TIANMA

MODEL NO　　:　　__TM025ZDHG03__

MODEL VERSION:　　__00__

SPEC VERSION　:　　__V2.0__

ISSUED DATE:　　__2017-4-24__

☐ **Preliminary Specification**

■ **Final Product Specification**

Customer :____Nestlabs____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Liang Meng	Zhijie Song	Xiaoxing Ding

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2016-6-28	Preliminary spec released	Liang Meng
1.1	2016-6-30	Update pin39, add note on LED lifetime	Liang Meng
1.2	2016-9-1	Update weight, VCC=3V, power consumption, Chromaticity	Liang Meng
1.3	2017-2-21	Add Brightness @ 25mA,packing information	Liang Meng
2.0	2017-4-24	Final spec released	Liang Meng

1 General Specifications

Feature		Spec
Display Spec.	Size	2.48"
	Resolution	320(RGB)x320
	Technology Type	a-si TFT
	Pixel Configuration	RGB Vertical Stripe
	Pixel pitch(mm)	0.1395x0.1395
	Display Mode	TM,NW
	Surface Treatment	AG
	Viewing Direction	6 o'clock(IC 6 o'clock)
	Gray Scale Inversion Direction	12 o'clock(IC 6 o'clock)
Mechanical Characteristics	LCM (W x H x D) (mm)	50.44×56.34×2.6
	Active Area(mm)	44.64 x 44.64
	Connection Type	FH26-41S-0.3SHW
	LED Numbers	6
	Weight (g)	14.8
Electrical Characteristics	Interface	24bit MIPI DBI Type C
	Color Depth	16.7M
	Driver IC	R61529A

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

Recommended Connector: FH26-41S-0.3SHW

No	Symbol	I/O	Description	Remark
1	LEDA	P	LED anode	
2	LEDK	P	LED cathode	
3	RESET	I	Reset Signal	
4	VSYNC	I	Vertical synchronizing signal	
5	HSYNC	I	Vertical synchronizing signal	
6	ENABLE	I	A data ENABLE signal	
7	PCLK	I	Pixel clock signal	
8	GND	P	Power Ground	
9	DB23	I	Data bus	
10	DB22	I	Data bus	
11	DB21	I	Data bus	
12	DB20	I	Data bus	
13	DB19	I	Data bus	
14	DB18	I	Data bus	
15	DB17	I	Data bus	
16	DB16	I	Data bus	
17	DB15	I	Data bus	
18	DB14	I	Data bus	
19	DB13	I	Data bus	
20	DB12	I	Data bus	
21	GND	P	Power Ground	
22	DB11	I	Data bus	
23	DB10	I	Data bus	
24	DB9	I	Data bus	
25	DB8	I	Data bus	
26	DB7	I	Data bus	
27	DB6	I	Data bus	
28	DB5	I	Data bus	
29	DB4	I	Data bus	
30	DB3	I	Data bus	
31	DB2	I	Data bus	

32	DB1	I	Data bus	
33	DB0	I	Data bus	
34	CS	I	Chip select signal	
35	SDI	I	Serial data input.	
36	SDO	I	Serial data output.	
37	SCL	I	Serial clock signal.	
38	GND	P	Power Ground	
39	GND-ID	P	ID pin, connect to Power Ground	
40	VCC	P	Power Supply of Analog Circuit	
41	IOVCC	P	Power Supply of Logic Circuit	

Table 2.1 Input terminal pin assignment

I---Input, O---Output, P--- Power/Ground

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	2.4	3.3	V	Note1
Input voltage	V_{IN}	1.65	3.3	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-40	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 3　Absolute Maximum Ratings

Note1: Input voltage include DB0~DB23,PCLK, Hsync, Vsync, Enable, Reset, CS,SDI,SDO,SCL.
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

4.1 LCD Module

GND=0V,Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8	3.3	V	
Analog Supply Voltage		VCC	2.4	3	3.3	V	
Input Signal Voltage	High Level	VIH	0.8xIOVCC	-	IOVCC	V	
	Low Level	VIL	-	-	0.3xIOVCC	V	
Output Signal Voltage	High Level	VOH	0.9xIOVCC	-	-	V	
	Low Level	VOL	-	-	0.2xIOVCC	V	
(Panel+LSI) VCC Power Consumption	Black Mode		-	22	50	m W	VCC=3V IOVCC=1.8V
	Sleeping Mode		-	5.5	200	μ W	
(Panel+LSI) IOVCC Power Consumption	Black Mode			1.2	2	m W	VCC=3V IOVCC=1.8V
	Sleeping Mode			0.036	100	μ W	

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	25	mA	
Forward Voltage	V_F	16.8	18.6	20.4	V	
Backlight Power Consumption	W_{BL}	-	372	-	mW	
LED life time	-	10000	20000	-	Hrs	Note2

Table 4.2.1 backlight unit electrical characteristics

Figure 4.2 LED backlight circuit
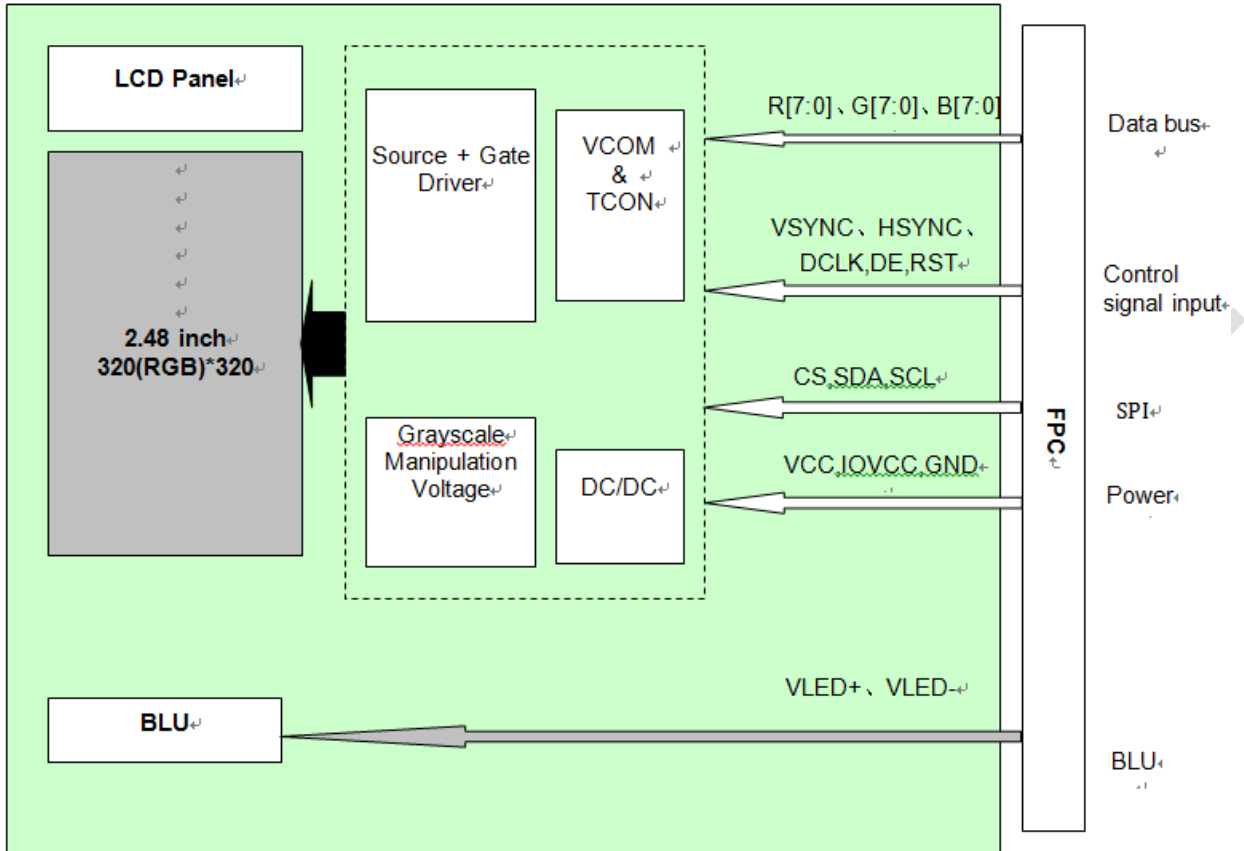
Note1: Jufei: 01.JT.CBS206W-P, lv:37/38 (3050~3250mcd), color, G1/G2
Note2: The LED lifetime is defined as the module brightness decay 50% of original brightness 1000nits at If=20mA, Ta=25 degree.
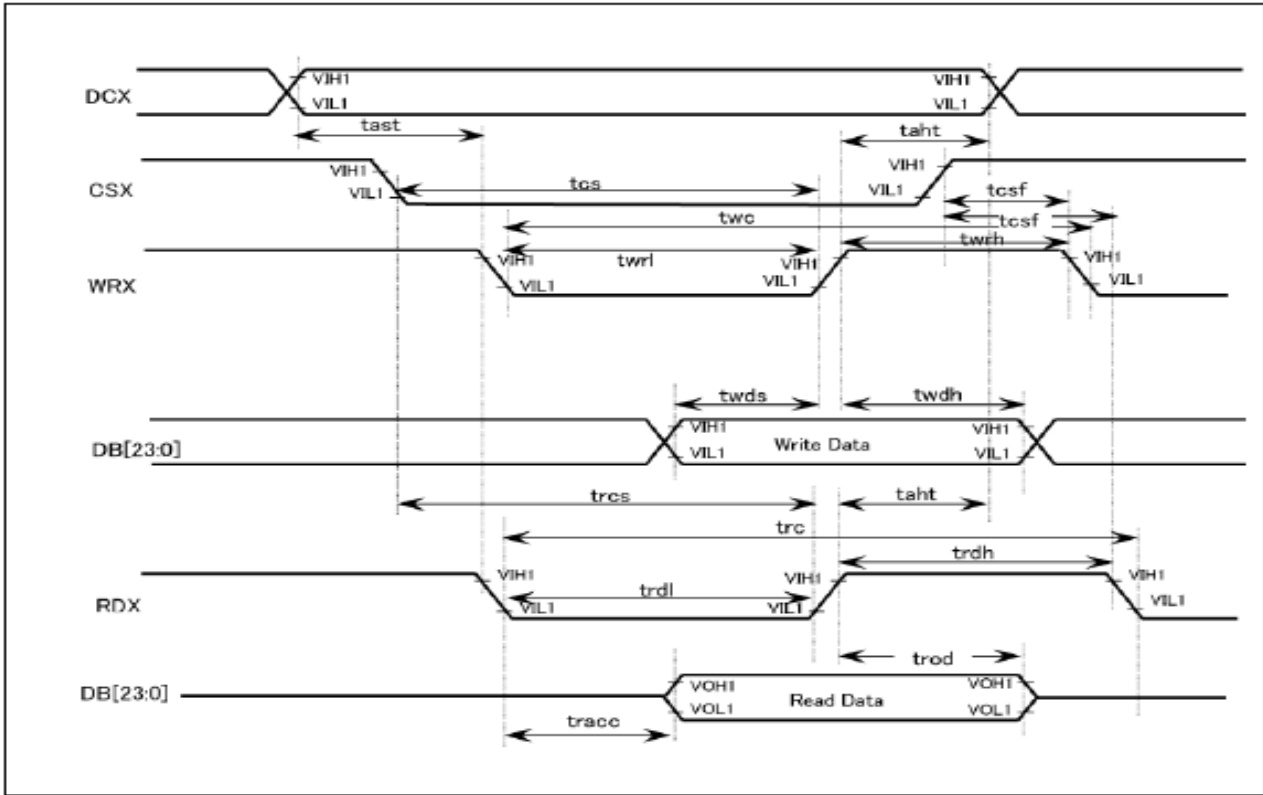
4.3 Block Diagram

5 Timing Chart

5.1 Timing Parameter

Note: Please refer to RSP R61529A data sheet for more details.

Figure 159 DBI Type B (24/18/16/8 Bits) Timing

Table 86   3/2-Transfer   (IOVCC1=1.650V ~ 3.3V, Ta=-40°C ~ +85°C)

Item	Symbol		Unit	Test Condition	Min.	Max.
Address setup time	DCX	tast	ns		0	-
Address hold time (Write/Read)		taht	ns		10	-
Chip select setup time (Write)	CSX	tcs	ns		20	-
Chip select setup time (Read)		trcs	ns		170	-
Chip select wait time (Write)		tcsf	ns		15	-
Chip select wait time (Read)			ns		20	-
Write cycle time	WRX	twc	ns		50	-
Write control pulse "High" period		twrh	ns		20	-
Write control pulse "Low" period		twrl	ns		20	-
Read cycle time	RDX	trc	ns		450	-
Read control pulse "High" period		trdh	ns		250	-
Read control pulse "Low" period		trdl	ns		170	-
Write data setup time	DB[23:0]	twds	ns	CL Max.30pF Min.8pF	15	-
Write data hold time		twdh	ns		15	-
Read access time		tracc	ns		10	150
Output disable time		trod	ns		10	-

Table 87 1-Transfer   (IOVCC1=1.650V ~ 3.3V, Ta=-40°C ~ +85°C)

Item	Symbol		Unit	Test Condition	Min.	Max.
Address setup time	DCX	tast	ns		0	-
Address hold time (Write/Read)		taht	ns		10	-
Chip select setup time (Write)	CSX	tcs	ns		35	-
Chip select setup time (Read)		trcs	ns		170	-
Chip select wait time (Write)		tcsf	ns		15	-
Chip select wait time (Read)			ns		20	
Write cycle time	WRX	twc	ns		80	-
Write control pulse "High" period		twrh	ns		35	-
Write control pulse "Low" period		twrl	ns		35	-
Read cycle time	RDX	trc	ns		450	-
Read control pulse "High" period		trdh	ns		250	-
Read control pulse "Low" period		trdl	ns		170	-
Write data setup time	DB[23:0]	twds	ns	CL Max.30pF Min.8pF	15	-
Write data hold time		twdh	ns		15	-
Read access time		tracc	ns		10	150
Output disable time		trod	ns		10	-

Table 88 2-, 3- Transfer   (IOVCC1=1.650V ~ 3.3V, Ta=-40°C ~ +85°C)

Item	Symbol		Unit	Test Condition	Min.	Max.
Address setup time	DCX	tast	ns		0	-
Address hold time (Write/Read)		taht	ns		10	-
Chip select setup time (Write)	CSX	tcs	ns		15	-
Chip select setup time (Read)		trcs	ns		170	-
Chip select wait time (Write)		tcsf	ns		15	-
Chip select wait time (Read)			ns		20	-
Write cycle time	WRX	twc	ns		40	-
Write control pulse "High" period		twrh	ns		15	-
Write control pulse "Low" period		twrl	ns		15	-
Read cycle time	RDX	trc	ns		450	-
Read control pulse "High" period		trdh	ns		250	-
Read control pulse "Low" period		trdl	ns		170	-
Write data setup time	DB[23:0]	twds	ns	CL Max.30pF Min.8pF	15	-
Write data hold time		twdh	ns		25	-
Read access time		tracc	ns		10	150
Output disable time		trod	ns		10	-

Note: 1 transfer: (1) 16-bit I/F 16bpp

3/2 transfers: (1) 16-bit I/F 18bpp, (2) 16-bit I/F 24 bpp Option 1

2 transfers: (1) 8-bit I/F 16bpp, (2) 16-bit I/F 18bpp Options 2, 3, (3) 16-bit I/F 24bpp Option 2

3 transfers: (1) 8-bit I/F 18bpp, (2) 8-bit I/F 24bpp

6 Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note2,3
		θB		50	60	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	600	800	-		Note 3
Response Time		T_{ON}	25℃	-	20	30	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.235	0.285	0.335		Note 1,5
		y		0.265	0.315	0.365		
	Red	x		0.530	0.580	0.630		Note 1,5
		y		0.270	0.320	0.370		
	Green	x		0.290	0.340	0.390		Note 1,5
		y		0.540	0.590	0.640		
	Blue	x		0.100	0.150	0.200		Note 1,5
		y		0.060	0.110	0.160		
Uniformity		U		70%	80%	-	%	Note 6
NTSC				-	50%	-	%	Note 5
Luminance		L	20mA	990	1260	-	cd/m^2	Note 7
			25mA	1240	1570			

Test Conditions:

1. I_F= 20 mA, and the ambient temperature is 25℃.

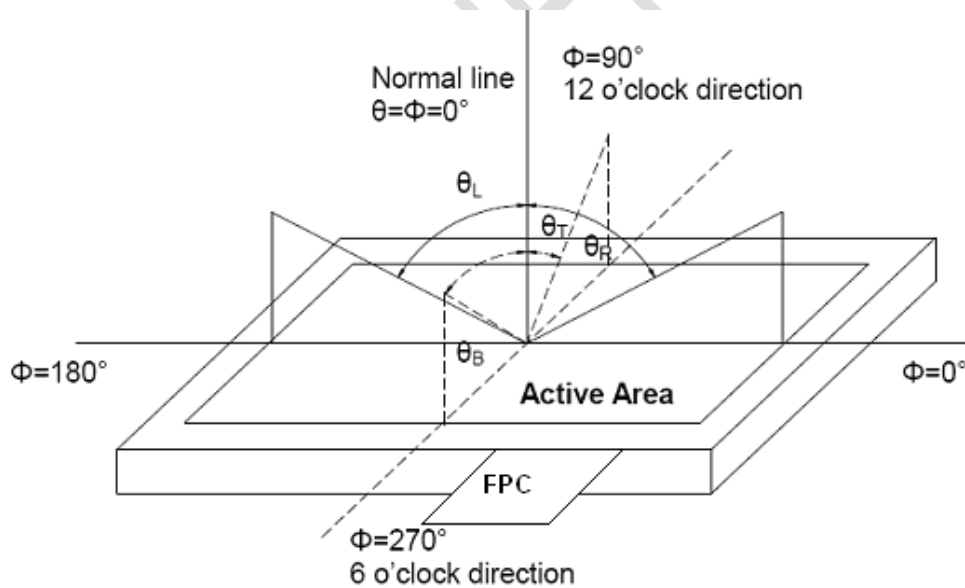2. The test systems refer to Note 1 and Note 2.

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.

Photo detector

Field

500mm

TFT-LCD Module

LCD Panel

The center of the screen
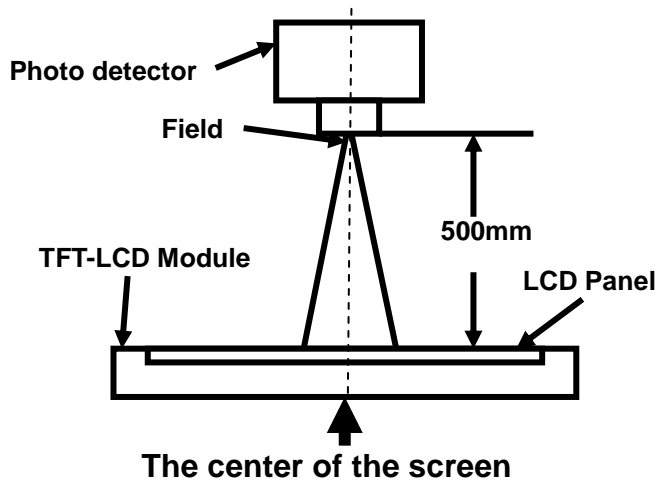
Note 2:   Definition of viewing angle range and measurement system.

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

Normal line
$\theta=\Phi=0°$

$\Phi=90°$
12 o'clock direction

θ_L

θ_T

θ_R

$\Phi=180°$

θ_B

Active Area

$\Phi=0°$

FPC

$\Phi=270°$
6 o'clock direction

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 drive by Vwhite.

"Black state": The state is that the LCD should drive 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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.
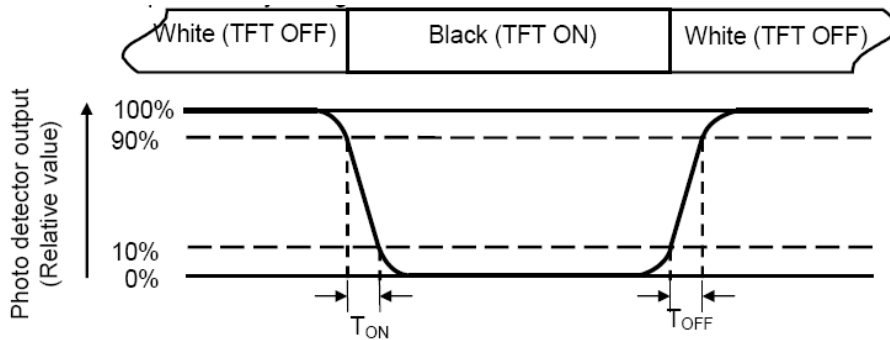
Note 5:　Definition of color chromaticity (CIE1931)

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
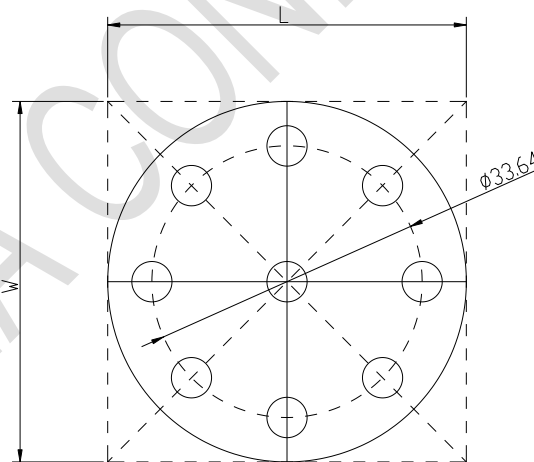
　Lmax: The measured Maximum luminance of all measurement position.

　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℃, 336hrs	Check at 72, 168, 336Hrs
2	Low Temperature Operation	Ta=-20℃, 336hrs	Check at 72, 168, 336Hrs
3	High Temperature Storage	Ta=+80℃, 336hrs	Check at 72, 168, 336Hrs
4	Low Temperature Storage	Ta=-40℃, 336hrs	Check at 72, 168, 336Hrs
5	High Temp. High Humidity Operation	Ta=+60℃, 90% RH ,336 hours	Check at 72, 168, 336Hrs
6	Low Temp. High Humidity Operation	Ta=10°C, 90% RH, 336 hours	Check at 72, 168, 336Hrs
7	Hot start test operation	Ramp to 80 °C at a rate of 5 °C/min; 80 °C for 1 hour; Power ON the device, wait for 5 minutes, and power OFF. Repeat 5x.	
8	Cold start test operation	Ramp to -40 °C at a rate of 5 °C/min; -40 °C for 1 hour; Power ON the device, wait for 5 minutes, and power OFF. Repeat 5x.	
9	Temp Humidity Cycling (non-operation)	-20℃ @ 120 min dwell to +60℃, 90%RH @ 120 min dwell. 20℃/Hr 14 cycles	
10	Heat Cycle (non-operation)	-40℃ @ 24 min dwell to +80℃ @ 24 min dwell. 21℃/minute 100 cycles	
11	Altitude Test (non-operation)	20,000 ft, -25℃ and 35℃, 16 Hrs Dwell w/ 2,000 ft/min ramp, (-25℃ 16h, 35℃ 16h, total 32h)	
12	ESD	C=150pF, R=330Ω，5points/panel Air:±15KV, 10times; Contact:±8KV, 10 times; （Environment: 15℃～35℃, 30%～60%, 86Kpa～106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
13	Vibration Test (non-operation)	3.5 Grms Frequency range: 5-500Hz, Stroke: 1.5mm, Sweep: 5Hz~500Hz~5Hz 2 hours for each direction of X. Y. Z.	
14	Mechanical Shock (non-operation)	1000G @ 0.5 ms,front, back and bottom	
15	Package Drop Test	Height: 60cm（＞10Kg），80cm（＜10Kg) 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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

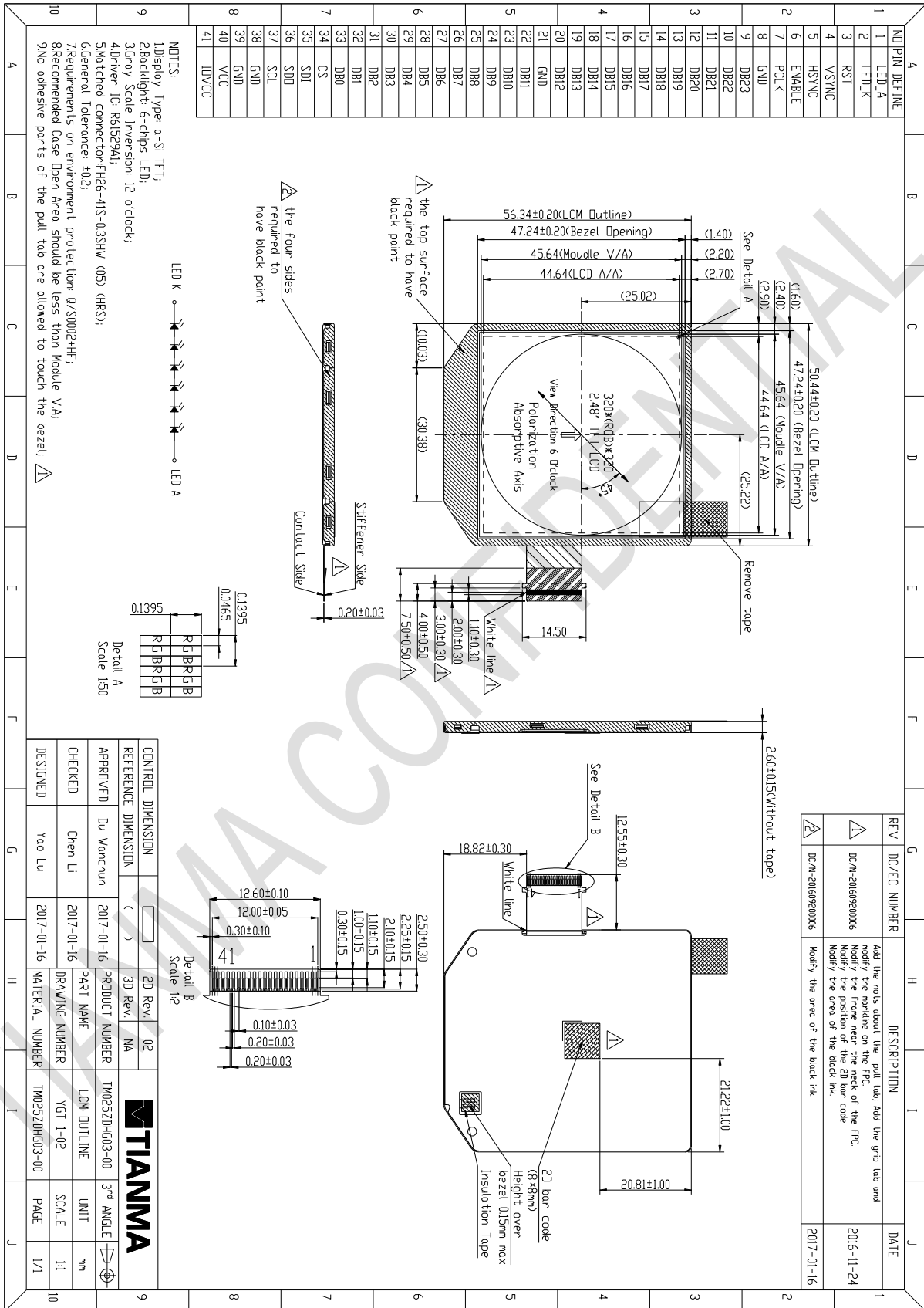Note2: Ta is the ambient temperature of sample.

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.
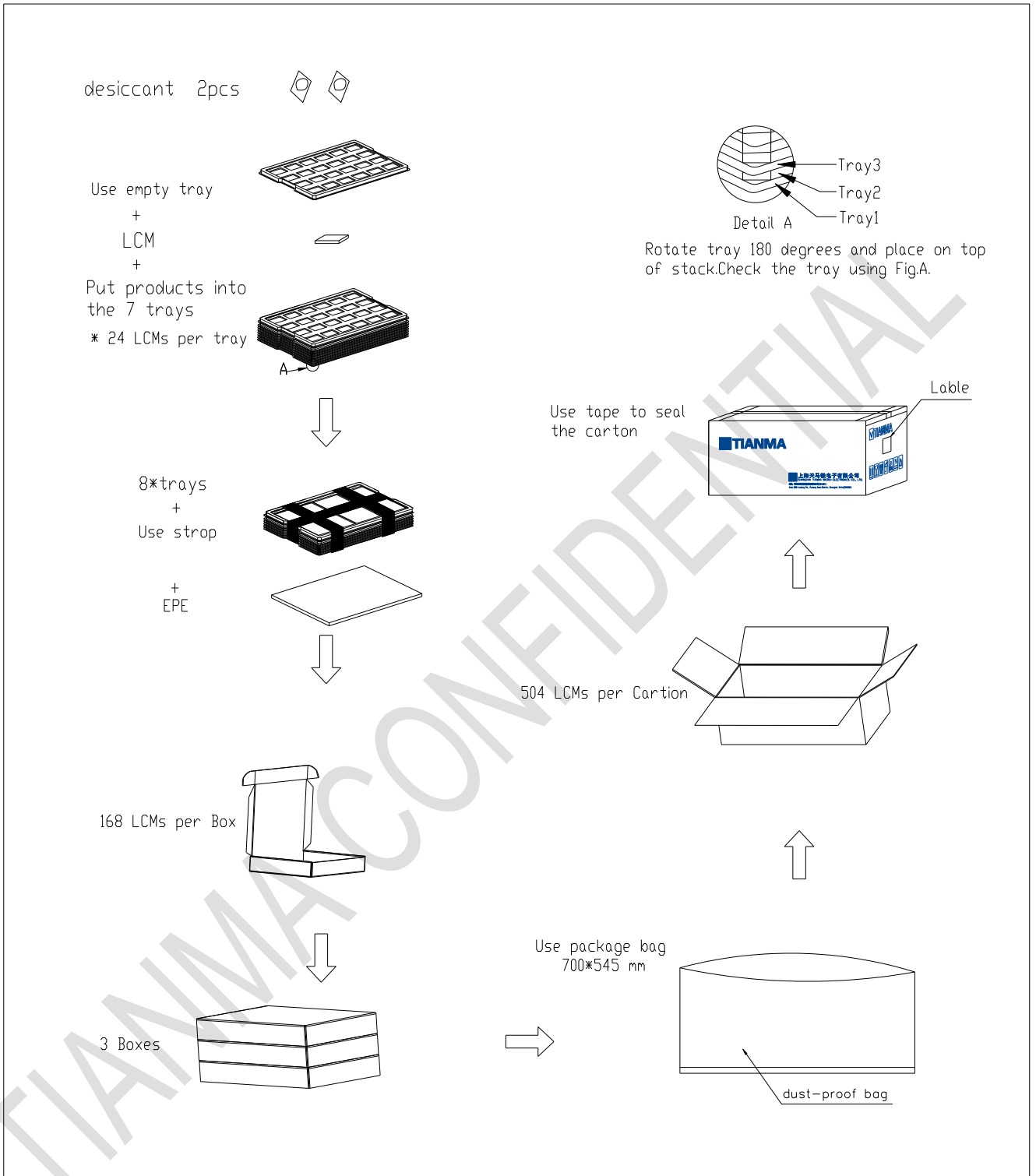
8 Mechanical Drawing

NOTES:
1. Display Type: a-Si TFT;
2. Backlight: 6-chips LED;
3. Gray Scale Inversion: 12 o'clock;
4. Driver IC: R61529A1;
5. Matched connector: FH26-41S-0.3SHW (05) (HRS);
6. General Tolerance: ±0.2;
7. Requirements on environment protection: 0/S0002+HF;
8. Recommended Case Open Area should be less than Module V.A;
9. No adhesive parts of the pull tab are allowed to touch the bezel;

PIN DEFINE

NO	PIN DEFINE
1	LED_A
2	LED_K
3	RST
4	VSYNC
5	HSYNC
6	ENABLE
7	PCLK
8	GND
9	DB23
10	DB22
11	DB21
12	DB20
13	DB19
14	DB18
15	DB17
16	DB16
17	DB15
18	DB14
19	DB13
20	DB12
21	GND
22	DB11
23	DB10
24	DB9
25	DB8
26	DB7
27	DB6
28	DB5
29	DB4
30	DB3
31	DB2
32	DB1
33	DB0
34	CS
35	SDI
36	SDO
37	SCL
38	GND
39	GND
40	VCC
41	IOVCC

320x(RGB)x320
2.48" TFT LCD
View Direction 6 O'clock
Polarization
Absorptive Axis

56.34±0.20(LCM Outline)
47.24±0.20(Bezel Opening)
45.64(Moudle V/A)
44.64(LCD A/A)
(25.02)
50.44±0.20 (LCM Outline)
47.24±0.20 (Bezel Opening)
45.64 (Moudle V/A)
44.64 (LCD A/A)
(25.22)

Remove tape

the top surface
required to have
black point

the four sides
required to
have black point

Detail A
Scale 150
0.1395 / 0.0465 / 0.1395
RGBRGB / RGBRGB / RGBRGB

LED K
LED A

Stiffener Side
Contact Side
0.20±0.03

White line
7.50±0.50 / 4.00±0.50 / 3.00±0.30 / 2.00±0.30 / 1.10±0.30
14.50

2.60±0.15(Without tape)

See Detail B
12.55±0.30
White line
18.82±0.30

Detail B
Scale 1:2
12.60±0.10
12.00±0.05
0.30±0.10
41   1
0.30±0.15 / 1.00±0.15 / 1.10±0.15 / 2.10±0.15 / 2.25±0.15 / 2.50±0.30
0.10±0.03
0.20±0.03
0.20±0.03

21.22±1.00
20.81±1.00

2D bar code
(8x8mm)
Height over
bezel 0.15mm max
Insulation Tape

REV	DC/EC NUMBER	DESCRIPTION	DATE
	DC/N-2016092000006	Add the nots about the pull tab; Add the grip tab and Modify the markline on the FPC. Modify the frame near the neck of the FPC. Modify the position of the 2D bar code.	2016-11-24
	DC/N-2016092000006	Modify the area of the black ink.	2017-01-16

CONTROL DIMENSION	( )	
REFERENCE DIMENSION	( )	
APPROVED	Du Wanchun	2017-01-16
CHECKED	Chen Li	2017-01-16
DESIGNED	Yao Lu	2017-01-16

2D Rev.	02
3D Rev.	NA
PRODUCT NUMBER	TM025ZDHG03-00
PART NAME	LCM OUTLINE
DRAWING NUMBER	YGT 1-02
MATERIAL NUMBER	TM025ZDHG03-00

TIANMA
3rd ANGLE
UNIT: mm
SCALE: 1:1
PAGE: 1/1

9　Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM	TM025ZDHG03-00	50.44×56.34×2.60	0.01492	504	
2	Carton	Corrugated paper	544×365×250	0.76	1	
3	Dust-Proof Bag	PE	700×545	0.046	1	
6	Tray	PET	485.0×330.0×13.8	0.162	24	
7	DESICCANT		45×35(2g)	0.002	6	
8	BOX	Corrugated paper	520×345×74	0.3879	3	
9	EPE	EPE	485.0×330.0×5	0.07813	3	
10	Total weight	13.62 Kg±5%				

desiccant 2pcs

Use empty tray
        +
     LCM
        +
Put products into
the 7 trays

* 24 LCMs per tray

A

8*trays
     +
Use strop

     +
   EPE

168 LCMs per Box

3 Boxes

Detail A

Tray3
Tray2
Tray1

Rotate tray 180 degrees and place on top
of stack.Check the tray using Fig.A.

Use tape to seal
the carton

Lable

504 LCMs per Cartion

Use package bag
700*545 mm

dust-proof bag

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

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