MODEL NO :	**TL070FVXS02**
VERSION :	**-00 Ver. F1.3**
ISSUED DATE :	**2023-11-27**

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

Customer :______________________________

Approved by	Notes

TIANMA Confirmed :______________________________

Prepared by	Checked by	Approved by
XingKai Wang	ChangWei Liu	HuaSheng Yan

This technical specification is subject to change without notice.

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Record of Revision

Rev	Issued Date	Description	Editor
P1.0	2023/08/22	Initial Specification Release	XingKai Wang
F1.0	2023/09/15	Final Specification Release	XingKai Wang
F1.1	2023/10/31	Update LCM 2D bar code label information	XingKai Wang
F1.2	2023/11/15	Update with more accurate frame rates, power consumption data, and timing table data.	XingKai Wang
F1.3	2023/11/27	Update sRGB information with CIE 1931 coverage	XingKai Wang

1 General Specifications

Feature		Spec
Display Spec.	Size	7.0 inch
	Resolution	1920RGB x 1080
	Technology Type	LTPS SFT
	Pixel Configuration	R.G.B Vertical Stripe
	Pixel pitch(mm)	0.0807 x 0.0807
	Display Mode	SFT with Normal Black
	Surface Treatment	HC
	Viewing Direction	All Direction
Mechanical Characteristics	LCM (W x H x D) (mm)	165.04 × 106.26 × 2.21
	Active Area(mm)	154.944 × 87.156
	Module border(mm)	5.05 / 5.05 / 9.55 / 9.55 (L/R/U/D)
	With /Without TSP	With TSP
	Connection Type	20682-040E-02
	LED Numbers	40 LEDs (8P5S)
	Weight (g)	65
Electrical Characteristics	Interface	eDP 1.4b
	Differential termination resistance	85 ± 10 Ω
	Color Depth	16.7M (8bit)
	TCON IC	NT56810

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180° shift.

Note 2: Requirement on environmental protection: Q/ S0002

Note 3: LCM weight tolerance: ± 10 %

2 Input / Output Terminals

Connector: 20682-040E-02

Pin No.	Symbol	Function	Remark
1	NC/SCL	I2C SCL for DDS function	
2	GND	Ground	
3	Lane1_N	EDP Data Lane 1N	
4	Lane1_P	EDP Data Lane 1P	
5	GND	Ground	
6	Lane0_N	EDP Data Lane 0N	
7	Lane0_P	EDP Data Lane 0P	
8	GND	Ground	
9	TCH_I2C_SCL	Touch I2C Interface : Clock Input	
10	TCH_I2C_SDA	Touch I2C Interface : Data Input / Output	
11	GND	Ground	
12	TCH_ATTN	Touch Interrupt Pin	
13	TP VCC	TP Digital Power Supply	
14	GND	Ground	
15	AUX_CH_P	EDP AUX Lane P	
16	AUX_CH_N	EDP AUX Lane N	
17	GND	Ground	
18	LCD_VCC	LCM Digital Power Supply, (TYP. 3.3V)	
19	LCD_VCC	LCM Digital Power Supply, (TYP. 3.3V)	
20	LCD_VCC	LCM Digital Power Supply, (TYP. 3.3V)	
21	LCD_VCC	LCM Digital Power Supply, (TYP. 3.3V)	
22	FRM	Reserved for LCD Panel Self Test Enable	
23	LCD_GND	Ground	
24	LCD_GND	Ground	
25	LCD_GND	Ground	
26	LCD_GND	Ground	
27	HPD	Hot Plug Detection pin for EDP	
28	BL_GND	Back Light Ground	
29	BL_GND	Back Light Ground	
30	BL_GND	Back Light Ground	
31	BL_GND	Back Light Ground	
32	BL_ENABLE	Backlight On / Off	
33	BL_PWM DIM	System PWM signal Input	
34	Touch_EN	Touch Function Enable Pin	
35	NC/SDA	I2C SDA for DDS function	
36	BL_PWR	Backlight power (5V~21V)	
37	BL_PWR	Backlight power (5V~21V)	
38	BL_PWR	Backlight power (5V~21V)	
39	BL_PWR	Backlight power (5V~21V)	
40	APOLC	APOL function(High enable)	

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

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit	Remark
Logic Supply Voltage	V_{CC}	-0.3	+4.0	V	
BL Supply Voltage	BL_PWR	2.5	+24	V	
Operating Temperature	T_{OPR}	0	50	°C	
Storage Temperature	T_{STG}	-20	60	°C	
Absolute Humidity	H_{STG}	-	90	%	

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

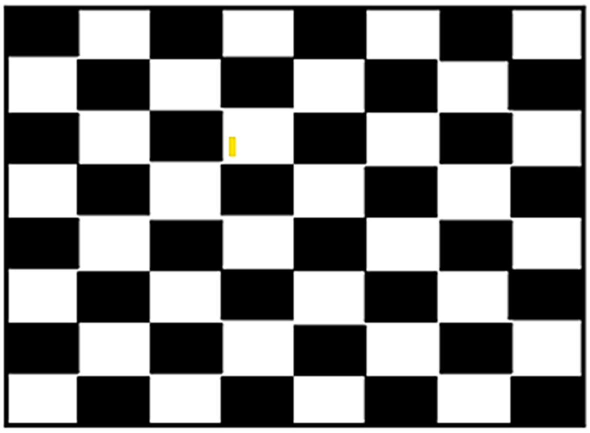
GND=0V, Ta=25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage		V_{CC}	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	GND	--	0.15* VDDIO	V	
	High Level	V_{IH}	0.7* VDDIO	--	3.6	V	
Frame rate		-	48	60	120	Hz	
Power Consumption		Black	0.344	0.430	0.516	W	
		White	0.361	0.451	0.541	W	
		Mosaic 8 X 8	0.362	0.453	0.544	W	Note 1
		Heavy pattern	0.510	0.637	0.764	W	Note 2
RX_DIFFpp	Rx differential peak to peak eye voltage		120	-	-	mV	Note 3
HPD	Hot Plug Detect		1.8	3.3	3.6	V	
TP_V_{CC}	Power supply to the Touch.		3	3.3	3.6	V	
AUX	RX AUX Pair signal in eDP interface.		0	0.6	1.2	V	
Touch_EN	Touch Function Enable Pin		1.65	1.8	1.95	V	

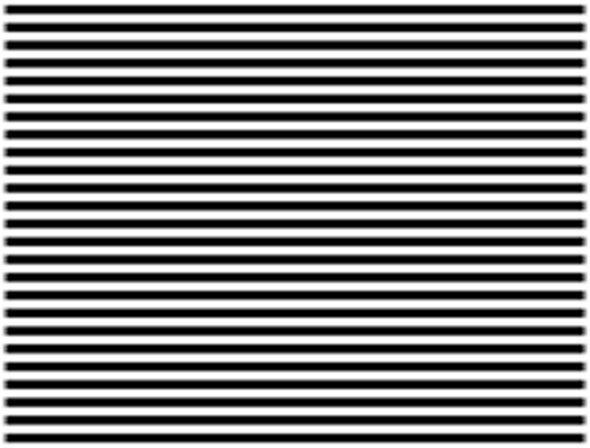
DC Electrical Characteristics

Parameters.	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage (Max. pattern)	V_{DD}	3	3.3	3.6	V	
Current dissipation (Max. Pattern)	I_{DD}	0.122	0.153	0.184	mA	60Hz (VRR) w/o OD
Power dissipation (Max. Pattern)	P_{DD}	0.404	0.505	0.606	W	
Current dissipation (Max. Pattern)	I_{DD}	0.154	0.193	0.232	mA	120Hz (VRR) w/o OD
Power dissipation (Max. Pattern)	P_{DD}	0.510	0.637	0.764	W	
Inrush current	I_{rush}	-	-	1.648	A	Power on
Inrush current	I_{rush}	-	-	0.318	A	Power off
Peak current(H strip)	I_{peak}			209.3	mA	Vrms = 3V

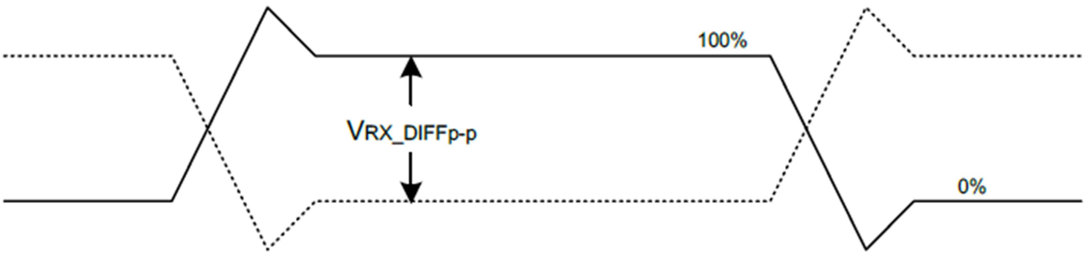
Note 1：Mosaic pattern



Note 2：Heavy pattern is H-strip pattern



Note 3：



4.2 Driving Backlight

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	I_F	-	15	-	mA	For each LED
Forward Voltage	V_F	-	2.8	2.9	V	
Backlight Power Consumption	W_{BL}	-	1.8	2.2	W	For Backlight

Table 4.2.1 Backlight unit electrical characteristics

4.3 Backlight input signal characteristics

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Power Supply	BL_PWR	5.0	12.0	21.0	V	
LED Enable Input High Level	BL_ENABLE	1.2	-	3.6	V	
LED Enable Input Low Level		-	-	0.7	V	
PWM Logic Input High Level	VPWM_EN	1.2	-	3.6	V	
PWM Logic Input Low Level		-	-	0.7	V	
PWM Input Frequency	FPWM	100		25K	Hz	
PWM Duty Ratio	Duty	5	-	100	%	

5 Timing Chart

5.1 eDP: The DP(DisplayPort) includes the main link, AUX channel, and HPD interface. Main Link and AUX channel are differential pairs and AC coupled with embedded clock architecture. eDP (Embedded DisplayPort) is based on the DP Standard but is mainly used in embedded systems like Notebook, Netbook, and All-in-one PCs.

Figure 5.2 Source channel mapping

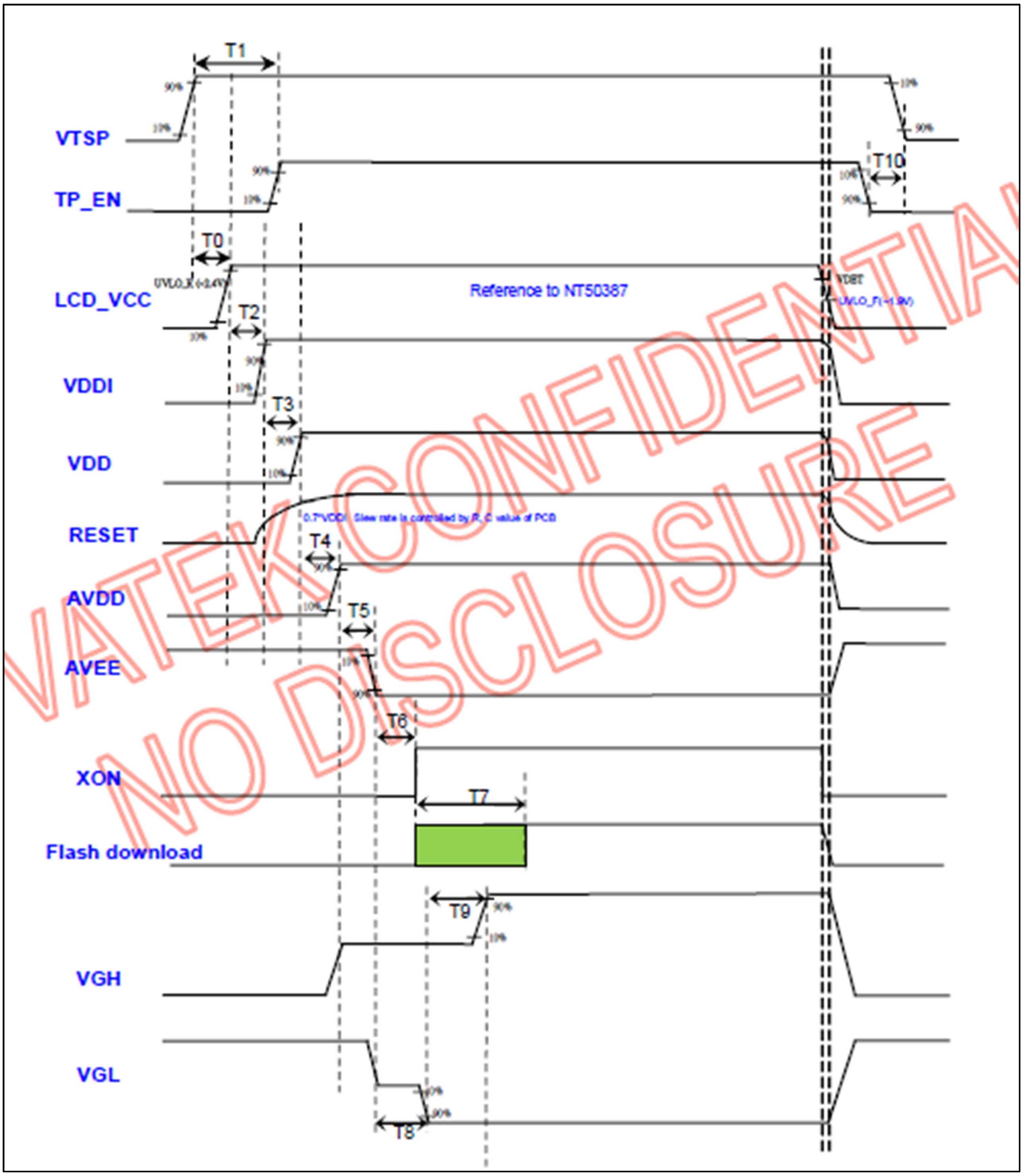
1920*1080 Timing

Parameter		Min.	Typ.	Max.	Unit
Frame Rate		48	120	-	Hz
Clock Frequency		-	142.780	285.550	MHz
Horizontal Section	**Front porch**	48	48	48	Pixel
	Active	1920			
	Blanking	160	160	160	
Vertical Section	**Front porch**	54	54	54	Line
	Active	1080			
	Blanking	64	64	64-	

NOTE: The maximum clock frequency = (1920+160)*(1080+64)*120≤ 289.54MHz

5.5 Power Sequence

5.5.1 Power on/off sequence



Symbol	Description	Value MIN	Value TYP	Value MAX	Unit
T0	VTSP to LCD_VCC	1			ms
T1	VTSP ON to TP_EN ON	10			ms
T2	LCD_VCC to VDDI	1			ms
T3	VDDI to VDD	1			ms
T4	VDD to AVDD	1			ms
T5	AVDD to AVEE	1			ms
T6	AVEE to XON	1			ms
T7	Download Time of Flash setting (key setting)	20			ms
T8	AVEE to VGL	1			ms
T9	VGL to VGH	1			ms
T10	VTSP to LCD_VCC	1			ms

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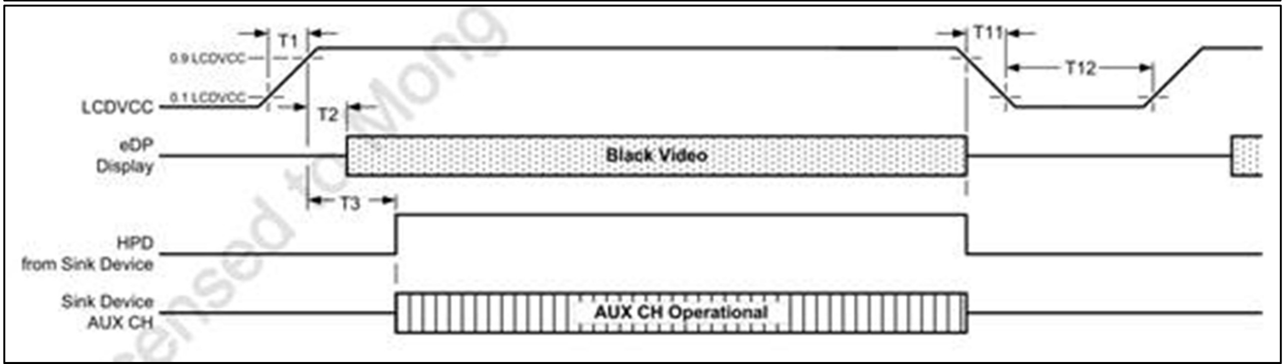


Timing Parameter	Description	Required By	Min Limit (ms)	Max Limit (ms)	Notes
T1	Power rail rise time, 10 to 90%	Source Device	0.5	10	
T2	Delay from LCDVCC to automatic Black Video generation	Sink Device	0	80	Automatic Black Video generation prevents display noise until valid video data is received from the Source device.[a, b]
T3	Delay from LCDVCC to HPD high	Sink Device	0	80	Sink device AUX CH must be operational upon HPD high.[c]
T11	Power rail fall time, 90 to 10%	Source Device	–	10	
T12	Power-off time	Source Device	500	–	LCDVCC may start to rise again immediately after the minimum T12 time, as illustrated in Figure 11-1 and Figure 11-2.

5.5.2 EDID

Address	Address	Field Name & Comments	Value
(Decimal)	(HEX)		(HEX)
0	0	Header	00
1	1	Header	FF
2	2	Header	FF
3	3	Header	FF
4	4	Header	FF
5	5	Header	FF
6	6	Header	FF
7	7	Header	00
8	8	manufacture code	51
9	9	manufacture code	A1
10	0A	Product Code	27
11	0B	Product Code	20
12	0C	LCD module Serial No –("0" if not used)	00
13	0D	LCD module Serial No –("0" if not used)	00
14	0E	LCD module Serial No –("0" if not used)	00
15	0F	LCD module Serial No –("0" if not used)	00
16	10	Week of manufacture	1E
17	11	Year of manufacture	21
18	12	EDID Structure Ver # = 1	01
19	13	EDID revision # = 4	04
20	14	Video I/P definition = Digital I/P (80h)	A5
21	15	Max H image size = (Rounded to cm)	10
22	16	Max V image size = (Rounded to cm)	08
23	17	Display Gamma	78
24	18	Feature support (no DPMS, Active off, RGB, timing BLK 1)	07
25	19	Red/Green Low bits (RxRy/GxGy)	6E
26	1A	Blue/White Low bits (BxBy/WxWy)	A1
27	1B	Red X Rx	A4
28	1C	Red Y Ry	52
29	1D	Green X Gx	4C

30	1E	Green Y Gy	9A
31	1F	Blue X Bx	25
32	20	Blue Y By	0F
33	21	White X Wx	50
34	22	White Y Wy	54
35	23	Established timings 1 (00h if not used)	00
36	24	Established timing 2 (00h if not used)	00
37	25	Manufacturer's timings (00h if not used)	00
38	26	Standard timing ID1 (01h if not used)	01
39	27	Standard timing ID1 (01h if not used)	01
40	28	Standard timing ID2 (01h if not used)	01
41	29	Standard timing ID2 (01h if not used)	01
42	2A	Standard timing ID3 (01h if not used)	01
43	2B	Standard timing ID3 (01h if not used)	01
44	2C	Standard timing ID4 (01h if not used)	01
45	2D	Standard timing ID4 (01h if not used)	01
46	2E	Standard timing ID5 (01h if not used)	01
47	2F	Standard timing ID5 (01h if not used)	01
48	30	Standard timing ID6 (01h if not used)	01
49	31	Standard timing ID6 (01h if not used)	01
50	32	Standard timing ID7 (01h if not used)	01
51	33	Standard timing ID7 (01h if not used)	01
52	34	Standard timing ID8 (01h if not used)	01
53	35	Standard timing ID8 (01h if not used)	01
54	36	Pixel Clock LSB	8B
55	37	Pixel Clock HSB	6F
56	38	Horizontal Active (lower 8 bits)	80
57	39	Horizontal blanking (lower 8 bits)	A0
58	3A	Horizontal Active/Horizontal blanking (upper 4:4 bits)	70
59	3B	Vertical active(lower 8 bits)	38
60	3C	Vertical blanking(lower 8 bits)	40
61	3D	Vertical Active : Vertical Blanking (upper 4:4 bits)	40
62	3E	Horizontal Sync Offset	30
63	3F	Horizontal Sync Pulse Width	20

64	40	Vertical Sync Offset , Sync Width	62
65	41	Horizontal Vertical Sync Offset/Width upper 2 bits	0C
66	42	Horizontal Image Size	9B
67	43	Vertical image Size	57
68	44	Horizontal Image Size / Vertical image size	00
69	45	Horizontal Border = (0 for Notebook LCD)	00
70	46	Vertical Border = (0 for Notebook LCD)	00
71	47	Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives,	18
72	48	Pixel Clock LSB	C6
73	49	Pixel Clock HSB	37
74	4A	Horizontal Active (lower 8 bits)	80
75	4B	Hor blanking (lower 8 bits)	A0
76	4C	Horizontal Active/Horizontal blanking (upper4:4 bits)	70
77	4D	Vertcal active(lower 8 bits)	38
78	4E	Vertical blanking(lower 8 bits)	40
79	4F	Vertical Active : Vertical Blanking (upper4:4 bits)	40
80	50	Horizontal Sync Offset	30
81	51	Horizontal Sync Pulse Width	20
82	52	Vertical Sync Offset , Sync Width	62
83	53	Horizontal Vertical Sync Offset/Width upper 2 bits	0C
84	54	Horizontal Image Size	9B
85	55	Vertical image Size	57
86	56	Horizontal Image Size / Vertical image size	00
87	57	Horizontal Border = (0 for Notebook LCD)	00
88	58	Vertical Border = (0 for Notebook LCD)	00
89	59	Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives,	1A
90	5A	Detailed timing descriptor # 3 / Monitor Descriptor # 3	00
91	5B	Flag (byte 2)	00
92	5C	Reserved	00
93	5D	FD(hex) defines Display Range Limits:	FD
94	5E	Vertical Rate Offsets are zero.	00
95	5F	Defines Minimum Vertical Rate	30
96	60	Defines Maximum Vertical Rate	78
97	61	Defines Minimum Horizontal Rate	8C

98	62	Defines Maximum Horizontal Rate	8C
99	63	Defines Maximum Pixel Clock	1D
100	64	Space	01
101	65	Space	0A
102	66	Space	20
103	67	Space	20
104	68	Space	20
105	69	Space	20
106	6A	Space	20
107	6B	Space	20
108	6C	Detailed timing descriptor # 4 / Monitor Descriptor # 4	00
109	6D	Flag (byte 2)	00
110	6E	Reserved	00
111	6F	Monitor Descriptor # 4	FC
112	70	Flag	00
113	71	Manufacture P/N	54
114	72	Manufacture P/N	4C
115	73	Manufacture P/N	30
116	74	Manufacture P/N	37
117	75	Manufacture P/N	30
118	76	Manufacture P/N	46
119	77	Manufacture P/N	56
120	78	Manufacture P/N	58
121	79	Manufacture P/N	53
122	7A	Manufacture P/N	30
123	7B	Manufacture P/N	32
124	7C	New line character indicates end of ASCII string	2D
125	7D	Space	30
126	7E	Extension Flag = 00	00
127	7F	Checksum	83
128	80		00
129	81		00
130	82		00
131	83		00

132	84		00
133	85		00
134	86		00
135	87		00
136	88		00
137	89		00
138	8A		00
139	8B		00
140	8C		00
141	8D		00
142	8E		00
143	8F		00
144	90		00
145	91		00
146	92		00
147	93		00
148	94		00
149	95		00
150	96		00
151	97		00
152	98		00
153	99		00
154	9A		00
155	9B		00
156	9C		00
157	9D		00
158	9E		00
159	9F		00
160	A0		00
161	A1		00
162	A2		00
163	A3		00
164	A4		00
165	A5		00

166	A6		00
167	A7		00
168	A8		00
169	A9		00
170	AA		00
171	AB		00
172	AC		00
173	AD		00
174	AE		00
175	AF		00
176	B0		00
177	B1		00
178	B2		00
179	B3		00
180	B4		00
181	B5		00
182	B6		00
183	B7		00
184	B8		00
185	B9		00
186	BA		00
187	BB		00
188	BC		00
189	BD		00
190	BE		00
191	BF		00
192	C0		00
193	C1		00
194	C2		00
195	C3		00
196	C4		00
197	C5		00
198	C6		00
199	C7		00

200	C8		00
201	C9		00
202	CA		00
203	CB		00
204	CC		00
205	CD		00
206	CE		00
207	CF		00
208	D0		00
209	D1		00
210	D2		00
211	D3		00
212	D4		00
213	D5		00
214	D6		00
215	D7		00
216	D8		00
217	D9		00
218	DA		00
219	DB		00
220	DC		00
221	DD		00
222	DE		00
223	DF		00
224	E0		00
225	E1		00
226	E2		00
227	E3		00
228	E4		00
229	E5		00
230	E6		00
231	E7		00
232	E8		00
233	E9		00

234	EA		00
235	EB		00
236	EC		00
237	ED		00
238	EE		00
239	EF		00
240	F0		00
241	F1		00
242	F2		00
243	F3		00
244	F4		00
245	F5		00
246	F6		00
247	F7		00
248	F8		00
249	F9		00
250	FA		00
251	FB		00
252	FC		00
253	FD		00
254	FE	Block Section Checksum	00
255	FF	Block Checksum	00

6 Optical Characteristics

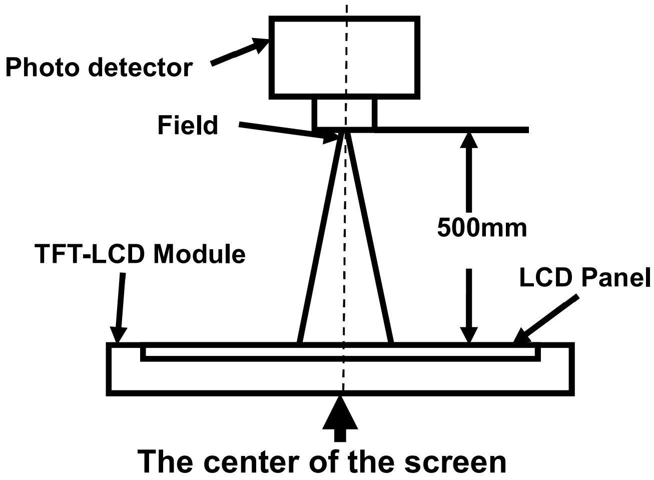
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
View Angles		θ_T	CR≧10	80	88	-	Degree	Note 2,3
		θ_B		80	88	-		
		θ_L		80	88	-		
		θ_R		80	88	-		
Contrast Ratio		CR	$\theta=0^{o}$	800	1000	-		Note 3
Response Time		T_f+T_r	25°C	-	9	15	ms	Note 4
		GTG			6.3	8		
Chromaticity	White	x	Backlight is on	0.283	0.313	0.343		Note 1,5
		y		0.299	0.329	0.359		
	Red	x		0.610	0.640	0.670		Note 1,5
		y		0.300	0.330	0.360		
	Green	x		0.270	0.300	0.330		Note 1,5
		y		0.570	0.600	0.630		
	Blue	x		0.120	0.150	0.180		Note 1,5
		y		0.030	0.060	0.090		
Uniformity		U	5 point	-	-	1.25		Note 6
		U	13 point	-	-	1.5		Note 6
sRGB			CIE1931 coverage	95	100	-	%	Note 5
Luminance		L		425	500	-	cd/m^2	Note 7
Gamma curve				2.0	2.2	2.4		
Crosstalk				-	-	2	%	Note 8

Test Conditions:

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

Note 1: Definition of optical measurement system.

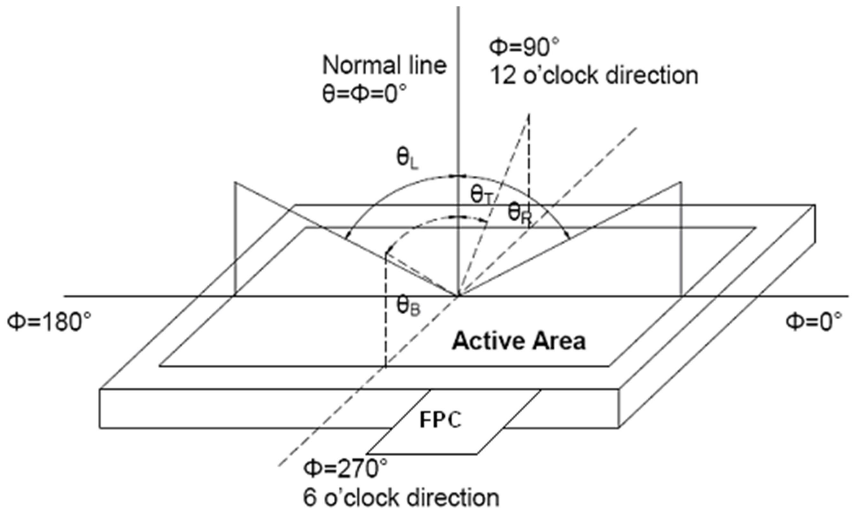
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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)。



Note 3: Definition of contrast ratio

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

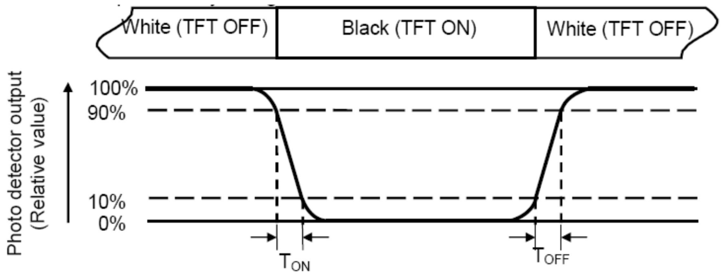
"White state ": The state is that the LCD should drive by V_{white}.

"Black state": The state is that the LCD should drive by V_{black}.

V_{white}: To be determined / V_{black}: 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.

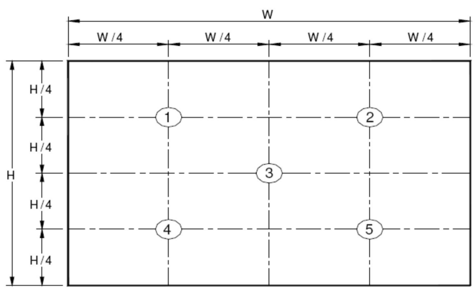
Note 6: Definition of Luminance Uniformity

Active area is divided into 5 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

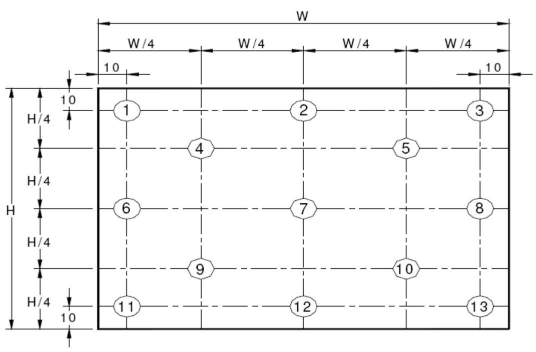
Luminance Uniformity (U) = Lmin/ Lmax

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

5 test Points



13 test Points



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.

Note 8: Definition of Crosstalk

Pattern: G: W: G = 1: 2: 1, G: D: G= 1: 2: 1,

Condition 1: G= G 127, W= G 255, D= G 0.

Condition 2: G= G 31, W= G 255, D= G 0.

Above conditions: U / D / R / L Crosstalk Max.

7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	**High Temperature Operation**	Ts=+50°C, 240 Hours	IEC60068-2-1:2007 GB2423.2-2008
2	**Low Temperature Operation**	Ta= 0°C, 240 Hours	IEC60068-2-1:2007 GB2423.1-2008
3	**High Temperature Storage**	Ta=+60°C, 240 Hours	IEC60068-2-1:2007 GB2423.2-2008
4	**Low Temperature Storage**	Ta=-20°C, 240 Hours	IEC60068-2-1:2007 GB2423.1-2008
5	**Operation at High Temperature and Humidity**	Ta=+50°C, 80% RH, 240 Hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	**Storage at High Temperature and Humidity**	Ta=+40°C, 90% RH, 240 Hours	
7	**Thermal Shock (non-operation)**	-20°C/ 30 mins ~ +60°C/30 mins, 100 cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
8	**Electrostatic Discharge (ESD)**	容阻套件: 150pF 330Ω 10 times/ Point，间隔 1S 对地要求：铁框接地（必须） 点位：正面 9 宫格 实验顺序: 1 与 2 分开并行，接触与空气分开并行（必须） 1. 不上电测试: 接触: ±4KV ~ ±8kV, 2KV 步进, Criteria C 空气: ±6KV ~ ± 15kV, 2KV 步进, Criteria C 2. 上电测试: 接触: ±2KV ~ ±6kV, 2KV 步进, Criteria B 空气: ±6KV ~ ±10kV, 2KV 步进, Criteria B 测试数量: 8pcs Air: ±15KV C 级 Contact: 8KV C 级	IEC61000-4-2:2001 GB/T17626.2-2006
9	**Vibration Test**	0.6G / 5-27.2 Hz, Sine 0.016 inch(p-p)/ 27.2~50Hz, Sine 2.0G/ 50 ~ 500 Hz, Sine wave, 0.475 Oct/ min, 4 cycles for each X, Y, Z	IEC60068-2-6:1982 GB/T2423.10—1995
10	**Mechanical Shock (Non-OP)**	120G, 3ms, half sine wave, 3 time for each direction of ±X, ±Y, ±Z	IEC60068-2-27:1987 GB/T2423.5—1995
11	**Package Drop Test**	6 surfaces/ 3 edges/ 1corner < 9kg: 92cm > 9kg: 76cm	IEC60068-2-32:1990 GB/T2423.8—1995

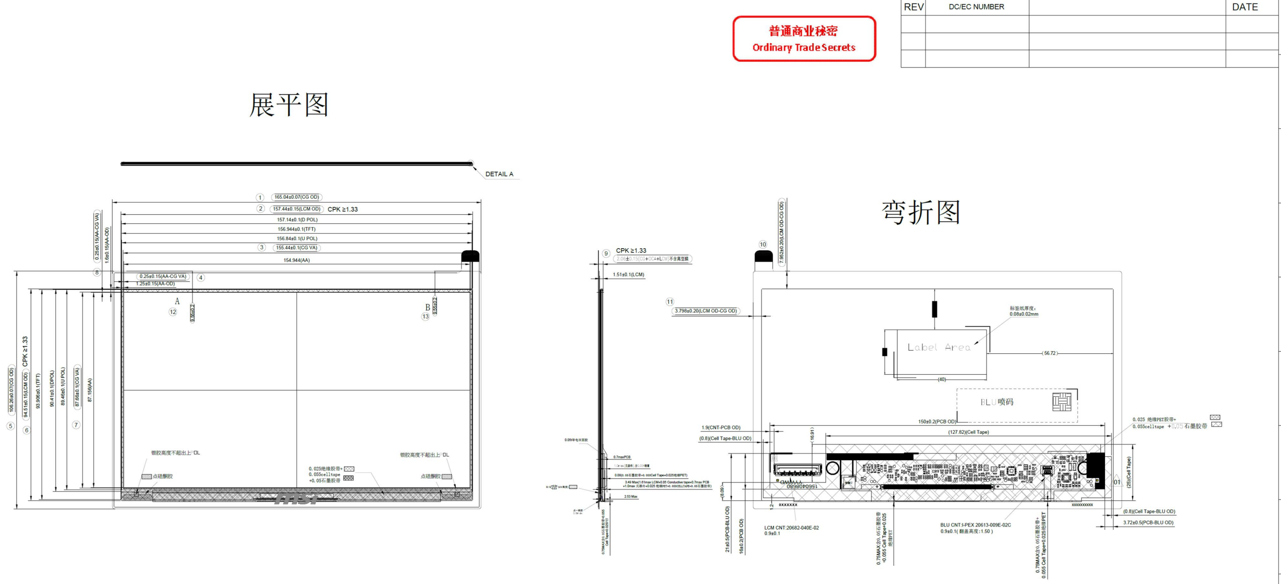
12	**Package shock Test**	Acceleration: 1.48 G Frequency: 5 ~ 200 Hz Random Sweep: 30 Minutes each Axis (X, Y, Z)	IEC60068-2-32:1990 GB/T2423.8—1995

Note 1: Ta is the ambient temperature of sample.

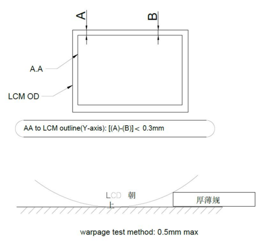
Note 2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at Room-temp.

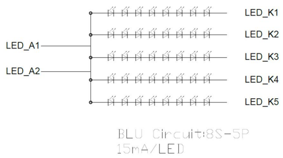
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8 Mechanical Drawing



NOTES:
1.Display Type: 7',1920*1080 LCD;
2.Backlight: 40-chips LED, 5 Strings of 8;
3.Driver IC:NT56810A;
4.VIEWING DIRECTION: ALL;
5.Connector: 20682-040E-02 BLU CNT:I-PEX 20613-009E-02C;
6.General Tolerance: ±0.25 ;
7.LCM warp: ≤0.5mm，test four edges and lcm corner，total 8 points ;
8.Luminance: 500nits typ, 425nits Min(中心点);
9.White (X,Y): (0.313±0.03, 0.329±0.03) ;
10.NTSC:sRGB 99% ;
11.Uniformity： 5P 80%/13P 67%;
12.Requirements on environment protection: Q/S0002 & Halogen free ;
13.Recommended Case Open Area should be less than Module V.A ;
14.Reference dimension: ( );
15.CPK of dimension 2 6 9 should be over 1.33 ;
16.Check Code : 1 - 13
16.The product must meet (EU) WEEE and ROHS certification requirements;
17.All sizes are final size Unspecified tolerances refer to tolerance chart;
Dimensions unspecified refer to the 3D,and tolerances refer to tolerance chart;
18. AA to LCM outline(Y-axis): [(A)-(B)] < 0.3mm;
19.CG 背面油墨表面能满足酒精擦拭后≥34（Arcotest 达因笔，5s内收缩不超过20%)

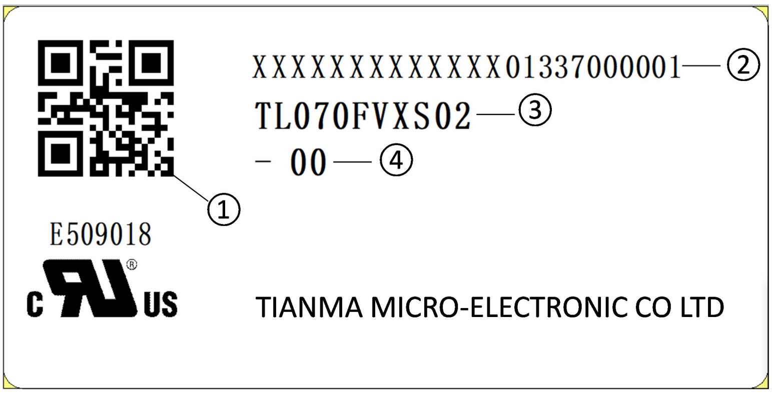




CONTROL DIMENSION			2D Rev.	01	TIANMA		
REFERENCE DIMENSION	( )		3D Rev.	N/A			
APPROVED	Ma Chengxu	2023-08-22	PRODUCT NUMBER		TL070FVXS02-00	3rd ANGLE	
CHECKED	Li Mingyong	2023-08-22	PART NAME		YGT	UNIT	mm
DESIGNED	Wang Junrong	2023-08-22	DRAWING NUMBER			SCALE	1:1
			MATERIAL NUMBER			PAGE	1/1

9 Packing Drawing

9.1 LCM 2D bar code label



Note:
The customer PN + SN definition will be aligned with customer specification, comprises a total of 24 digits. “x” can be A~Z, 0~9 or special characters request by customer.
① 2D code, customer PN + SN information
② Customer PN + SN, total 24 digits (It can be Blank, but 24 digits need to aligned with 2D code information)
③ Tianma Mode Number
④ Tianma Model Reversion code

9.2 Package label

Note:
The customer PN definition will be aligned with customer specification, comprises a total of 13 digits. “x” can be A~Z, 0~9 or special characters request by customer.
① Customer PN, total 13 digits
② Tianma Model Number + Model Reversion code
③ Blank represents for NPI ; Tianma Model Number + Model Reversion code represents for MP
④ Product Quantity
⑤ Operator Number
⑥ Product type

9.3 Weight of Package

9.3.1 Content description

Panel Size：	7 Inch	Customer：	GM2	With TP/CG：	是
Module No.：	TL070FVXS02-00	Version：	1.0	With EPE	否
Resolution：	FHD	Packing Mode：	两小	栈板型号	PL004
Module Outline Dimension：		165.04 × 106.26 × 2.06 mm		满栈板箱数	30

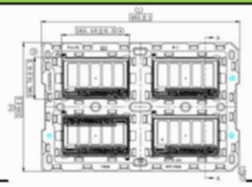
9.3.2 Packaging material specification table

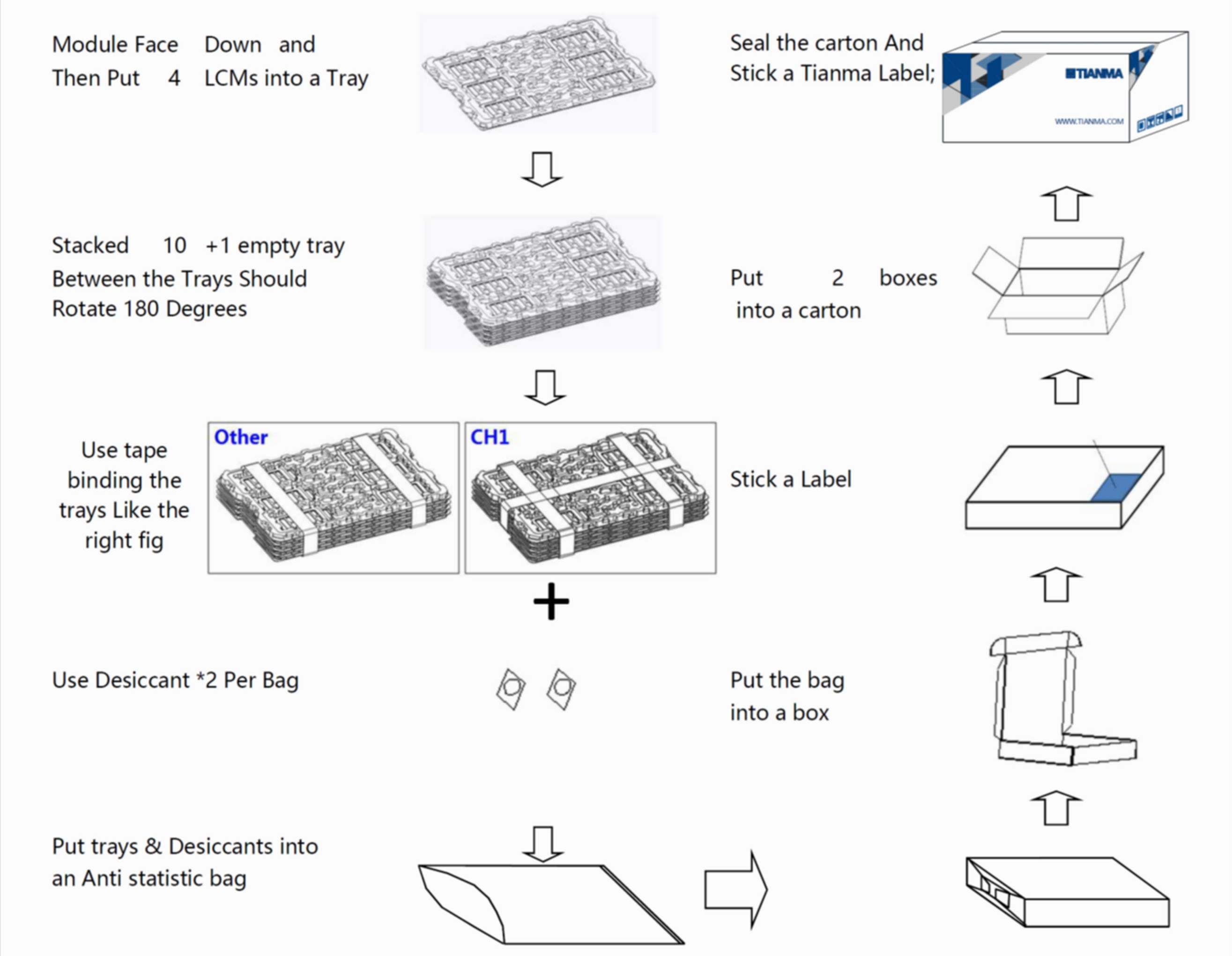
No	Item	Model (P/N)	Dimensions (mm)	Weight (kg)	Quantity	Remark
1	LCM module	TL070FVXS02-00	165.04 × 106.26 × 2.06	0.062	80	
2	Carton	1680388300	544 × 365 × 250	0.866	1	
3	Box	1680388290	520 × 345 × 111	0.558	2	
4	Anti-statistic bag	1680335310	380 × 700 × 0.08	0.06	2	
5	Desiccant	1680003280	45 X 35 mm (2 克/ 包)	0.002	4	单位：包
6	Tray	1150369341	485×330×1	0.213	22	
Total weight		11.756 ± 1.5 Kg				

9.3.3 Packaging Quantity Specifications

(1) LCM quantity per tray : 2 row x 2 column = 4 pcs
(2) Total LCM quantity in Carton: (Number of trays 22 – Empty trays 2) x quantity per tray 4 = 80
Note : Please refer to the data from "estimated report about the dimension and stack of Carton" about stacking carton

9.3.4 Graphical packaging instructions

No.	说明	图示
1	a). LCM显示面 朝下 放置于Tray盘（ 1150369341 ）中; b). 确保FPC平整不翘起，如右图所示; c). 每盘Tray放 4 pcs Module;	
2	小心堆叠 10 +1层Tray（最上层为空Tray）为一摞。	
3	注意：所有上下层Tray间正叠;	
4	确认堆叠无误后，用 2 条胶带，按照 二 字型360°捆包，如下图所示;	
5	把捆包后的整摞Tray和2袋干燥剂放入抗静电袋中;	
6	把静电袋放入纸盒内，确保纸盒平整，在纸盒上贴附天马专用标签纸;	
7	按照每层 一个 纸盒堆 两 层方式装入大纸箱，在大纸箱侧边贴上一张天马标签纸，具体流程如下图所示。	
8	外箱使用带天马英文logo的胶带	



9.3.5 Placement method of pallets

栈板型号： PL004
纸箱堆叠数按 3*2/每层*共5层，共30箱

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 Modules.

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.

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

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

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

10.8.1.4 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.

10.9 Storage precautions

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

10.9.2 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°C ~ 40°C Relatively humidity: ≤ 80 %

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

10.10 Transportation Precautions

10.10.1The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.