MODEL NO. : TM035WDH01-00

ISSUED DATE: 2012-6-18

VERSION : Ver 1.0

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

Customer :_____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
Longping.Deng	Ling.Shen	Ruiyuan.Zhou

This technical specification is subjected to change without notice

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Table of Contents

Coversheet..... 1
Table of Contents..... 2
Record of Revision..... 3
1 General Specifications..... 4
2 Input/Output Terminals..... 5
3 Absolute Maximum Ratings..... 7
4 Electrical Characteristics..... 8
5 Timing Chart..... 10
6 Optical Characteristics..... 17
7 Environmental / Reliability Test..... 20
8 Mechanical Drawing..... 22
9 Packing Drawing..... 23
10 Precautions For Use of LCD Modules..... 24

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2012-6-18	Preliminary Specification Release	Longping.Deng

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1 General Specifications

Feature		Spec
Display Spec.	Size	3.5 inch
	Resolution	**480(RGB)×640**
	Interface	RGB18 bit +SPI
	Color Depth	262K
	Technology Type	a-si TFT
	Pixel Pitch (mm)	0.111x0.111
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM,NW
	Surface Treatment(Up Polarizer)	AG
	Viewing Direction	9 o’ clock
	Gray Scale Inversion Direction	3 o’ clock
Mechanical Characteristics	LCM (W x H x D) (mm)	64.00*85.00*3.0
	Active Area(mm)	53.28*71.04
	With/Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	6 LED

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2 Input/Output Terminals

2.1 TFT LCD Panel

Pin	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	YU	/	Touch Panel Upper side(No connection)	
3	XR	/	Touch Panel Right side(No connection)	
4	YD	/	Touch Panel Lower side(No connection)	
5	XL	/	Touch Panel Left side(No connection)	
6	GND	P	Ground	
7	NC	/	No connection	
8	NC	/		
9	GND	P	Ground	
10	NC	/	No connection	
11	NC	/		
12	NC	/		
13	NC	/		
14	NC	/		
15	GND	P	Ground	
16	NC	/	No connection	
17	RESET	I	Reset pin to Initial the IC, when RESET="L", reset enable	
18	NC	/	No connection	
19	NC	/		
20	VDD	P	Power supply (+3.3V)	
21	GND	P	Ground	
22~27	B00~B05	I	6bits Blue Data	
28	GND	P	Ground	
29~34	G00~G05	I	6bits Green Data	
35	GND	P	Ground	
36~41	R00~R05	I	6bits Red Data	
42	GND	P	Ground	
43	VDD	P	Power supply （+3.3V）	

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44	NC	/	No connection	
45	GND	P	Ground	
46	MCLK	I	No connection	
47	GND	P	Ground	
48	ENAB	I	Data Enable for RGB interface operation	
49	GND	P	Ground	
50	CS	I	Chip select	
51	SDA	I	Serial Data signal	
52	NC	/	No connection	
53	SCL	I	Serial clock signal	
54	VS	I	Vertical Sync Signal	
55	HS	I	Horizontal Sync Signal	
56	NC	/	No connection	
57	NC	/	No connection	
58	LED-	P	LED light cathode	
59	LED+	P	LED light anode (+19.2V)	
60	GND	P	Ground	

Note1: I/O definition: I-----Input O---Output P----Power/Ground

Note2: Internal connection, PSWAP=1, DSWAP=00; Please refer to NT35516's spec.

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3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	4.6	V	
Input signal Voltage	Vin	GND	VDD	V	
Operating Temperature	TOPR	-20	60	℃	
Storage Temperature	TSTG	-30	70	℃	

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4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
POWER Supply Voltage		VDD	3.00	3.30	3.30	V	
Input Signal Voltage	Low Level	VIL	GND	-	0.3xVDD	V	
	High Level	VIH	0.7xVDD	-	VDD	V	
Output Signal Voltage	Low Level	VIL	GND	-	0.2xVDD	V	
	High Level	VIH	0.8xVDD	-	VDD	V	

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4.2 Driving Backlight

Ta=25℃

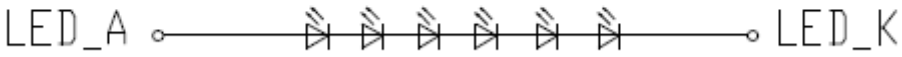
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	20	--	mA	
Forward Current Voltage	V_F	--	3.2	--	V	
Backlight Power Consumption	W_{BL}	--	64	--	mW	

Note1: The LED driving condition is defined for each LED module

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: 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.

Note4: The LED driving condition is defined for each LED module.



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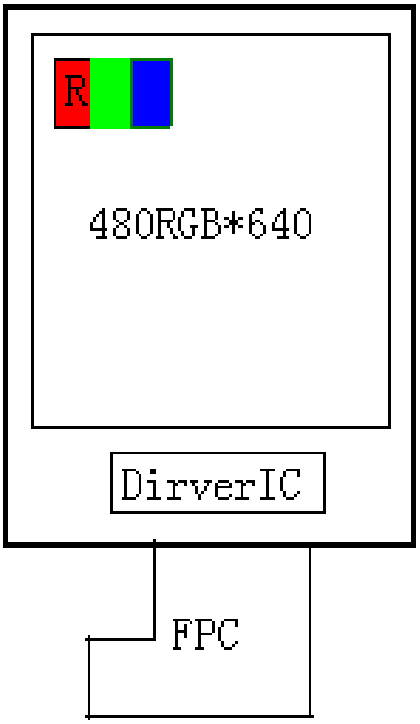
4.3 Block Diagram

LCD module diagram



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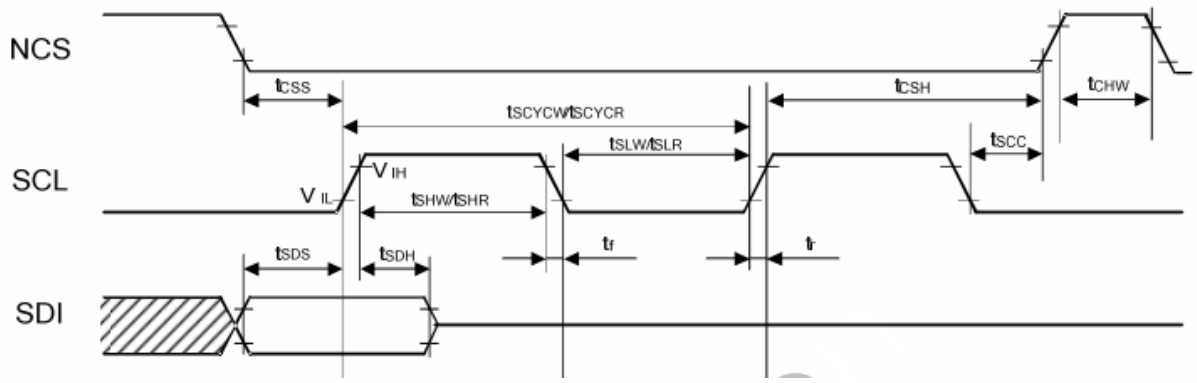
5 INTERFACE TIMING

5.1 Serial Interface Characteristics(3-Pin serial)



Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Serial clock cycle (Write) SCL "H" pulse width (Write) SCL "L" pulse width (Write)	tSCYCW tSHW tSLW	SCL	80 30 30	- - -	- - -	ns
Data setup time (Write) Data hold time (Write)	tSDS tSDH	SDI	10 10	- -	- -	ns
Serial clock cycle (Read) SCL "H" pulse width (Read) SCL "L" pulse width (Read)	tSCYCR tSHR tSLR	SCL	150 60 60	- - -	- - -	ns
SCL to Chip select	tSCC	NCS	30	-	-	ns
NCS "H" pulse width	tCHW	NCS	60	-	-	ns
NCS-SCL time (write) NCS-SCL time (write	tCSS tCSH	NCS	30 30	- -	-	ns
NCS-SCL time (Read) NCS-SCL time (Read)	tCSS tCSH	NCS	60 65	- -	-	ns

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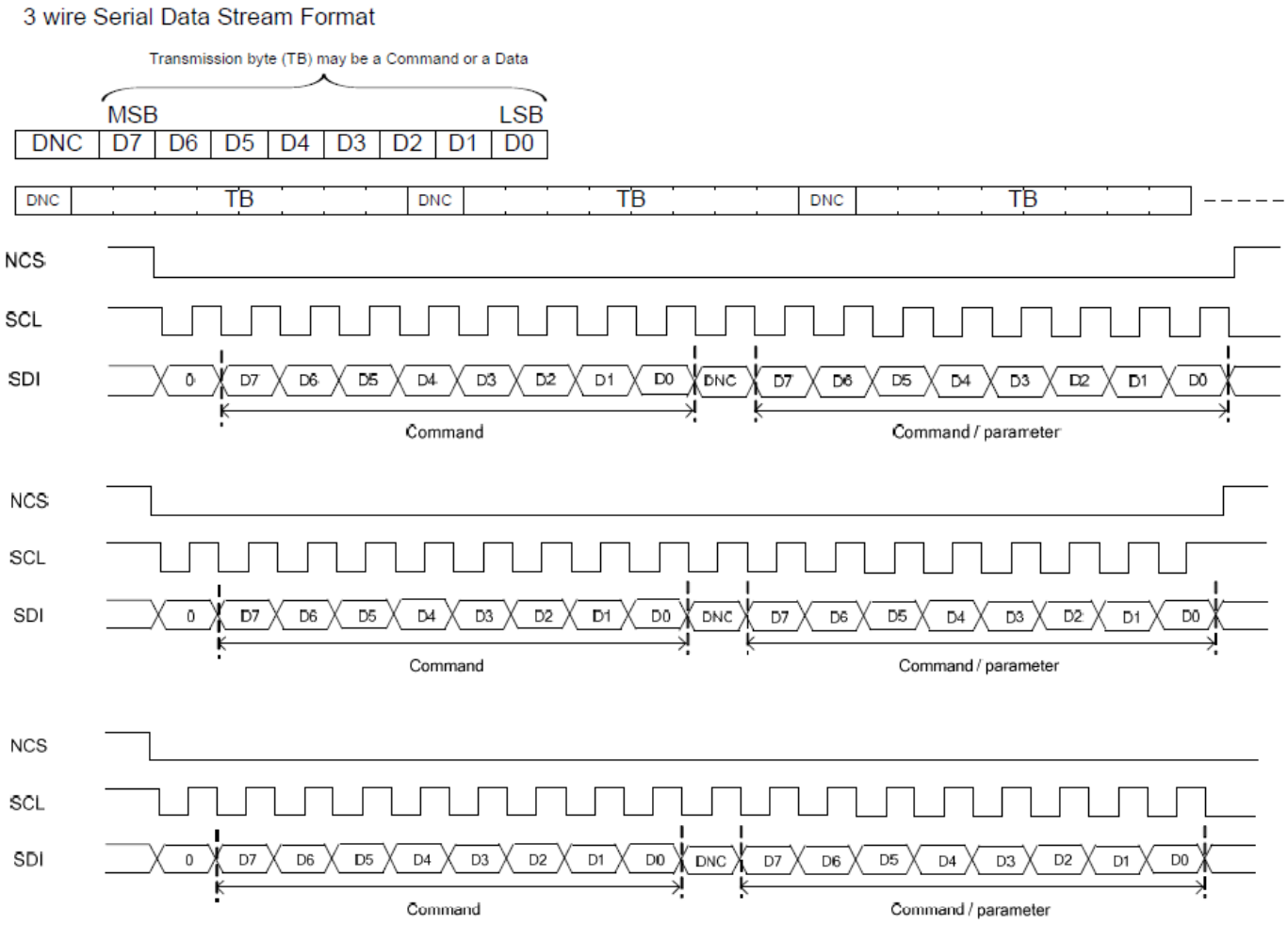
5.2 Serial Data Transfer Interface

The 3-Pin serial data packet contains a control bit DNC and a transmission byte. If DNC is low, the transmission byte is command byte. If DNC is high, the transmission byte is stored to command register. The MSB is transmitted first. The serial interface is initialized when NCS is high. In this state, SCL clock pulse or SDI/SDO data have no effect. A falling edge on NCS enables the serial interface and indicates the start of data transmission.



Serial Interface protocol 3 wire serial interface (write mode)

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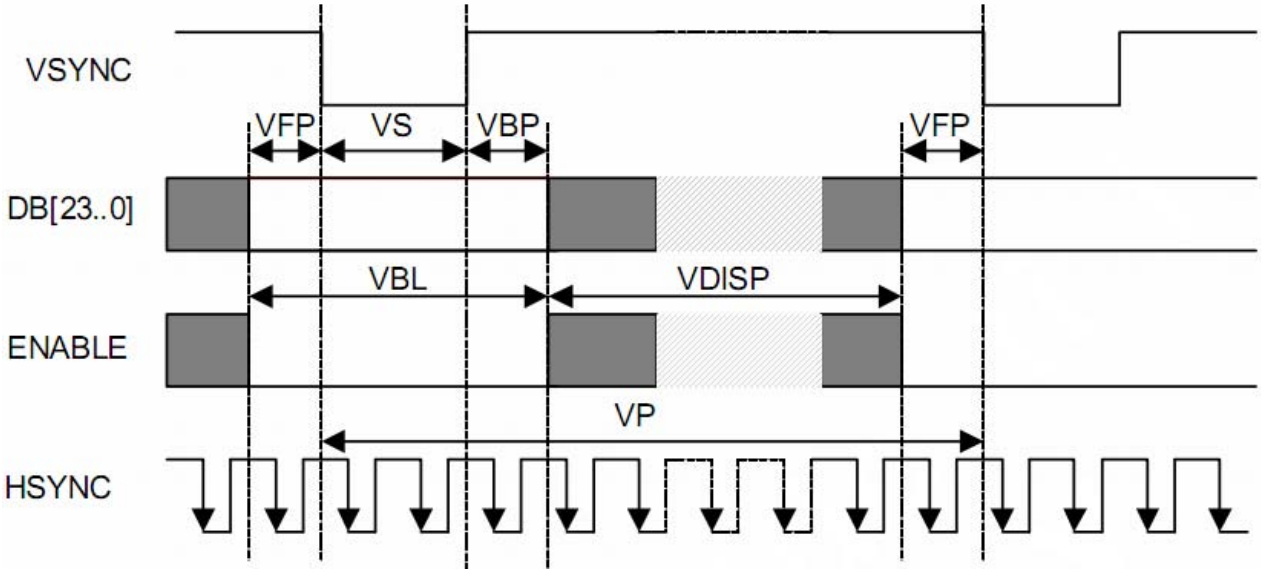
5.3 RGB Interface Characteristics

5.3.1 Vertical timing for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	646	-	650	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area	-	VDISP	-	640	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

5.3.2 Horizontal timing for RGB I/F

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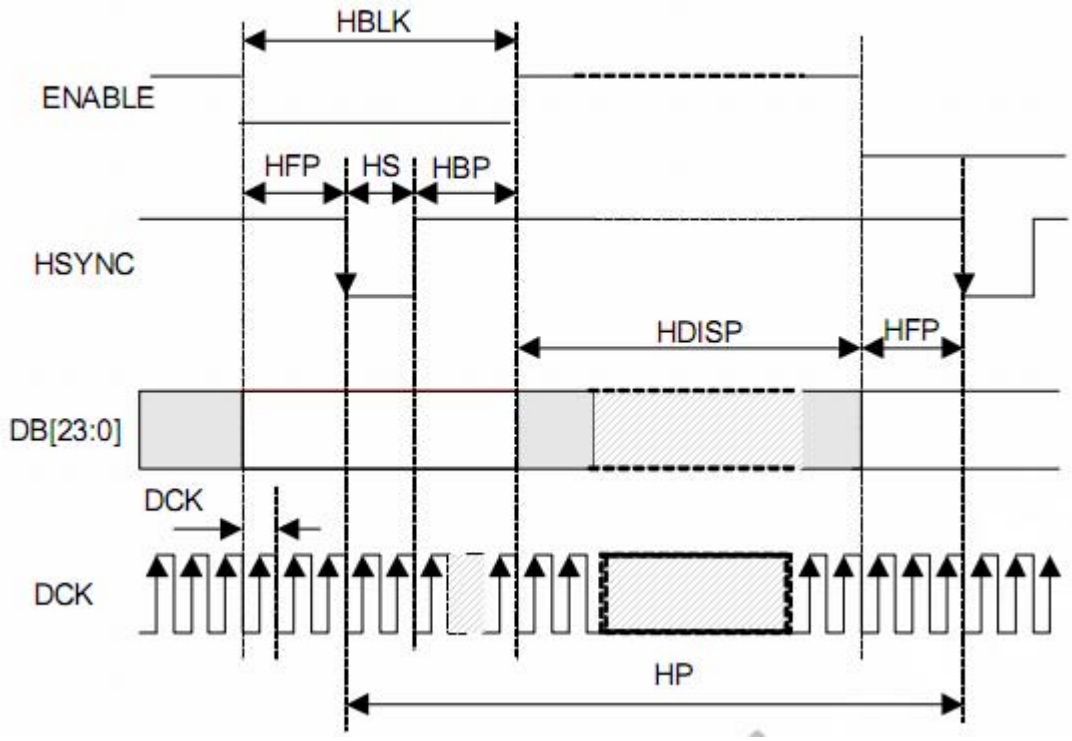

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency	DCK	VRR = Min. 50Hz	16.3	22.2	25.8	MHz
When RGB I/F is running		- Max. 70Hz	38.7	-	61.3	ns

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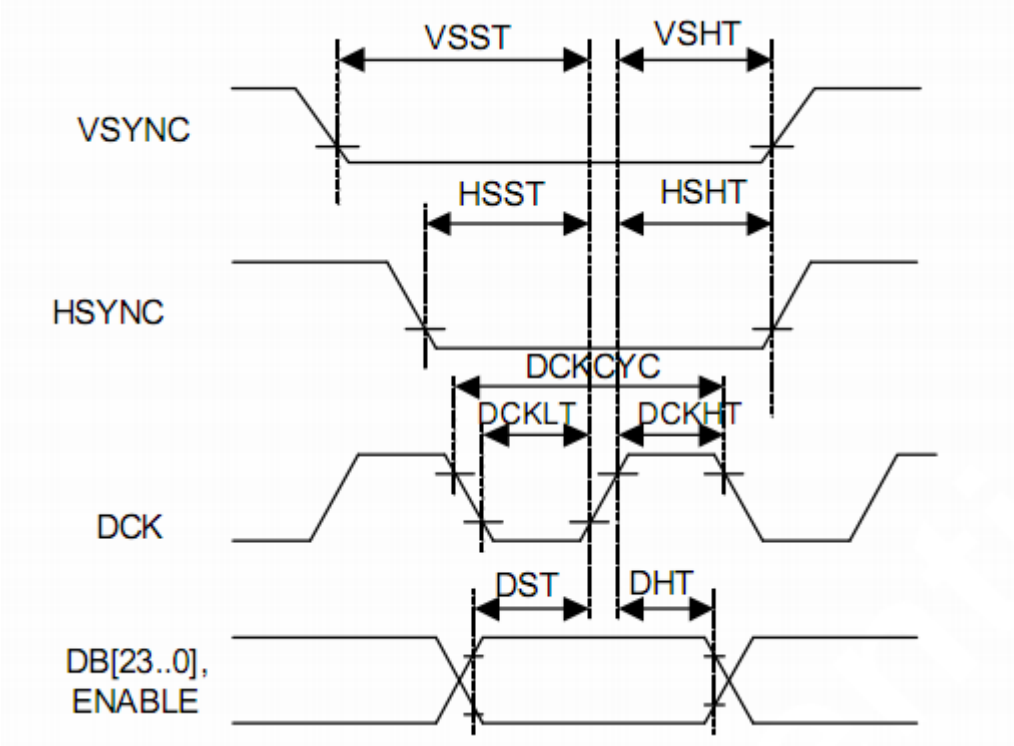
5.3.3 General Timings for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical sync. Setup time	VSST	-	5	-	-	ns
Vertical sync. Hold time	VSHT	-	5	-	-	ns
Horizontal sync. Setup time	HSST	-	5	-	-	ns
Horizontal sync. Hold time	HSHT	-	5	-	-	ns
Pixel clock low time	DCKLT	-	5	-	-	ns
Pixel clock high time	DCKHT	-	5	-	-	ns
Data setup time DB[23:0]	DST	-	5	-	-	ns
Data Hold time DB[23:0]	DHT	-	5	-	-	ns

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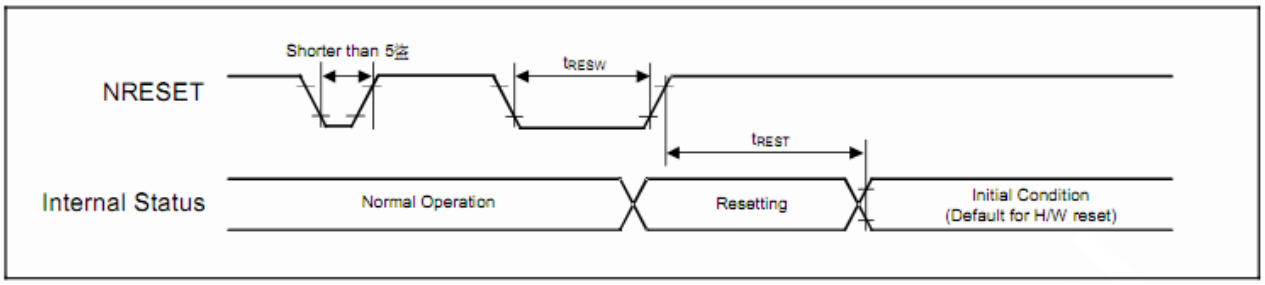
5.4 Reset Input Timing



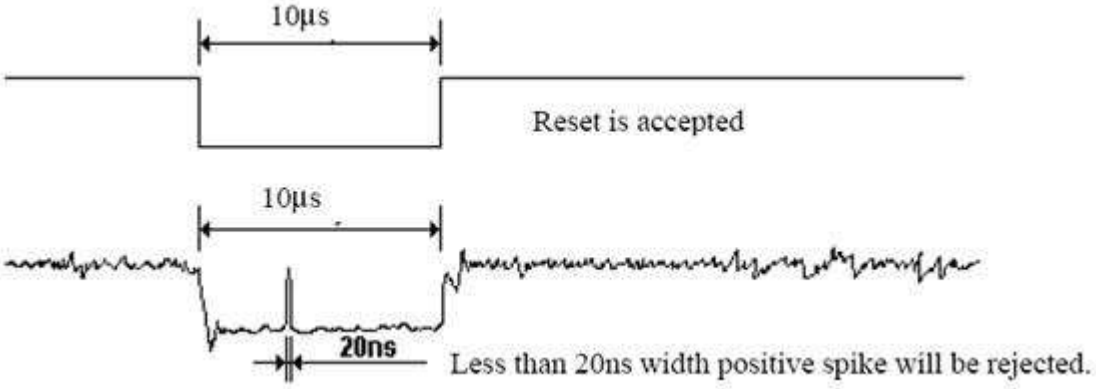
Symbol	Parameter	Related Pins	Min.	Typ.	Max.	Note	Unit
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	μs
tREST	Reset complete time	-	-	-	5	When reset is applied during Sleep In mode	ms
		-		-	120	When reset is applied during Sleep Out mode	ms

Note : (1).Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset

according to the table below:

NRESET Pulse	Action
Shorter than 5μs	Reset Rejected
Longer than 10μs	Reset
Between 5μs and 10μs	Reset Start

(2) Spike Rejection also applies during a valid reset pulse as shown below:



(3)It is necessary to wait 5msec after releasing NRESET before sending commands. Also Sleep Out

command cannot be sent for 120msec.

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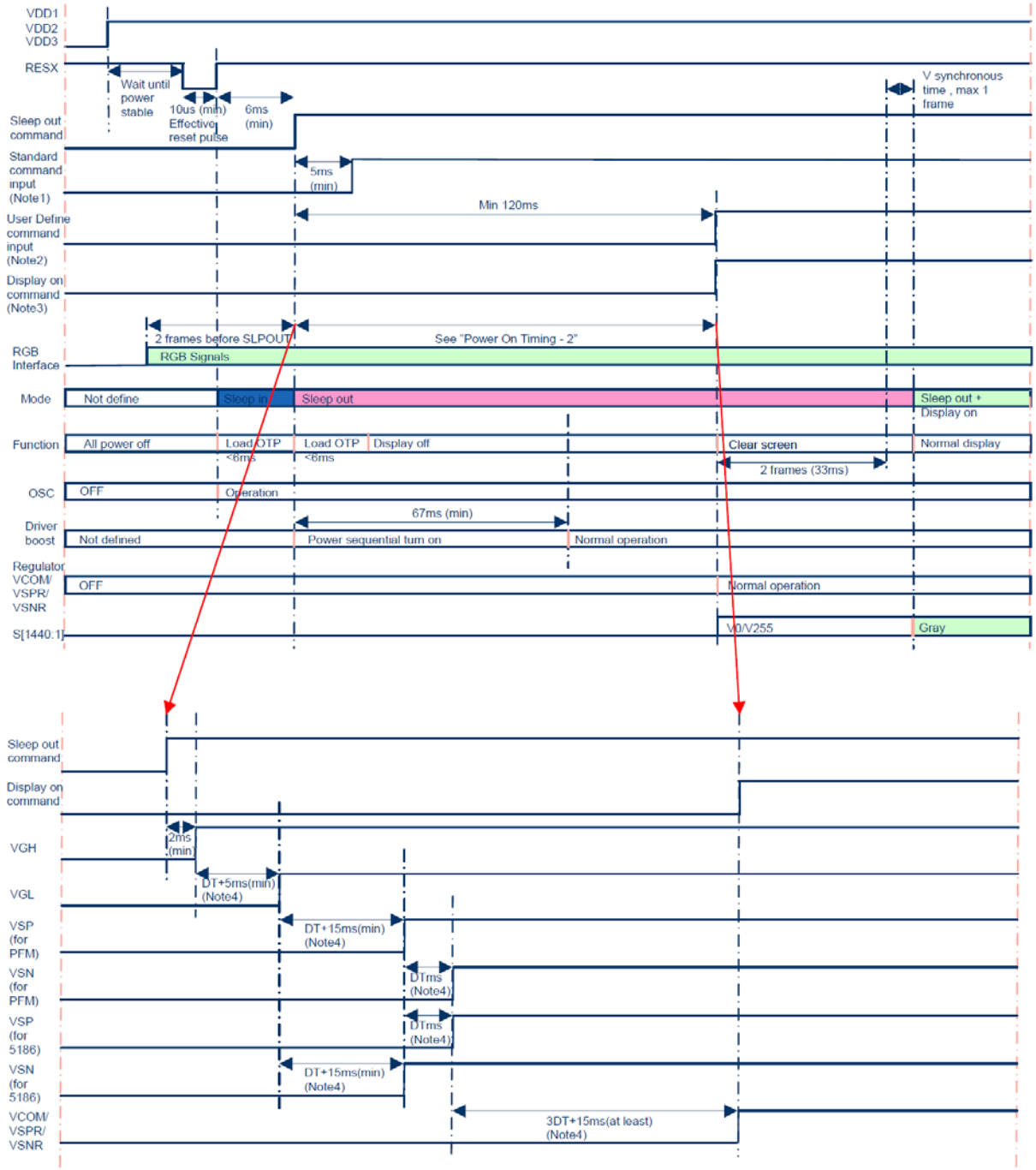
5.5 Power ON/OFF Timing



Note1:
"Standard" command except "01h" & "10h" command must wait 5ms after "Sleep out" command then can be sent. "01h" & "10h" command must wait 100ms after "Sleep out" command then can be sent.

Note2:
"User Define" command must wait 100ms after "Sleep out" command then can be sent. "B9h" command must be sent first then other command can be sent after "B9h" command.

Note3:
"Display on" command must send after "User Define" command or at the same time.

Note4:

DT[1:0] Delay time of power on and power off sequence.

DT1	DT0	Delay time of power on and power off sequence on
0	0	5ms
0	1	10ms
1	0	15ms
1	1	20ms

Default DT=5ms

Fig 5.5.1 Power ON Timing

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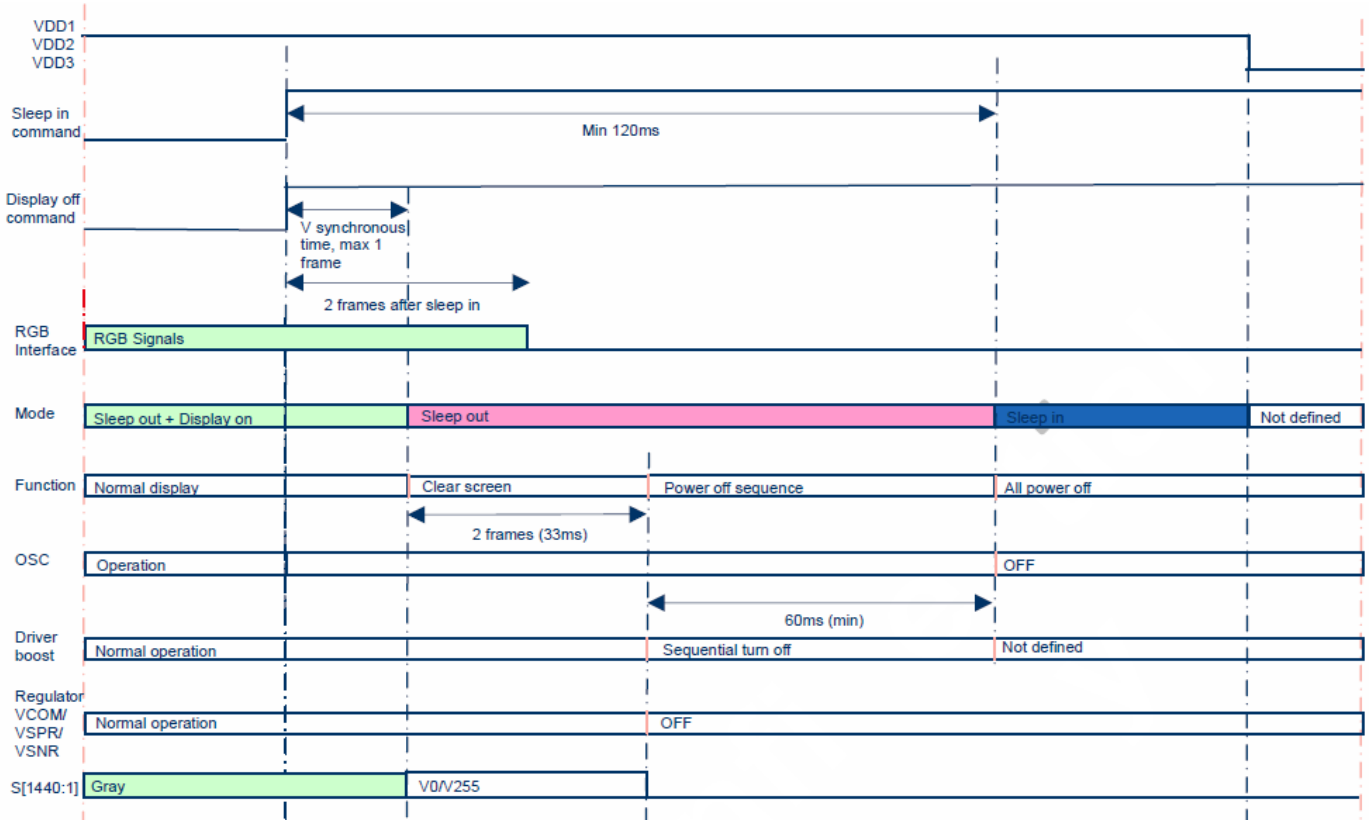

Fig 5.5.2 Power Off Timing

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6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	-	70	-	Degree	Note 2
		θB		-	70	-		
		θL		-	50	-		
		θR		-	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.251	0.301	0.351	-	Note5 Note1
		y		0.271	0.321	0.371		
	Red	x		0.530	0.580	0.630		
		y		0.27	0.320	0.37		
	Green	x		0.280	0.330	0.380		
		y		0.45	0.500	0.55		
	Blue	x		0.11	0.160	0.210		
		y		0.10	0.150	0.20		
Uniformity		U	-	70	75	-	%	Note1 Note6
NTSC		-	-	-	50	-	%	Note 5
Luminance		L		220	300	-	cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=20mA (One LED current), the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

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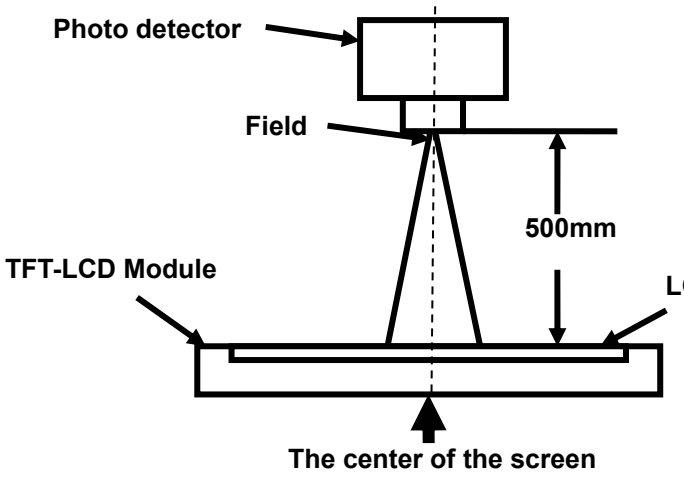
Note 1: Definition of optical measurement system.

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)。

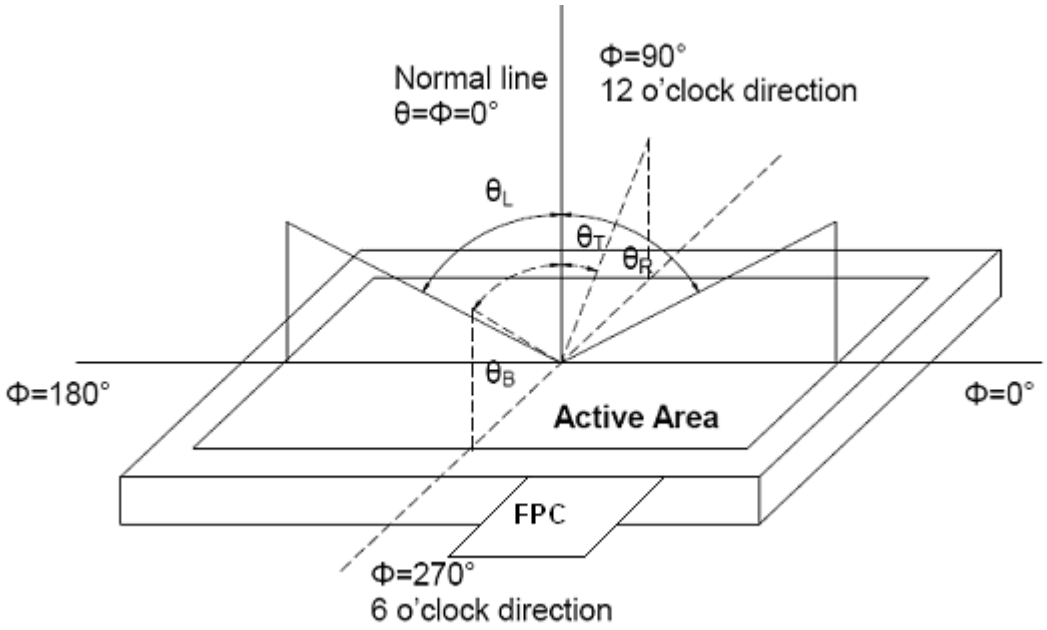


Fig. 1 Definition of viewing angle

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Note 3: Definition of contrast ratio

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

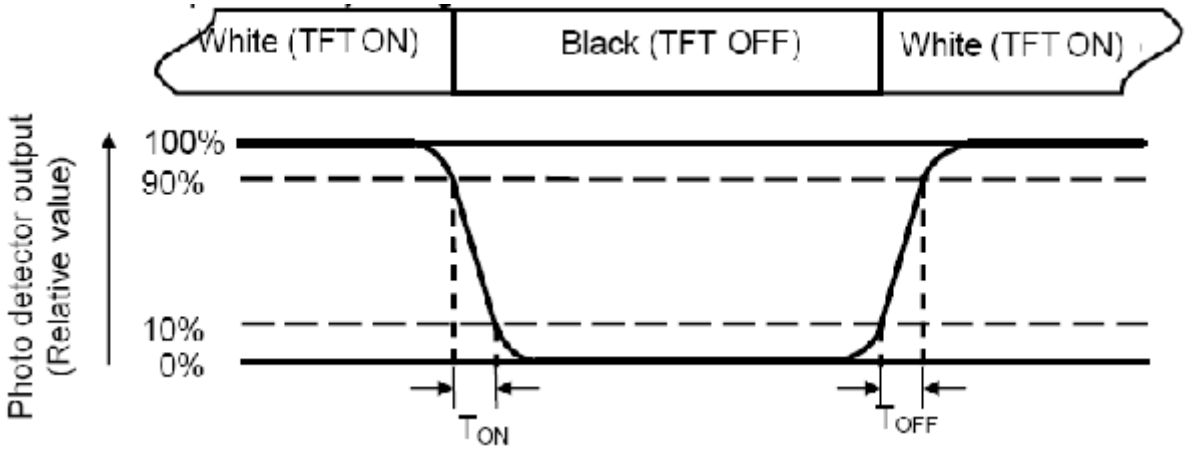
“White state “:The state is that the LCD should be driven by Vwhite.

“Black state”: The state is that the LCD should be 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.

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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

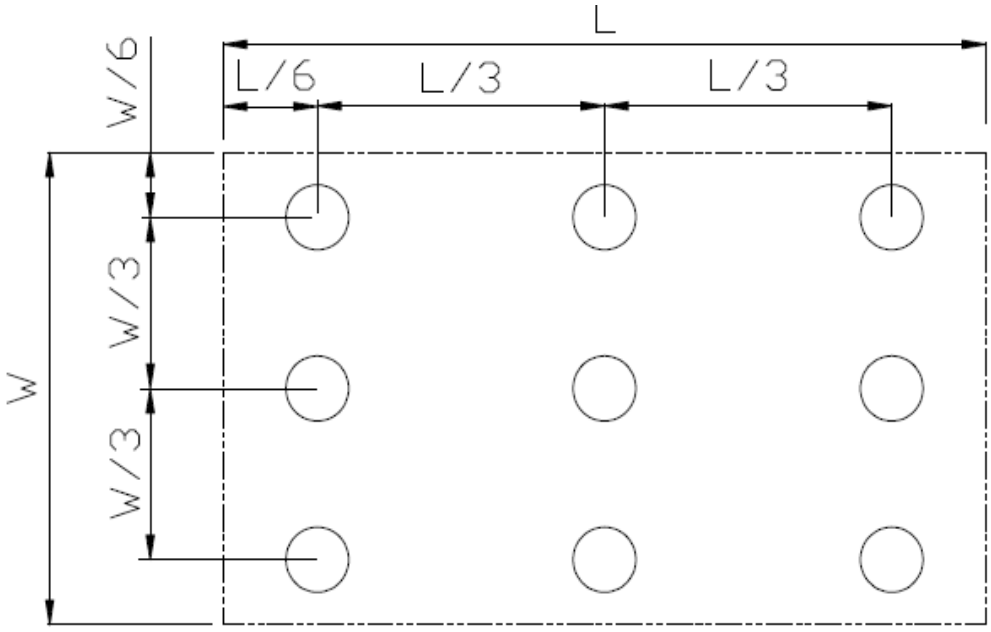

Fig. 2 Definition of uniformity

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.

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7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 120hrs	Note1 IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃,120hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+80℃, 120hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃, 120hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Storage	Ta=+60℃, 90% RH 120 hours	Note2 IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (Non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω,5points/panel Air:± 10KV, 5times, Contact:± 4KV, 5 times, （Environment: 15℃～35℃, 30%～60%, 86Kpa～106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
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)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (Non-operation)	60G 6ms, ± X,± Y,± Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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

Note2: Ta is the ambient temperature of sample.

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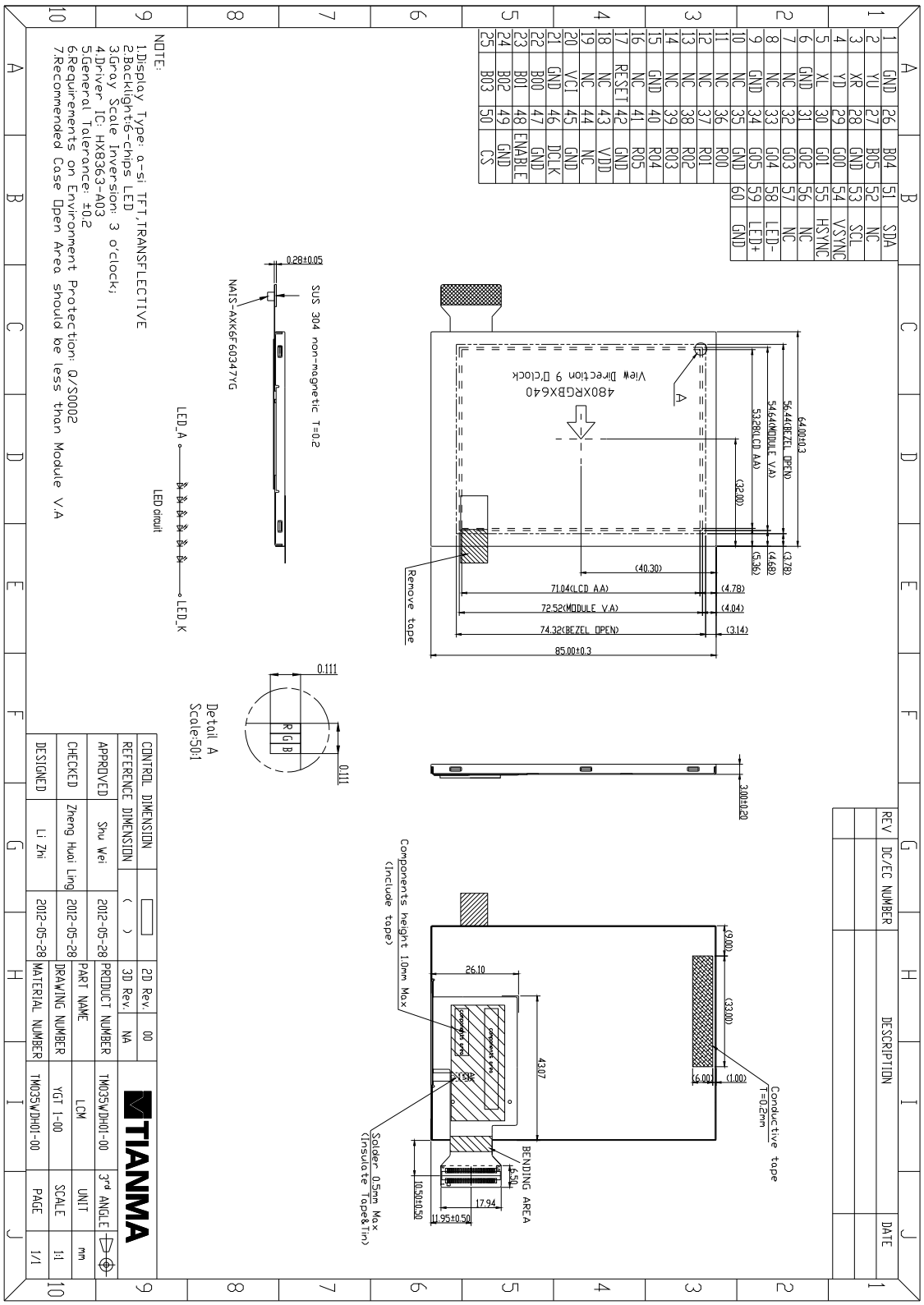
8 Mechanical Drawing



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9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM Module	TM035WDH01-00	64.00*85.00*3.0	TBD	TBD	
2	Tray	PET（Transmit）	TBD	TBD	TBD	Anti-static
3	Dust-Proof Bag	PE	TBD	TBD	TBD	
4	BOX	Corrugated Paper	TBD	TBD	TBD	
5	Desiccant	Desiccant	TBD	TBD	TBD	
6	Carton	Corrugated Paper	TBD	TBD	TBD	
7	Total weight	TBD				

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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.

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