MODEL NO. : TM057JDHP04

MODEL VERSION : 30

ISSUED DATE : 2015-12-16

VERSION : Ver 1.1

□Preliminary Specification
■Final Product Specification

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
Rui Xu	Longping Deng	Feng Qin

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2015-09-01	Final Product Specification Release	Rui Xu
1.1	2015-12-16	Add model version on Page 1, add Relative humidity and Absolute humidity on Page 6, Update Chromaticity and Luminance on Page 17	Rui Xu

1. General Specifications

Feature		Spec
Display Spec.	Size	5.7 inch
	Resolution	720(RGB) x1280
	Interface	MIPI
	Color Depth	16M
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Viewing Direction	ALL
Mechanical Characteristics	LCM (W x H x D) (mm)	74.98*137*1.57mm
	Active Area(mm)	71.28x126.72mm
	With/Without TSP	Without TSP
	Matching Connection Type	14-5804-024-000-829+
	Weight (g)	24
	LED Numbers	14 LEDs(7S2P)
Electronic	Driver IC	OTM 1287A

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

No	Symbol	I/O	Description	Comment
1	LEDK	P	Cathode for back-light LED lightbar	
2	LEDA	P	Anode for back-light LED lightbar	
3	LCD_ID	P	LCM ID Pin for customer identify(Ground)	
4	RESET	I	Reset pin, IC is initialized when Reset is low.	
5	TE	O	Output a frame head pulse signal	
6	LCD_PWM	O	Backlight On/Off control pin.	
7	IOVCC	P	Digital power supply	
8	VCC	P	Analog Supply Voltage	
9	GND	P	Ground	
10	MIPI_DSI_D3P	I	MIPI DSI 3 lane(+)	
11	MIPI_DSI_D3N	I	MIPI DSI 3 lane(-)	
12	GND	P	Ground	
13	MIPI_DSI_D2P	I	MIPI DSI 2 lane(+)	
14	MIPI_DSI_D2N	I	MIPI DSI 2 lane(-)	
15	GND	P	Ground	
16	MIPI_DSI_CKP	I	MIPI DSI CLK(+)	
17	MIPI_DSI_CKN	I	MIPI DSI CLK(-)	
18	GND	P	Ground	
19	MIPI_DSI_D1P	I	MIPI DSI 1 lane(+)	
20	MIPI_DSI_D1N	I	MIPI DSI 1 lane(-)	
21	GND	P	Ground	
22	MIPI_DSI_D0P	I/O	MIPI DSI 0 lane(+)	
23	MIPI_DSI_D0N	I/O	MIPI DSI 0 lane(-)	
24	GND	P	Ground	

Table 2.1 input terminal pin assignment

Note 1: I/O-----Input/Output
I-------Input
O-------Output
P------Power/Ground

3. Absolute Maximum Ratings

GND=0V, Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Logic Supply Voltage	IOVCC	-0.3	4.5	V	
Analog Supply Voltage	VCC	-0.3	6.0	V	
Backlight Forward Current	I_{LED}		25	mA	For each LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	
Relative humidity	RH	--	≤ 95	%	Ta ≤ 40°C
		--	≤ 85	%	40 < Ta ≤ 50°C
		--	≤ 55	%	50 < Ta ≤ 60°C
		--	≤ 36	%	60 < Ta ≤ 70°C
		--	≤ 24	%	70 < Ta ≤ 80°C
Absolute humidity	AH	--	≤ 70	g/m^3	Ta > 70°C

Table 3.1 absolute maximum rating

Note1: Logic Supply Voltage include MIPI_DSI_D0N~MIPI_DSI_D3N, MIPI_DSI_D0P~MIPI_DSI_D3P, MIPI_DSI_CKP, MIPI_DSI_CKN, Reset.

Note2: Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed

4. Electrical Characteristics

Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8	1.9	V	
Analog Supply Voltage		VCC	2.7	2.8	2.9	V	
Input Signal Voltage	Low Level	V_{IL}	-0.0	-	0.3* IOVCC	V	RESET
	High Level	V_{IH}	0.7* IOVCC	-	IOVCC	V	
Output Signal Voltage	Low Level	V_{OL}	0.0	-	0.2* IOVCC	V	TE,CABC
	High Level	V_{OH}	0.8* IOVCC	-	IOVCC	V	
(Panel+LSI) Power Consumption		White Mode (60Hz)	-	320	-	mW	IOVCC=1.8V, VCC=2.8V
		Sleeping Mode	-	0.05	-	mW	IOVCC=1.8V, VCC=2.8V

Table 4.1.1 LCD module electrical characteristics

4.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	20	--	mA	For each LED
Forward Voltage	V_F	--	3.2	--	V	For each LED
Backlight Power Consumption	W_{BL}	--	64	--	mW	For each LED
Operating Lifetime	--	10000	20000	--	hrs	Note3

Table 4.2.1 backlight unit electrical characteristics

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

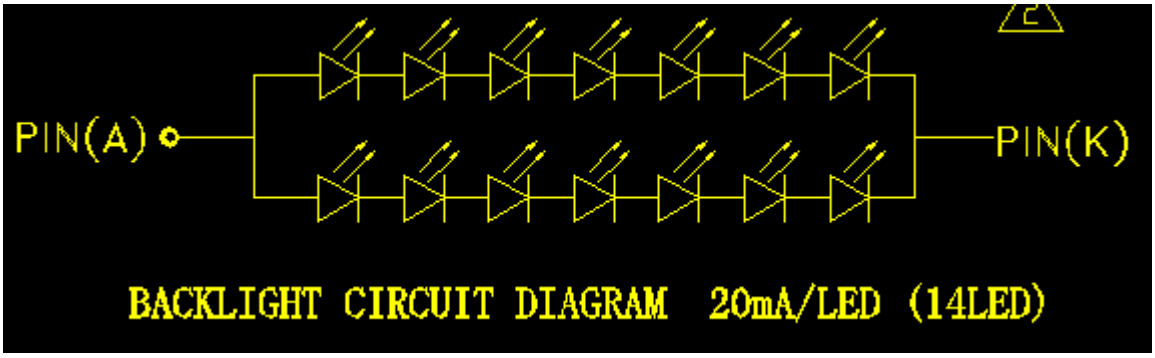
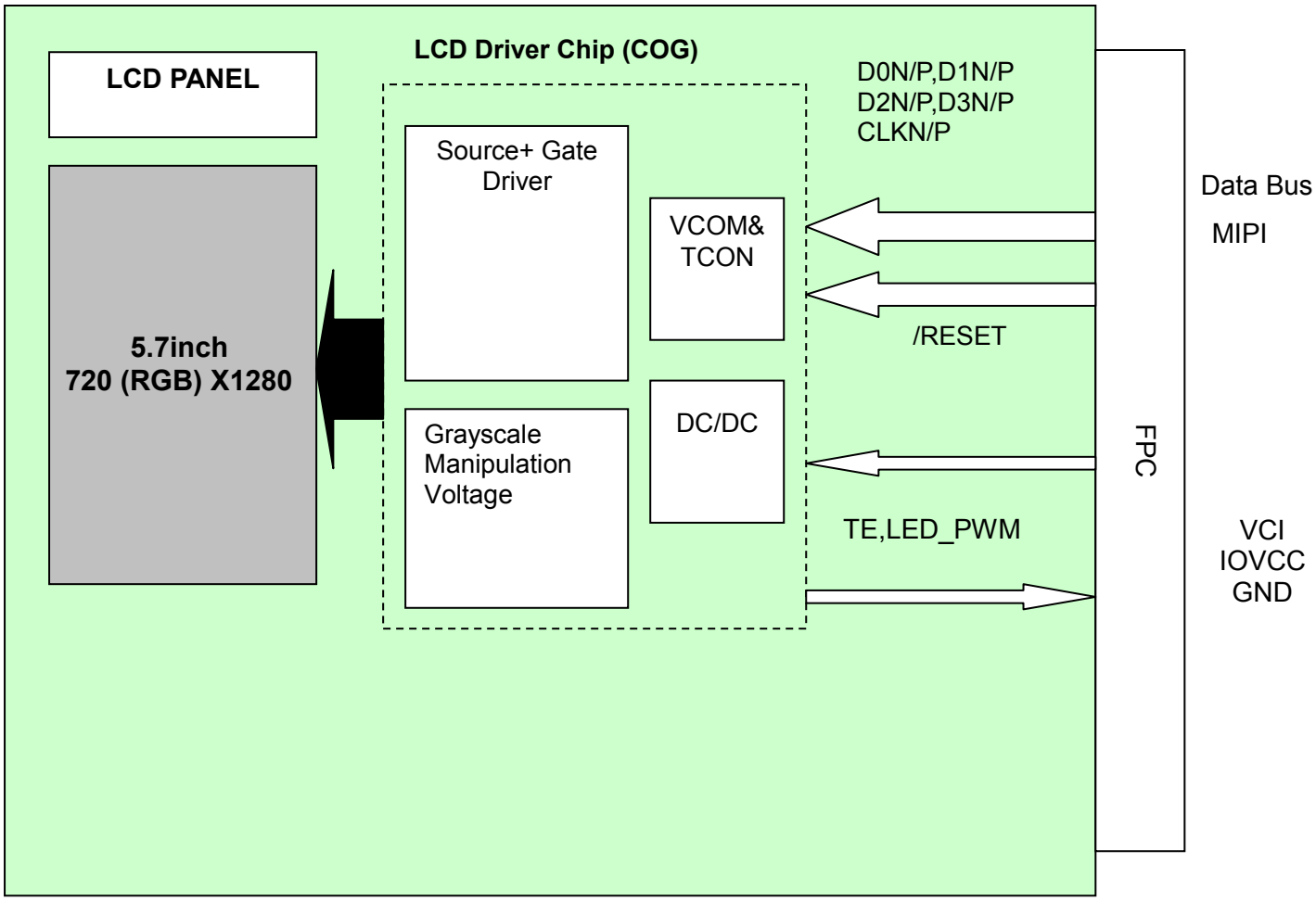


Figure 4.2.1 LED backlight circuit

Note 2: One LED : I_F =20 mA, 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



5. INTERFACE TIMING（MIPI）

5.1 The Electrical Characteristics of Low-Power Mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power mode						
DSI-D0+/-	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU → Display Module	50	-	-	ns
DSI-D0+/-	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module → MPU	58	-	-	ns
DSI-D0+/-	$T_{TA-SURED}$	Time-out before the MPU start driving	T_{LPXD}	-	$2XT_{LPXD}$	ns
DSI-D0+/-	$T_{TA-GETD}$	Time to drive LP-00 by display module	$5XT_{LPXD}$	-	-	ns
DSI-D0+/-	T_{TA-GOD}	Time to drive LP-00 after turnaround request - MPU	$4XT_{LPXD}$	-	-	ns
DSI-D0+/-	Ratio T_{LPX}	Ratio of T_{LPXM} / T_{LPXD} between MCU and display module	2/3	-	3/2	

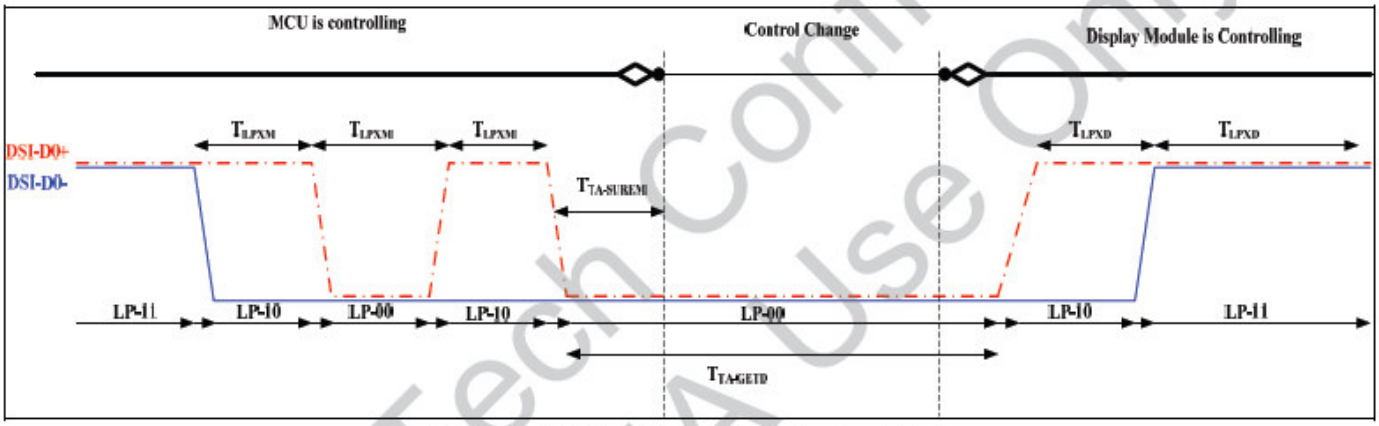


Fig. 7.3.1.2: BTA from the MCU to the Display Module

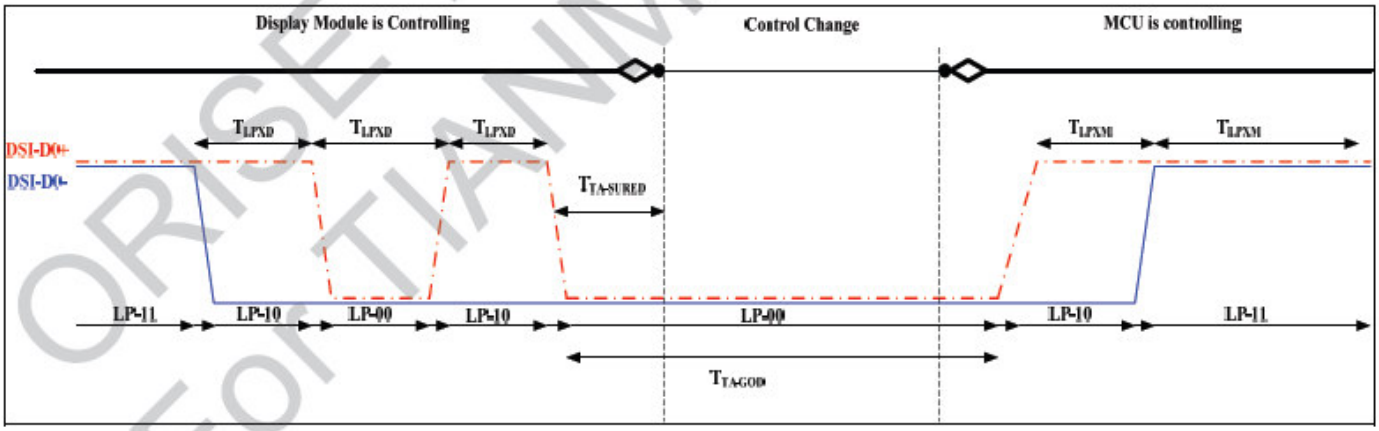
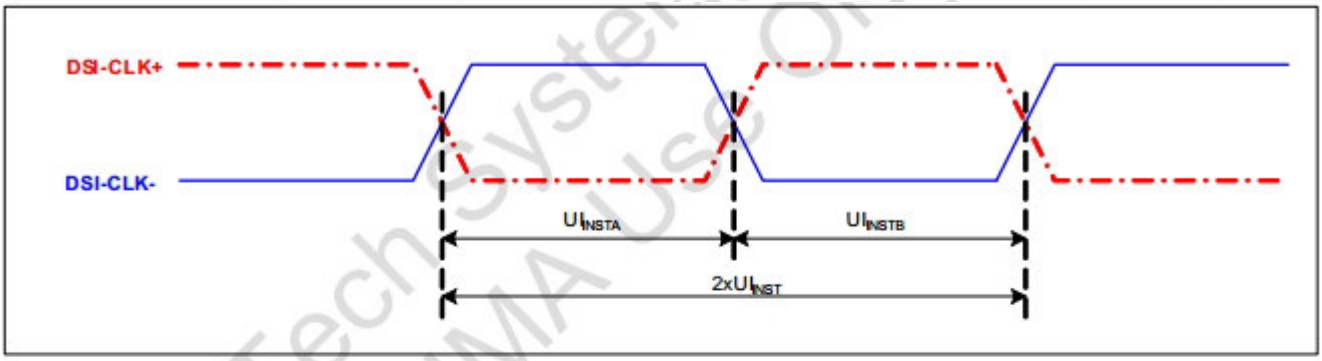
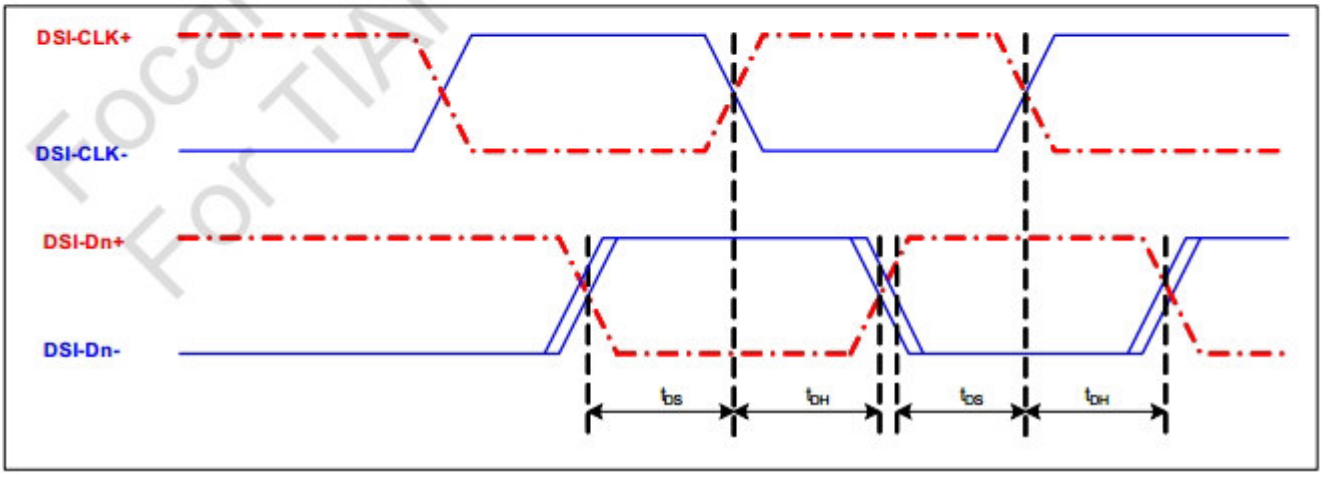


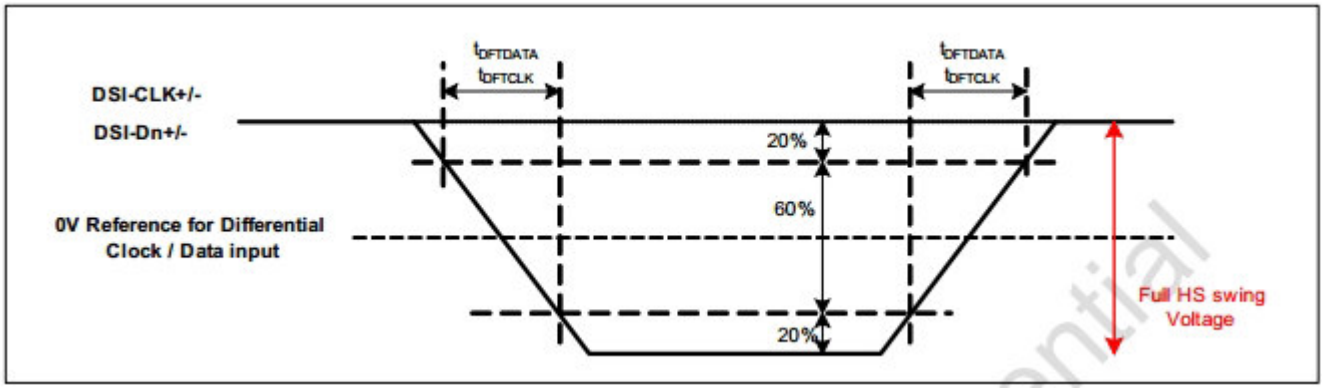
Fig. 7.3.5.2.1: BTA from the Display Module to the MCU

5.2 The Electrical Characteristics of High-Speed Mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Mode						
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	2.22	-	25	ns
DSI-CLK+/-	UI_{INSTA} , UI_{INSTB}	UI instantaneous Halfs	1.11	-	12.5	ns
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	-	UI
DSI-Dn+/-	t_{DH}	Data to clock hold time	0.15	-	-	UI
DSI-CLK+/-	t_{DRTCLK}	Differential rise time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DRTDATA}$	Differential rise time for data	150	-	0.3UI	ps
DSI-CLK+/-	t_{DFTCLK}	Differential fall time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DFTDATA}$	Differential fall time for data	150	-	0.3UI	ps







5.3 Bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Data Transmission Bursts						
DSI-Dn+/-	T_{LPX}	Length of any low-power state period	50	-	-	ns
DSI-Dn+/-	$T_{HS-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	40ns + 4UI	-	85ns + 6UI	ns
DSI-Dn+/-	$T_{HS-PREPARE}$ +$T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time to drive HS-0 before the sync sequence	145ns + 10UI	-	-	ns
DSI-Dn+/-	$T_{D-TERM-EN}$	Time to enable Data Lane receiver line termination measured from when Dn crosses $V_{IL(max)}$	Time for Dn to reach $V_{TERM-EN}$	-	35ns + 4UI	ns
DSI-Dn+/-	$T_{HS-SKIP}$	Time-out at RX to ignore transition period of EoT	40	-	55ns + 4UI	ns
DSI-Dn+/-	$T_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	max (8UI, 60ns+4UI)	-	-	ns
DSI-Dn+/-	$T_{HS-EXIT}$	Time to drive LP-11 after HS burst	100	-	-	ns
DSI-Dn+/-	T_{EoT}	Time from start of $T_{HS-TRAIL}$ period to start of LP-11 state	-	-	105ns + 12UI	ns

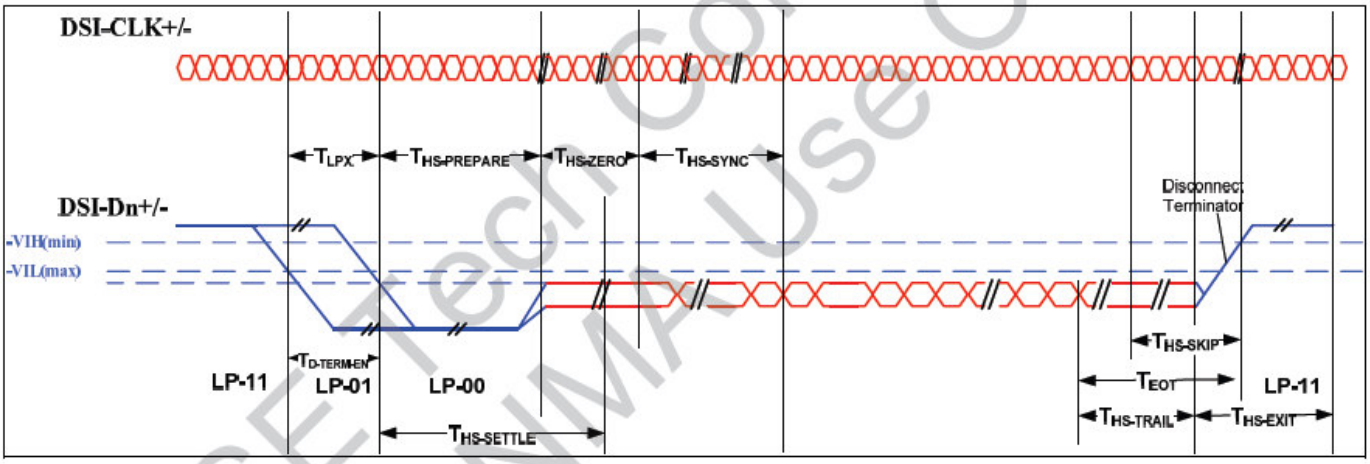


Fig. 7.3.5.3.1: High Speed Data Transmission Bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Switching the clock Lane between clock Transmission and Low Power Mode						
DSI-CLK+/-	$T_{CLK-POST}$	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	60ns + 52UI	-	-	ns
DSI-CLK+/-	$T_{CLK-PRE}$	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	8	-	-	UI
DSI-CLK+/-	$T_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS clock transmission	38	-	95	ns
DSI-CLK+/-	$T_{CLK-TERM-EN}$	Time to enable Clock Lane receiver line termination measured from when Dn crosses $V_{IL(max)}$	Time for Dn to reach $V_{TERM-EN}$	-	38	ns
DSI-CLK+/-	$T_{CLK-PREPARE}$ +$T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time for lead HS-0 drive period before starting Clock	300	-	-	ns
DSI-CLK+/-	$T_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	-	ns
DSI-CLK+/-	T_{EoT}	Time from start of $T_{CLK-TRAIL}$ period to start of LP-11 state	-	-	105ns + 12UI	ns

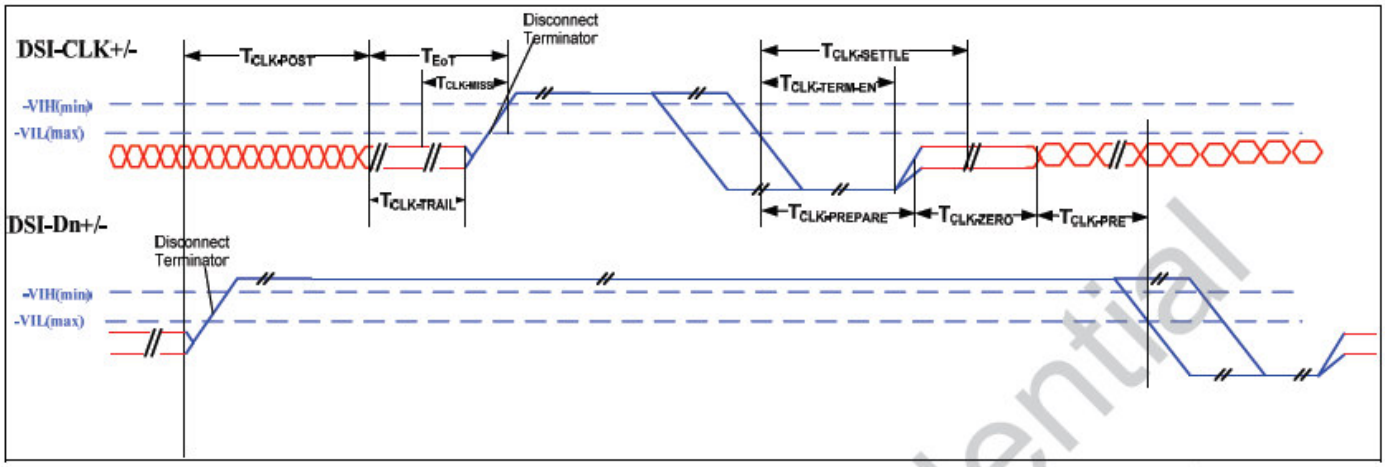


Fig. 7.3.5.3.2: Switching the clock Lane between clock Transmission and Low Power Mode

5.4 LP-11 between High Speed and Low Power Modes

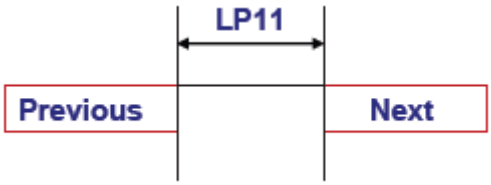
DSI-D0 High Speed or Low Power modes are starting or finishing from/to Stop State(SS,LP-11) when 4 different combinations,what are listed below,are possible:

1.High Speed Mode =>Stop State(SS,LP-11)=>High Speed Mode
2.High Speed Mode =>Stop State(SS,LP-11)=>Low Power Mode
3.Low Power Mode=>Stop State(SS,LP-11)=>High Speed Mode
4.Low Power Mode=>Stop State(SS,LP-11)=>Low Power Mode

The Low Power Mode is also including 2 different functions:
1.Escape
2.Bus Turnaround (BTA)

Stop State (SS, LP-11) Timings from Previous mode to Next mode

Previous \ Next	Escape mode		HSDT		BTA	
	Min	Max	Min	Max	Min	Max
Escape mode	100 ns	-	100 ns	-	100 ns	-
HSDT	60ns + 52UI	-	60ns + 52UI	-	60ns + 52UI	-
BTA	100 ns	-	100 ns	-	100 ns	-



5.5 Reset Timing Characteristics

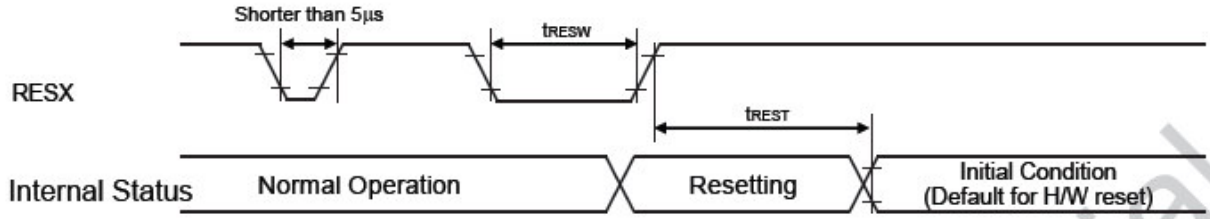


Table 7.3.2.1 Reset input timing

VSS=0V, VDDIO=1.6V to 3.6V, VCI=2.5V to 5.5V,Ta = -30 to 70°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	µs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-		-	120	When reset applied during Sleep out mode	ms

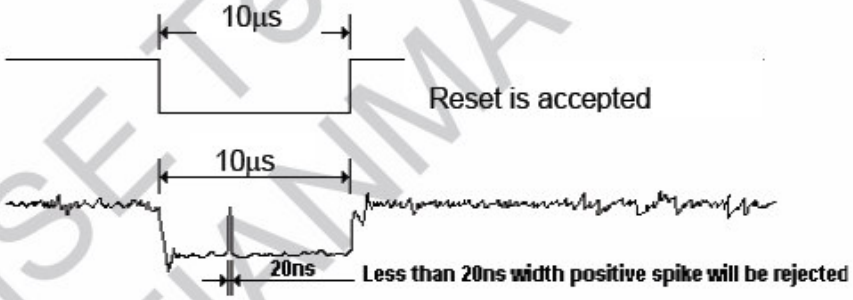
Note 1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 10µs	Reset
Between 5µs and 10µs	Reset starts (It depends on voltage and temperature condition.)

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, ID1/ID2/ID3/ID4 and VCOM value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.

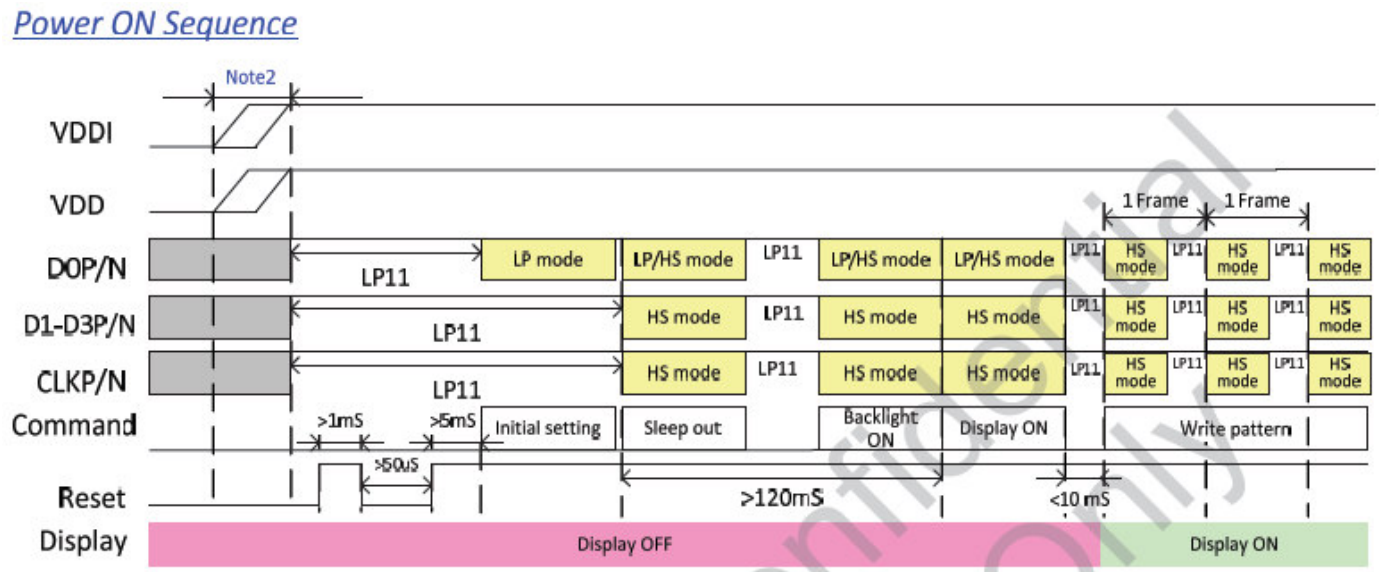
Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

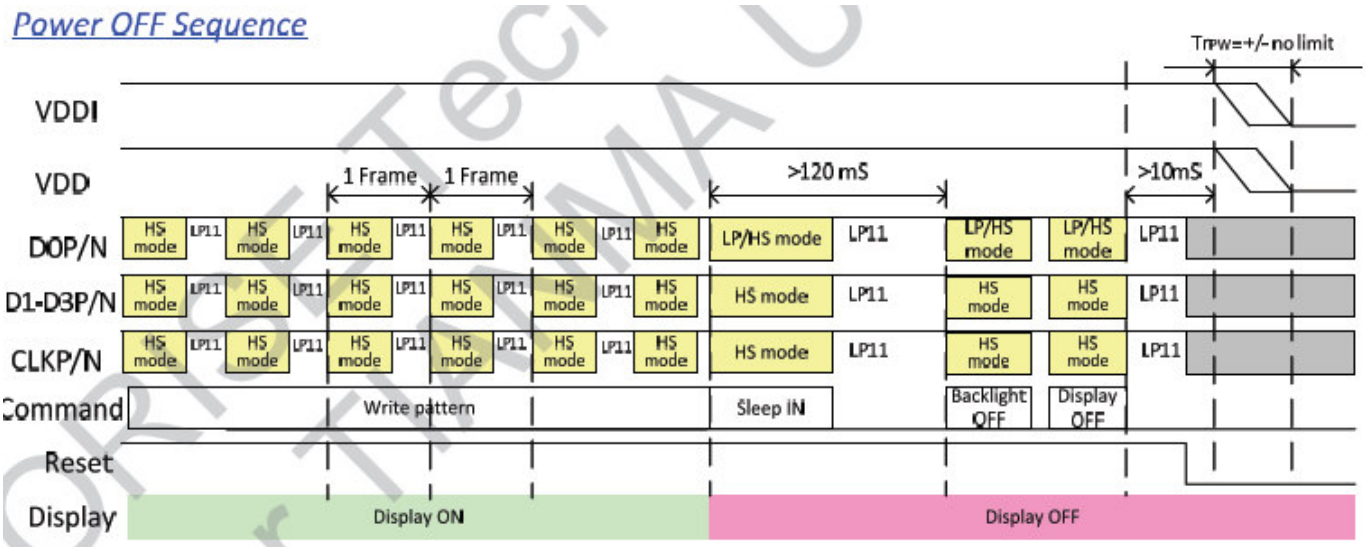
6. POWER ON/OFF SEQUENCE

6.1 Power on Sequence with MIPI video timing



Note :
1. Propose using non-continuous CLK with Burst mode
2. For VDDI/VDD power, propose applying them separately and having 10 ms timing gap

6.2 Power off Sequence with MIPI video timing



Note :
1. Propose using non-continuous CLK with Burst mode

Note 1:Sleep out(Low Power mode)
Note 2:Display on(Low Power mode)
Note 3:Display off(Low Power mode)
Note 4:Sleep in

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	80	85	-	Degree	Note 2
		θB		80	85	-		
		θL		80	85	-		
		θR		80	85	-		
Contrast Ratio		CR	θ=0°	700	900	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.250	0.300	0.350	-	Note5 Note1
		y		0.278	0.328	0.378		
	Red	x		0.584	0.634	0.684		
		y		0.290	0.340	0.390		
	Green	x		0.269	0.319	0.369		
		y		0.572	0.622	0.672		
	Blue	x		0.102	0.152	0.202		
		y		0.009	0.059	0.109		
Uniformity		U	-	80	85	-	%	Note1 Note6
NTSC		-	-	65	70	-	%	Note 5
Luminance		L		400	450	-	cd/m^2	Note1 Note7

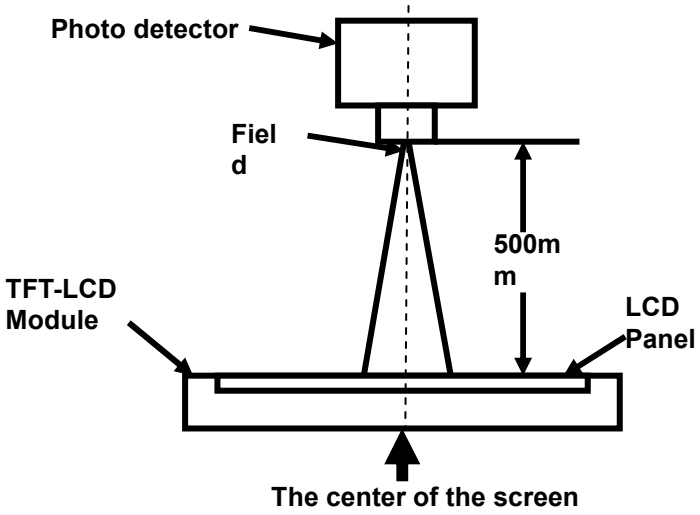
Ta=25℃

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.

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)。

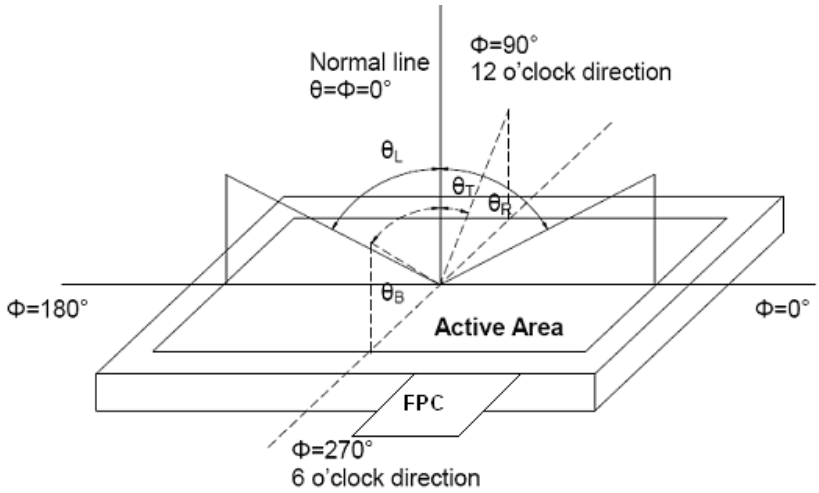


Fig.7.1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

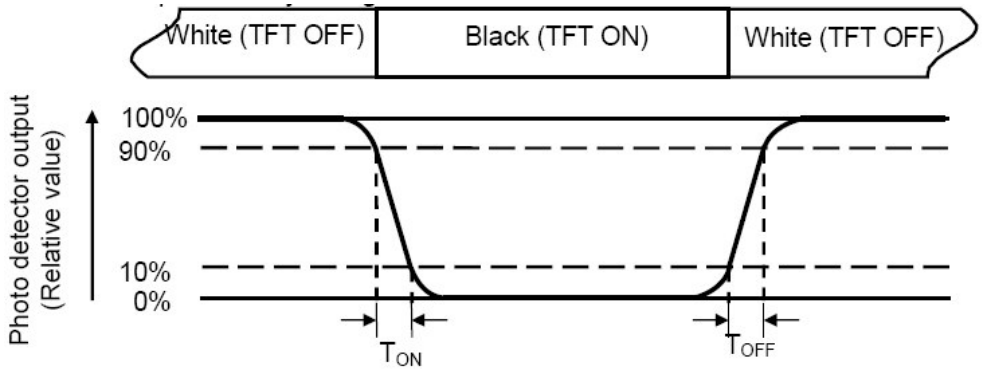
“White state “:The state is that the LCD should driven by Vwhite.

“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

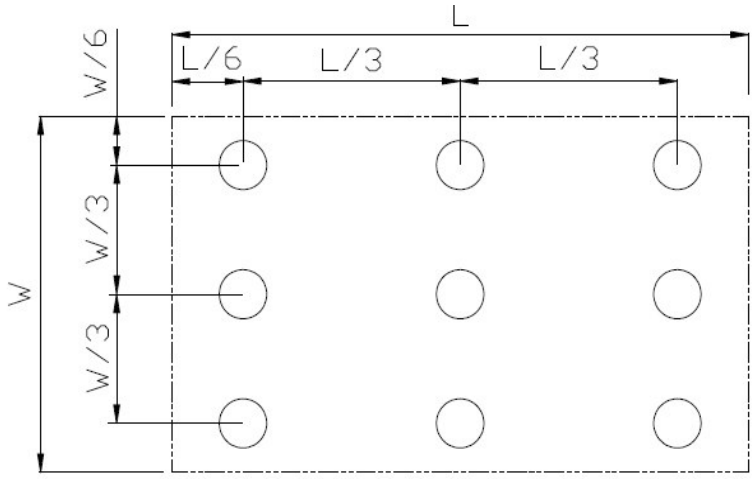


Fig.7.2 Definition of uniformity

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.

8. 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:± 8KV, 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

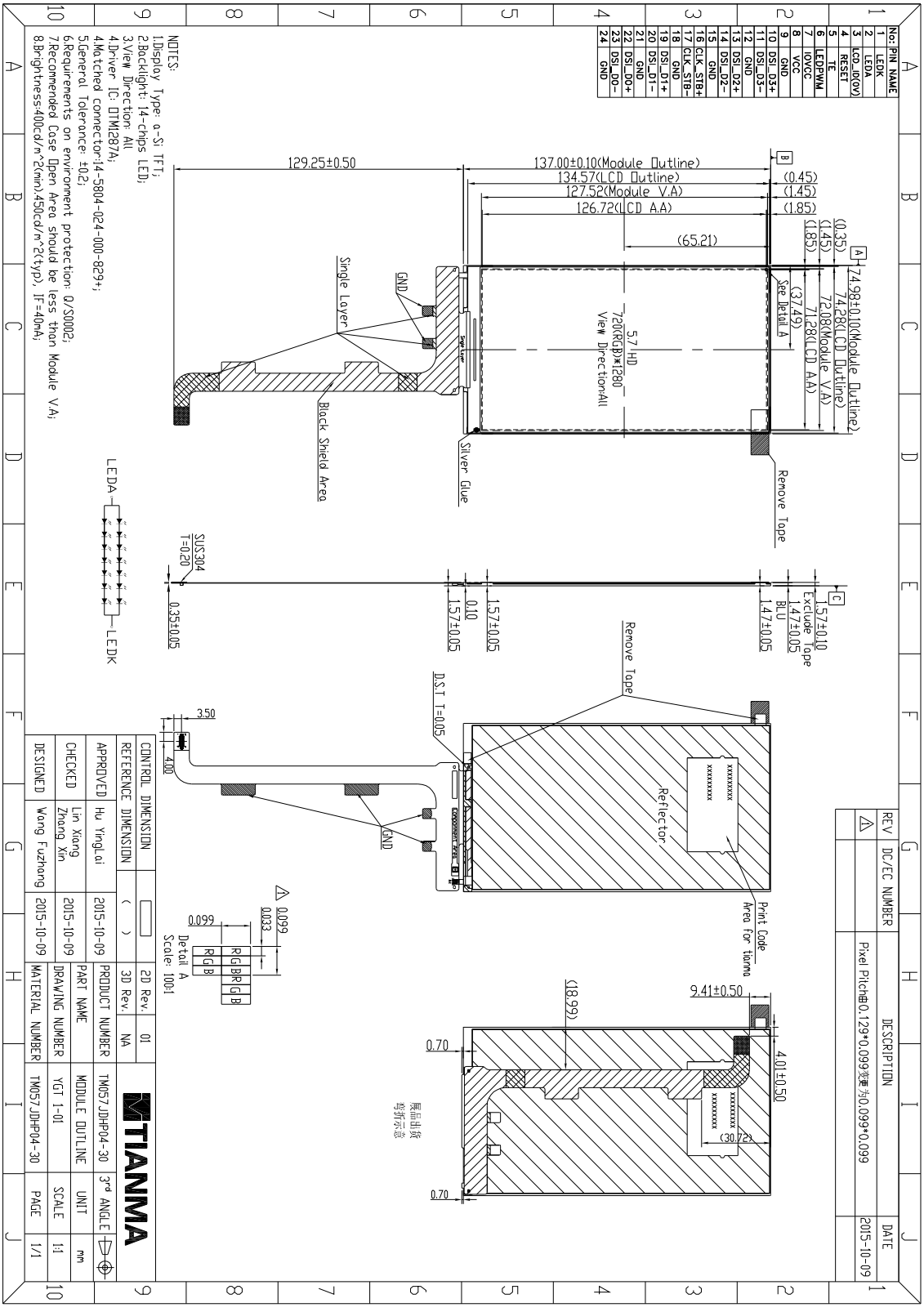
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: 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 don't guarantee all of the cosmetic specification.

9. Mechanical Drawing



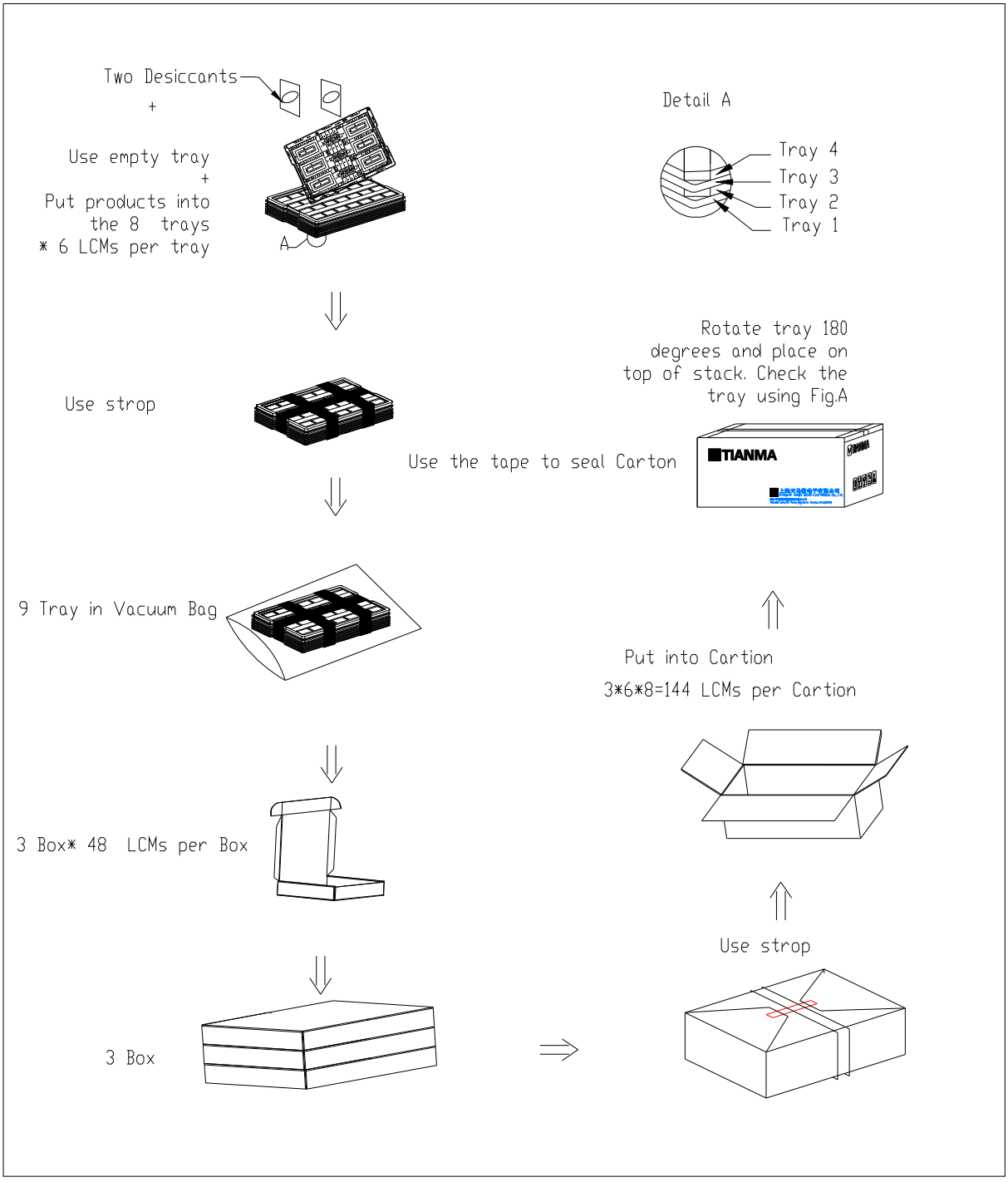
10. Packing Drawing

10.1 Packing Material

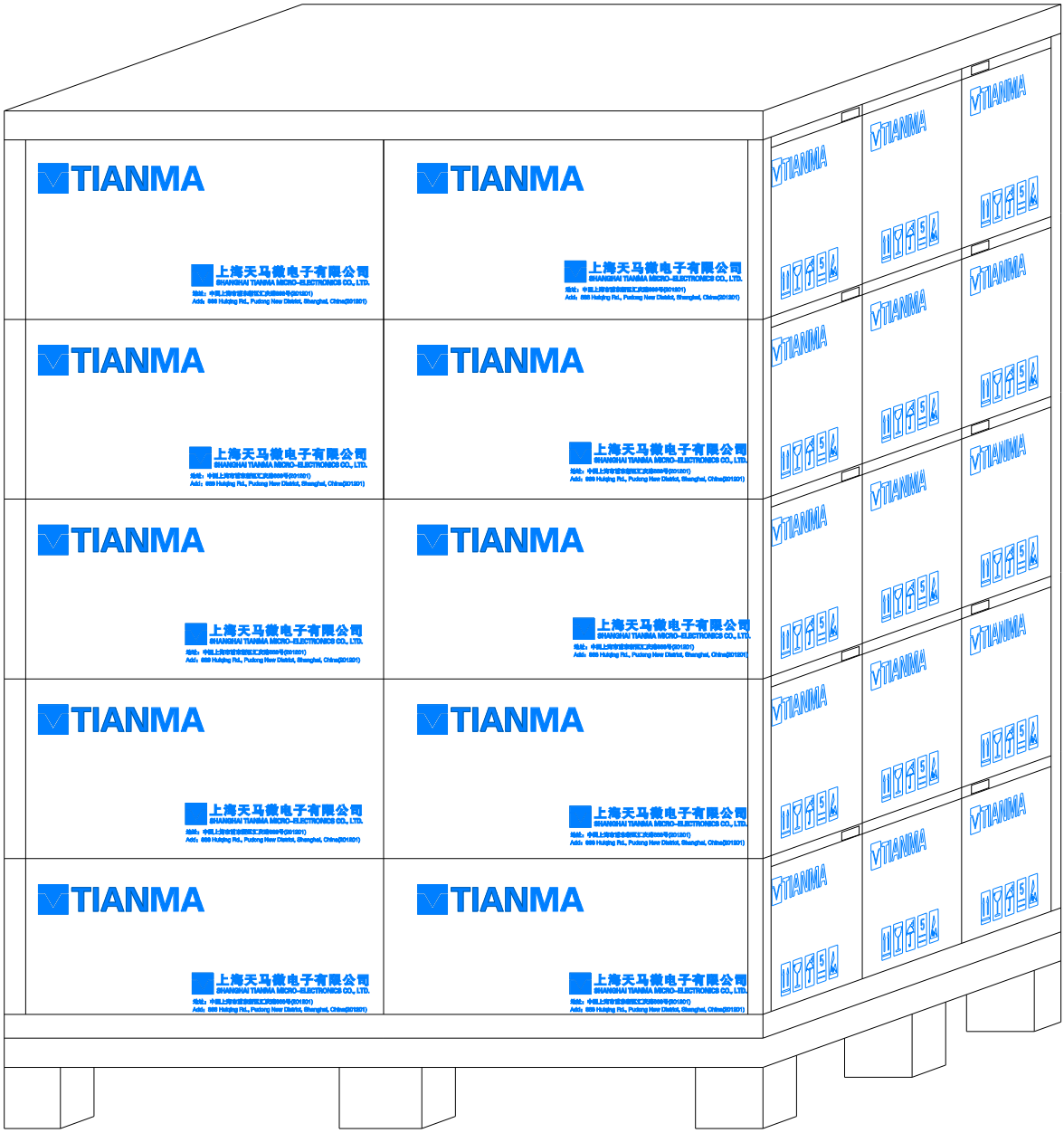
No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM057JDHP04-30	74.98*137*1.57	0.024	144	
2	Tray	PET(Transmit)	485×330×13.8	0.083	27	Anti-static
3	Vacuum Bag	PE	600×500×0.08	0.047	3	
4	BOX	Corrugated Paper	520×345×74	0.44	3	
5	Desiccant	Desiccant	45×35	0.002	6	
6	Label	Paper	100×52	0.001	4	
7	Carton	Corrugated Paper	544×365×250	1.01	1	
8	Total weight	8.2±5% Kg				

10.2 Packing Specification and Quantity

(1) LCM quantity per tray:3row×2column =6
(2) Total LCM quantity in Carton: Number of PET trays 24 × quantity per tray 6= 144
Note: Please refer to the data from “estimated report about the dimension and stack of Carton “ about stacking carton



纸箱堆叠数按2*3/每层*共5层



11. Precautions for Use of LCD Modules

Handling Precautions

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

11.1.2 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, pro mptly wash it off using soap and water.

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

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

11.1.5 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

11.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

11.1.8.4 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.

Storage precautions

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

11.2.2 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%

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

Transportation Precautions:

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