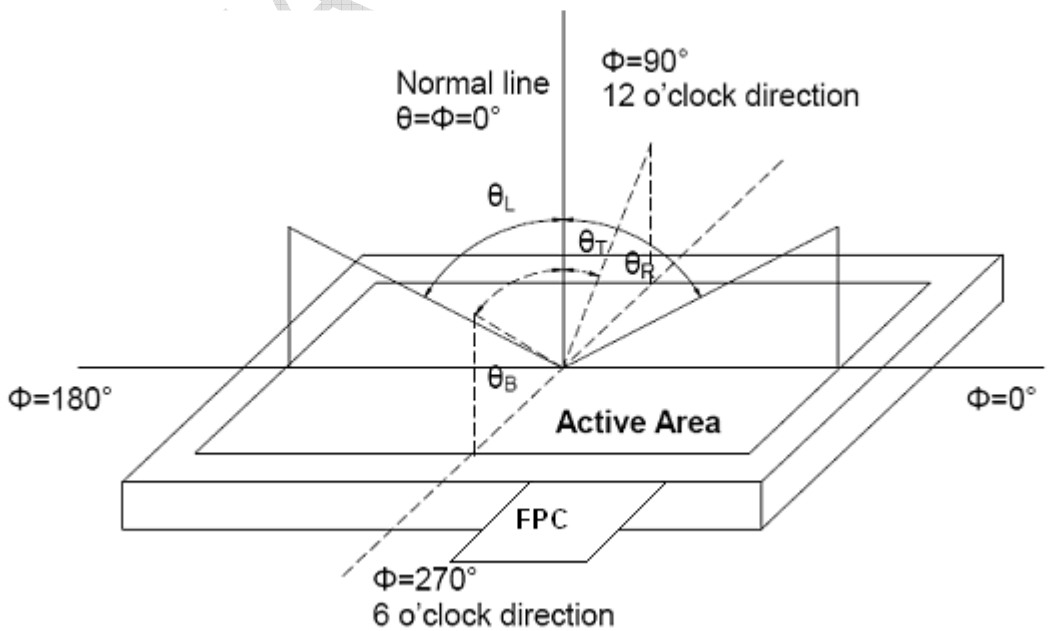


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

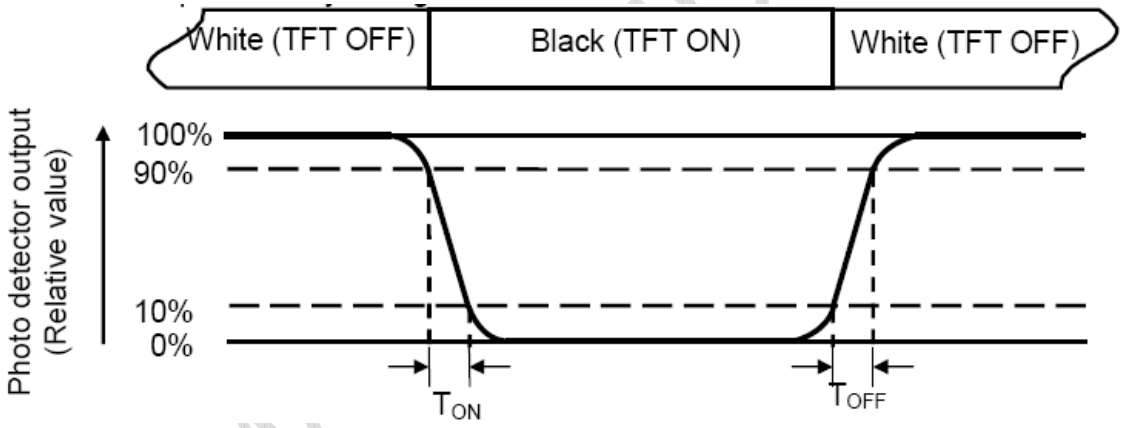
“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should driven by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

L-------Active area length W----- Active area width

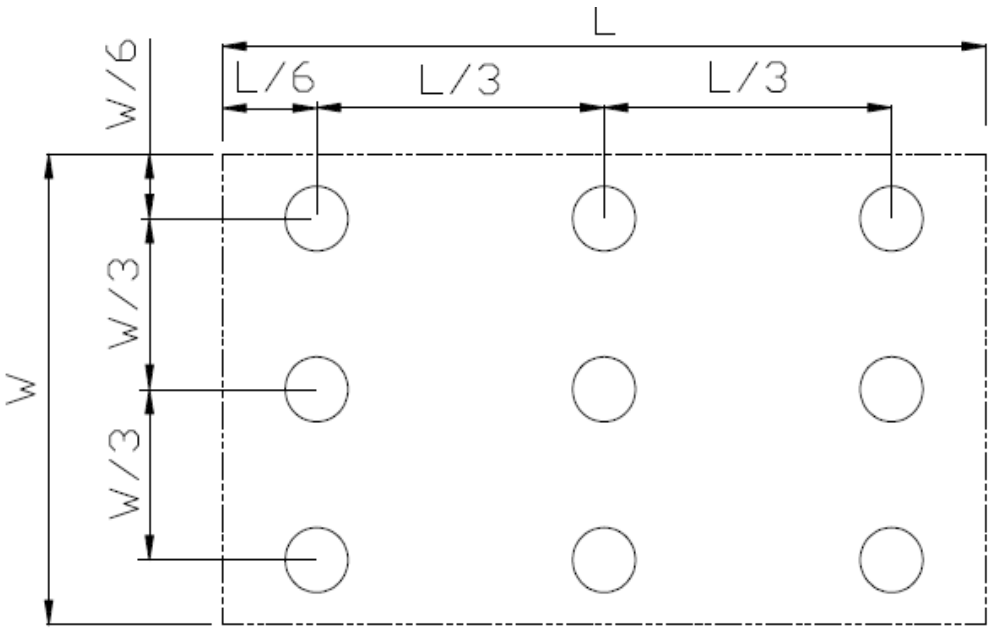


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

Measure the luminance of white state at center point.

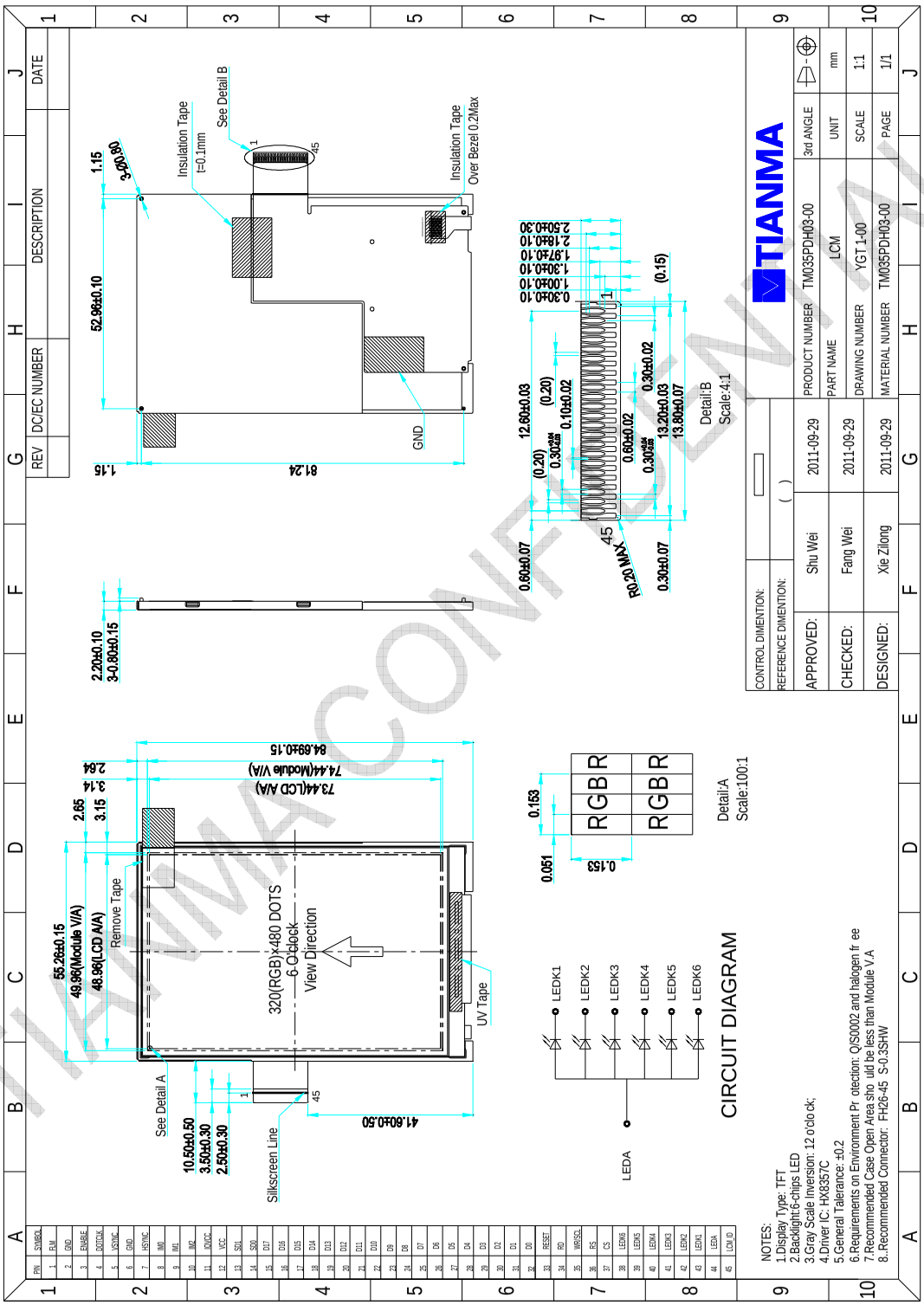
7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta=+80℃, 240hrs	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta=-30℃, 240hrs	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Storage	Ta=+60℃, 90% RH 240 hours	Note2 IEC60068-2-78 GB/T2423.3
6	Thermal Shock (Non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω，5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; （Environment: 15℃~35℃, 30%~60%, 86Kpa~106Kpa）	IEC61000-4-2 GB/T17626.2
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition)	IEC60068-2-6 GB/T2423.10
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8

Note1: Ts is the temperature of panel's surface.

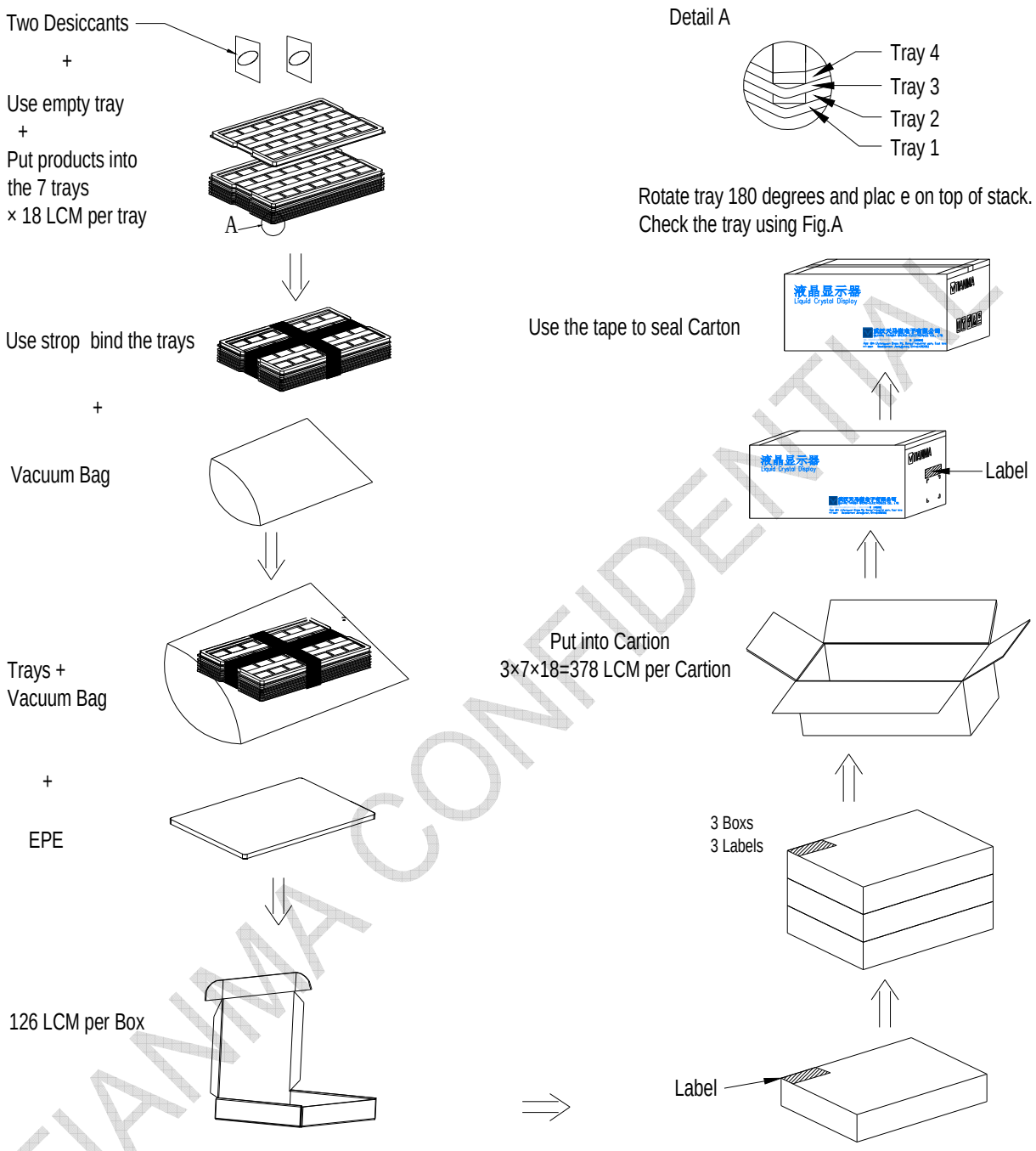
Note2: Ta is the ambient temperature of sample.

8 Mechanical Drawing



9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM035PDH03	55.26×84.69×2.20	0.02235	378	
2	Tray	PET（Transmit）	485x330x13.8	0.161	24	Anti-static
3	EPE	EPE	485X330X5	0.0183	3	
4	Vacuum Bag	PE	600×500×0.08	0.047	3	
5	Box	Corrugated Paper	520x345x74	0.227	3	
6	Desiccant	Desiccant	45×35	0.002	6	
7	Carton	Corrugated Paper	544×365×250	1.01	1	
8	Label	Paper	100×52	TBD	4	
9	Total weight	14.09 Kg				



10 Precautions For Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.