DOCUMENT NUMBER AND REVISION

VL-PS-COG-T700F2120-L2 REV.B

(COG-T700F2120-L2)

DOCUMENT TITLE:

PRELIMINARY SPECIFICATION

OF

LCD MODULE TYPE

CUSTOMER	
CUSTOMER REFERENCE NUMBER	
MODEL NUMBER	**COG-T700F2120-L2**
CUSTOMER APPROVAL	
DATE	

DEPARTMENT	NAME	SIGNATURE	DATE
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CONTENTS

VARITRONIX LIMITED

Preliminary Specification
of
LCD Module Type
Model No.: COG-T700F2120-L2

1. General Description

- 7.0" (diagonal) WVGA, normally black, FFS type, transmissive, amorphous silicon TFT Color LCD module
- Display Resolution: 800 x RGB x 480
- Viewing angle (U/D/L/R): 80/80/80/80. @ CR > 10
- Display up to 16.7M colours
- Anti-glare front polarizer
- 55 pin FPC connection
- RoHS Compliance.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.
(H: Horizontal; V: Vertical)

Table 1

Parameters		Specifications	Unit
Outline dimensions	Width x Height	167.7(H) x 109.45(V) (Exclude FPC)	mm
	Thickness	9.0 (Exclude components and screw posts) 19.8 (Max. thickness)	mm
Color TFT 800 x RGB x 480	Bezel opening	156.2(H) x 94.54 (V)	mm
	Active area	152.40(H) x 91.44(V)	mm
	Display format	800 x RGB x 480	dots
	Color configuration	RGB Vertical stripes	-
	Dot pitch	(0.0635*3) (H) x 0.1905 (V)	mm
Backlight		LED	-
Weight		Approx: 0.232	Kg

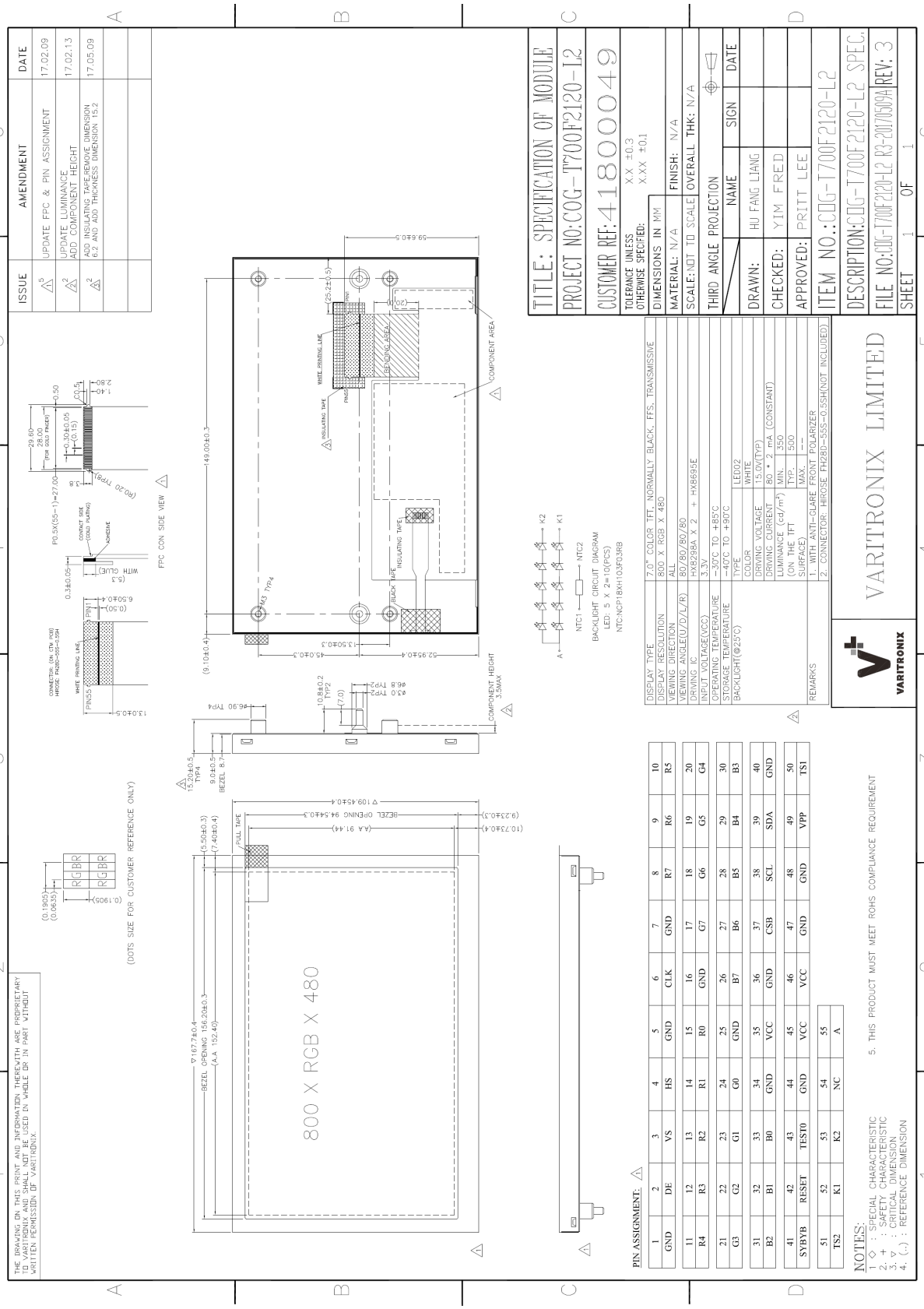


Figure 1: Module Mechanical Specification Drawing

3. Interface Signals

3.1 TFT-LCD Panel Driving

Table 2: Connector Pin assignment

Pin No.	Symbol	I/O	Description	Remarks
1	GND	P	Ground	
2	DE	I	TTL signal data enable when DE only mode enable.	Pulled low when HS+VS mode
3	VS	I	TTL signal Vertical Sync	
4	HS	I	TTL signal Horizontal Sync	
5	GND	P	Ground	
6	CLK	I	Clock Signal	
7	GND	P	Ground	
8	R7	I	Red Data 7	
9	R6	I	Red Data 6	
10	R5	I	Red Data 5	
11	R4	I	Red Data 4	
12	R3	I	Red Data 3	
13	R2	I	Red Data 2	
14	R1	I	Red Data 1	
15	R0	I	Red Data 0	
16	GND	P	Ground	
17	G7	I	Green Data 7	
18	G6	I	Green Data 6	
19	G5	I	Green Data 5	
20	G4	I	Green Data 4	
21	G3	I	Green Data 3	
22	G2	I	Green Data 2	
23	G1	I	Green Data 1	
24	G0	I	Green Data 0	
25	GND	P	Ground	
26	B7	I	Blue Data 7	
27	B6	I	Blue Data 6	
28	B5	I	Blue Data 5	
29	B4	I	Blue Data 4	
30	B3	I	Blue Data 3	
31	B2	I	Blue Data 2	
32	B1	I	Blue Data 1	
33	B0	I	Blue Data 0	
34	GND	P	Ground	
35	VCC	P	Power Supply	
36	GND	P	Ground	

Pin No.	Symbol	I/O	Description	Remarks
37	CSB	I	SPI interface chip select	Use to set internal register. Pull high when it is not used. Note 1.
38	SCL	I	SPI interface clock	Use to set internal register. Pull low when it is not used. Note 1.
39	SDA	I	SPI interface data bus	Use to set internal register. Pull low when it is not used. Note 1.
40	GND	P	Ground	
41	STBYB	I	Standby	
42	RESET	I	Reset	
43	TEST0	O	Logic test pins	Pease keep floating
44	GND	P	Ground	
45	VCC	I	Power Supply.	
46	VCC	I	Power Supply.	
47	GND	P	Ground	
48	GND	P	Ground	
49	VPP	P	Power input for OTP programming (7.6V).	Leave this pin open or connect it to VCC when not programming OTP.
50	TS1	C	Temp. sensor1	
51	TS2	C	Temp. sensor2	
52	K1	P	LED Cathode1	
53	K2	P	LED Cathode2	
54	NC	-	No connection	
55	A	P	LED Anode	

Remarks:

1. For I/O, “I” is Input, “O” is Output. “P” is for Power, and “C” is for passive.

Note 1:CSB,SCL,SDA supports 3-pins serial peripheral interface (SPI) to set initial code for internal register. All registers initial value has been programed OTP (one-time-programming) by factory. The customer should not change the initialization during normal operation.

3.2 LED Backlight Driving

Included in TFT-LCD PCBA, please refer to Section 3.1.

4. Absolute Maximum Ratings

The product or its functions may subject to permanent damage if it's stressed beyond those absolute maximum ratings listed below. Exposure to absolute maximum rating conditions for extended periods may affect display module reliability.

Table 3: Absolute Maximum Ratings & Environmental Conditions

Item	Symbol	Min.	Max.	Unit
Supply voltage	VCC	-0.3	+3.96	V
Single LED forward current (at 25C)	I_F	-	150	mA
Total LED forward current	I_F (Total)	-	300	mA
Relative Humidity (at 60°C, Note 3)	RH		90	%
Operating Temperature (Note 2)	Topr	-30	+85	°C
Storage Temperature	Tstg	-40	+90	°C

Note 1: GND=VSS=0V.

Note 2: Panel surface temperature should not exceed 85°C.

Note 3: No condensation allowed under any condition.

[Caution]

Do not display fixed pattern for prolonged hours because it may develop image sticking on the display.

5. Electrical Specifications

5.1 Block Diagram

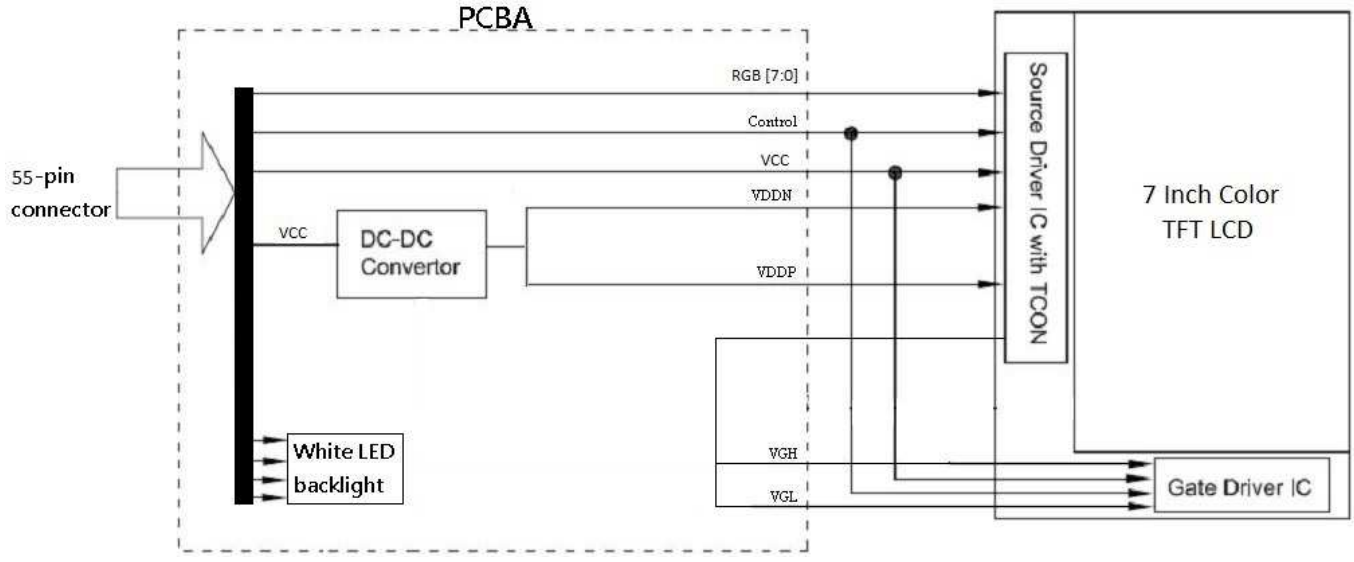


Figure 2: Block Diagram

5.2 Typical Electrical Characteristics

At Ta = 25 °C, VCC=+3.3V, GND=0V.

Table 4

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	VCC	3.0	3.3	3.6	V
Power supply current	ICC(Note 2)	-	130	180	mA
Driver input high signal voltage	VIH	0.7*VCC	-	VCC	V
Driver input low signal voltage	VIL	GND		0.3*VCC	
LED Life Time (50%)	(Note 3)	30000	-	-	hrs

Note 1: There is tolerance in optimum LCD driving voltage during production. Minimum and maximum LCD driving voltages indicate the range of optimum LCD driving voltage shift due to production tolerance. Please adjust LCD driving voltage manually to obtain the best module performance.

Note 2: All white pattern.

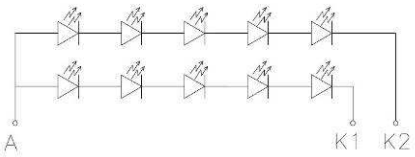
Note 3: The “LED Life Time” is defined as the time period when the brightness decrease to 50% of the initial value under continuous lighting at 25°C (dry condition) with the recommended driving current

5.3 Recommended Driving Condition For LED Backlight

Table 5 (Ta = 25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage of LED backlight	V_{LED}	Backlight current = 160 mA Number of LED dies = 10 pcs	-	15	-	V	Note 1
Supply current of LED backlight	$I_{LED1/2}$	Per LED string	-	80	-	mA	Note 2
Total Supply current of LED backlight	$I_{LED\ Total}$	$I_{LED1} + I_{LED2}$	-	160	-	mA	Note 2
Backlight Power Consumption	P_{LED}	-	-	2.4	-	W	Note 3

Note 1: Backlight Circuit Diagram



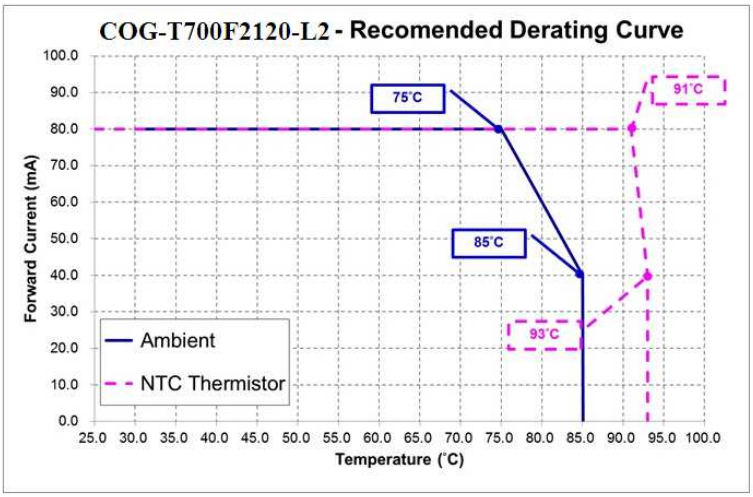
BACKLIGHT CIRCUIT DIAGRAM
LED: 5 X 2=10(PCS)

Note 2: The LED driving condition is defined for each LED module.
Total input current = 80 x 2 = 160 mA

Note 3: Backlight power consumption is calculated by ILED (Total) x VLED

Note 4: Backlight driving current best at 160 mA (for total)/ 80 mA (Per LED string) or below, and Should not significantly exceed 160 mA (for total))/ 80 mA (Per LED string) at all temperature; otherwise, overheating may happen and may damage the backlight.

Recommended Derating Curve (Current per LED string) for COG-T700F2120-L12



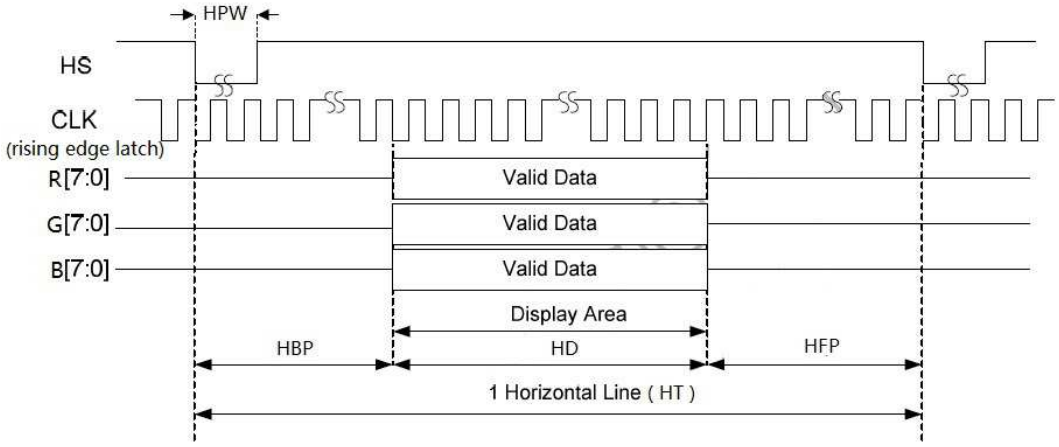
5.4 Timing Characteristics

5.4.1 Video Signal Timing

Table 6: Video signal timing(Sync mode)

Symbol	Parameter	Conditions	Related Pins	Min.	Typ.	Max.	Unit
VT	Vertical Total	-	VS	490	528	576	Line
VPW	VSYNC Low Pulse Width	-	VS	1	2	4	Line
VBP	Vertical Back Porch	-	VS	-	5	-	Line
VFP	Vertical Front Porch	-	VS	8	43	94	Line
VD	Vertical Active Area	-	VS	-	480	-	Line
HT	Horizontal Total		HS	824	832	1120	CLK
HPW	HSYNC Low Pulse	-	HS	3	8	15	CLK
HBP	Horizontal Back Porch	-	HS	-	16	-	CLK
HFP	Horizontal Front Porch	-	HS	16	16	315	CLK
HD	Horizontal Active Area	-	HS	-	800	-	CLK
Fframe	Frame Frequency	-	CLK	55	60	65	Hz
fCLK	CLK frequency		CLK		26.4		MHz

- **Horizontal**



- **Vertical**

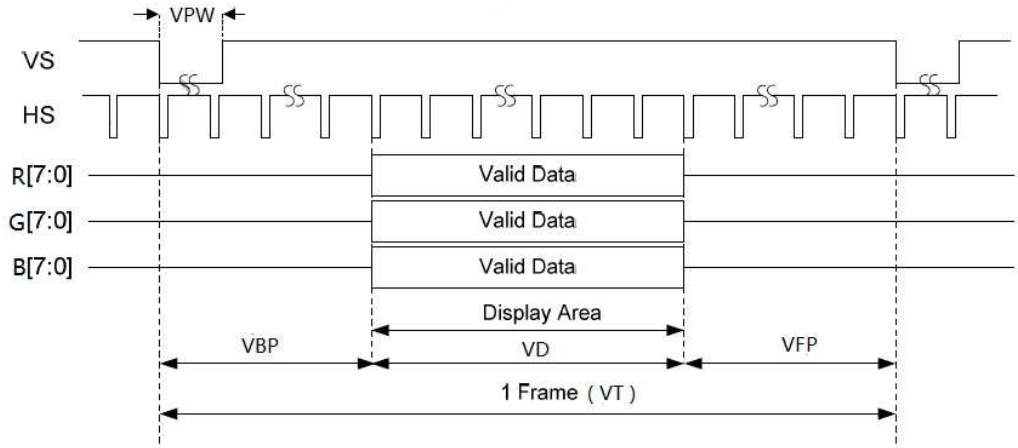


Figure 3: Video timing diagram

5.4.2 SPI interface (3 wires)

SPI interface is used to read and write the setting registers of the TFT module and read commands to control the TFT module. Refer to Appendix is for details of the registers setting.

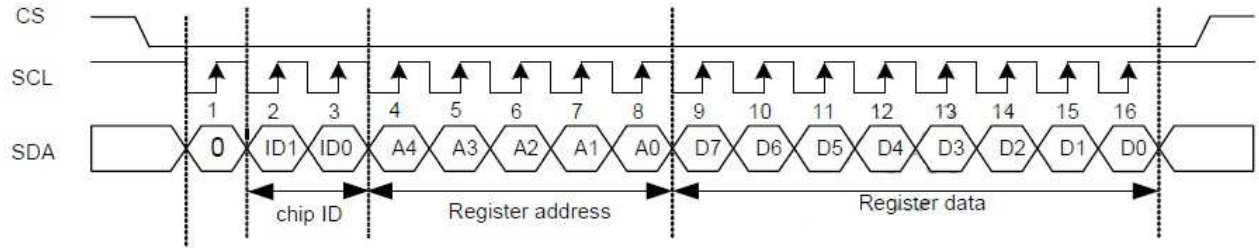


Figure 4: SPI write data format

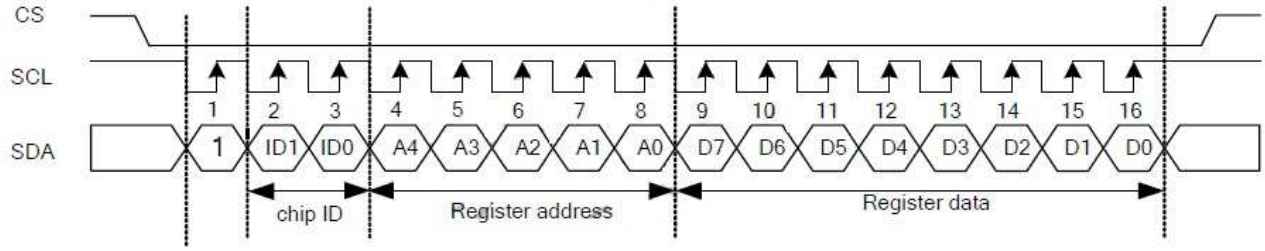


Figure 5: SPI read data format

5.4.3 SPI interface timing chart

Table 7: AC Characteristic of SPI Interface

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Setup Time	tS0 tS1	CS to SCL SDA to SCL	60 60	- -	- -	ns
Hold Time	tH0 tH1	CS to SCL SDA to SCL	60 60	- -	- -	ns
Pulse Width	tW1L tW1H	SCL pulse width SCL pulse width	75 75	- -	- -	ns
	tW2	CS pulse width	1	-	-	us
Clock duty		SCL	40	50	60	%

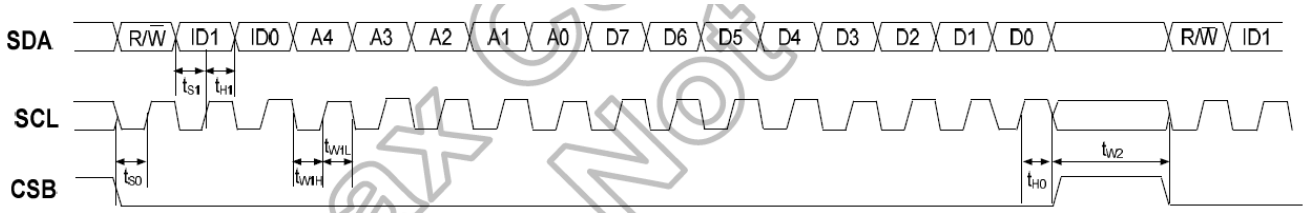
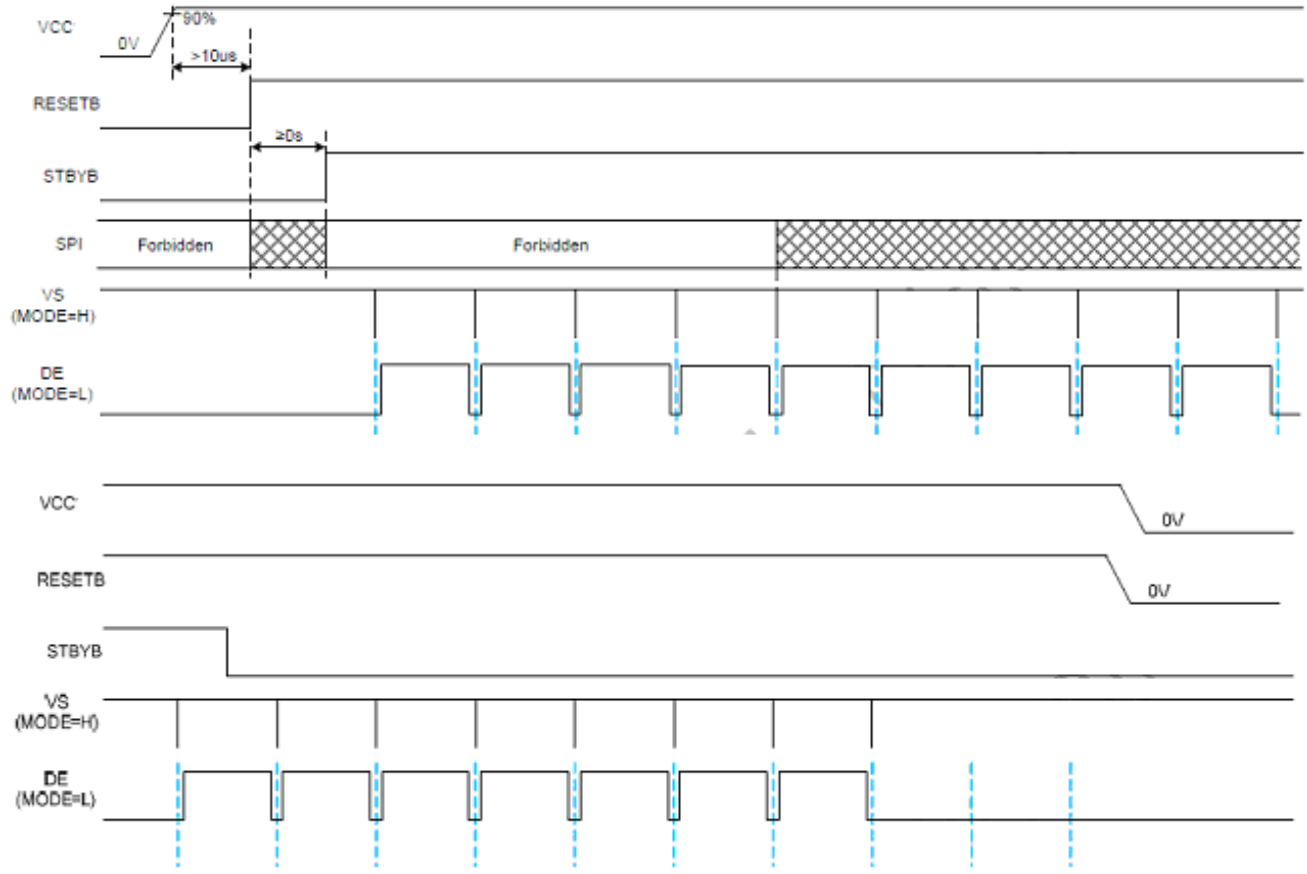


Figure 6: SPI timing

5.5 Power On/Off Sequence



Note: (1) The inputted signals must start to send all related signals before 20ms or after 100ms from STBYB rising.

Figure 7: Power on/off timing sequence

6. Optical Characteristics

Conditions unless specified otherwise:

- Ta = 25°C
- Supply voltage = 3.3 volts
- Elapsed time from switch on is greater than 30 minutes
- RGB, white and black test patterns only
- Factory settings
- Brightness = 100% unless specified
- Measurements are conducted at ambient temperature and perpendicular unless specified

Table 8

Items		Symbol	Condition		Min.	Typ.	Max.	Unit	Note
Response Time		T_R+T_F	Ta=-30°C	Viewing normal angle θ=ϕ=0°	-	-	500	ms	(Note 1)
			Ta=25°C		-	-	50		
Viewing angle	12’	θ2	Ta=25°C	Center CR≥10	-	80	-	deg.	(Note 2)
	6’	θ1			-	80	-		
	9’	ϕ2			-	80	-		
	3’	ϕ1			-	80	-		
Contrast Ratio		CR	Ta=25°C	Viewing normal angle θ=ϕ=0°	900	1200	-	-	(Note 3)
Brightness		Br	Ta=25°C		350	600	-	cd/m^2	
Chromaticity	White	x_W	Ta=25°C		0.28	0.31	0.34	-	(Note 4)
		y_W			0.29	0.32	0.35	-	
	Red	x_R			0.61	0.64	0.67	-	
		y_R			0.31	0.34	0.37	-	
	Green	x_G			0.29	0.32	0.35	-	
		y_G			0.59	0.62	0.65	-	
	Blue	x_B			0.12	0.15	0.18	-	
		y_B			0.02	0.05	0.08	-	
Luminance Uniformity		ΔY9	Ta=25°C	9 Points	-	75	-	%	(Note 5)
NTSC Ratio		-	Ta=25°C	-	65	70	-		%
Gamma Value			Ta=25°C		1.9	2.2	2.5	-	-

Note 1: The electro-optical response time measurements shall be made as Figure 8 by switching the “data” input signal OFF and ON. The times needed for the luminance to change from 10% to 90% s T_r, and 90% to 10% is T_f.

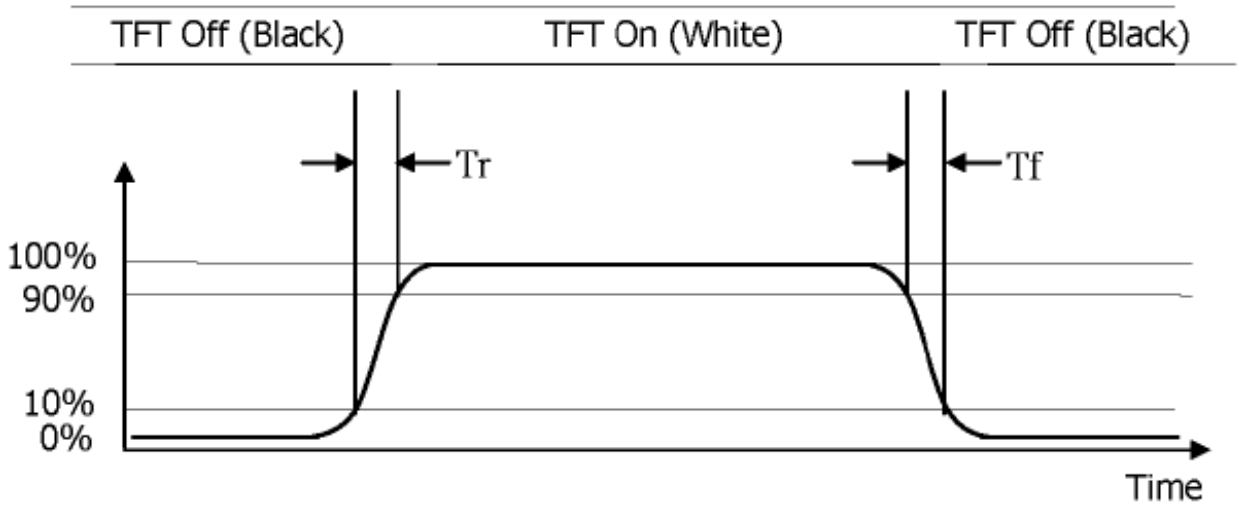


Figure 8: Response Time Testing

Note 2: The definitions of viewing angle.

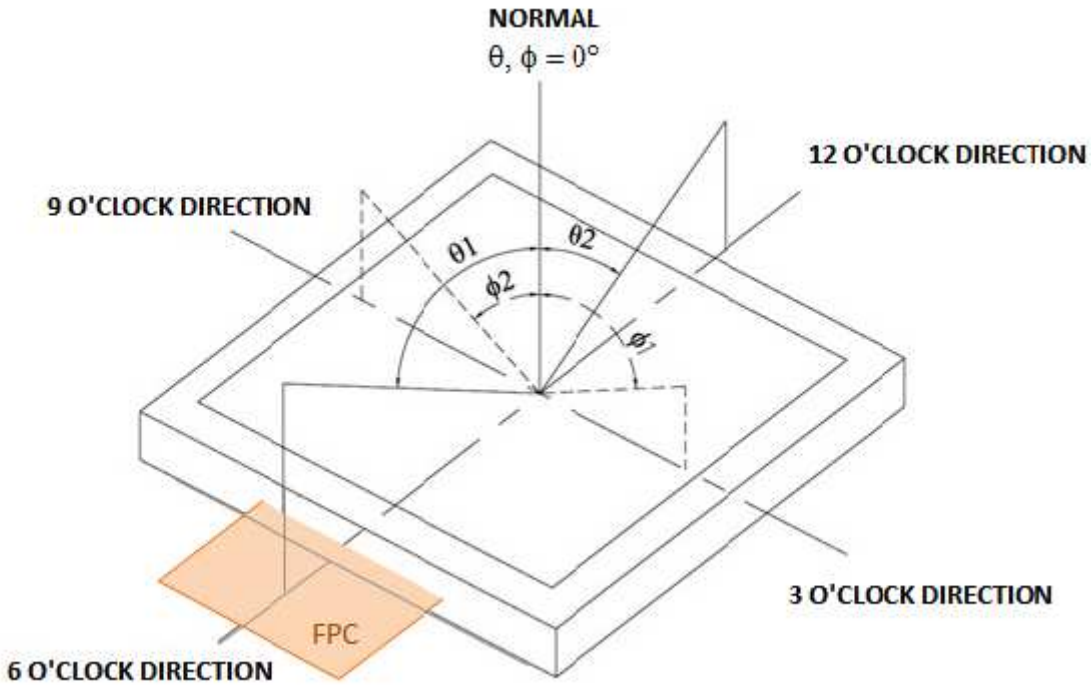
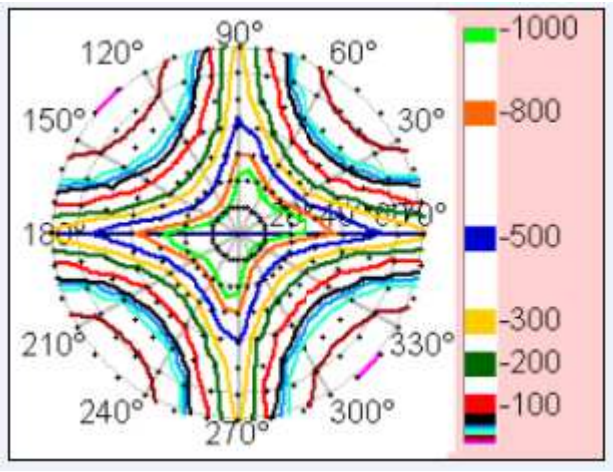


Figure 9



Note 3: Contrast measurements shall be made at viewing angle of $\theta=0^{o}$ and at the center of the LCD surface by using DMS. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 9)

Luminace Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note 4: The color chromaticity coordinates specified in Table 8 is reference to actual spectral data measured with all pixels first in red, green, blue and white. Measurements were made at the center of the panel.

Note 5: The White luminance uniformity on LCD surface is measured per VESA standard over 9 points and is then expressed as

$$\text{Uniformity } \Delta Y = \frac{\text{Minimum Luminance of 9 points}}{\text{Maximum Luminance of 9 points}} \times 100\ (\%)$$

Note6: NTSC ratio is the ratio of the area of the triangle formed by the corners of the R, G, B co-ordinates of the LCD and the area of the NTSC triangle

7. Reliability Conditions

Table 9: List of Reliability Tests

Test		Symbol	Condition	Reference	Sample Qty.
1	High Temperature Storage	HST	+90°C / 240 hrs	IEC 60068-2-2 Bb	4pcs
2	Low Temperature Storage	LST	-40°C / 240 hrs	IEC 60068-2-1 Ab	4pcs
3	High Temperature Operating (Note 1)	HOT	+85°C / 240 hrs	IEC 60068-2-2 Bb	4pcs
4	Low Temperature Operating	LOT	-30°C / 240 hrs	IEC 60068-2-1 Ab	4pcs
5	Accelerated Humidity Test Operating	AHTO	+60°C / 90% RH / 240 hrs	IEC60068-2-78 Cab	4pcs
6	Temperature Shock Test	TST	-30°C <> +85°C, 30min/5min/30min,100cycles Non-Operating	IEC 60068-2-14Na	4pcs
7	UV exposure resistance	UV	1KW Xenon / 100 hrs Power off.	IEC 60068-2-5 Sa	2pcs
8	Mechanical Shock (Note 2)	-	3 directions: X,Y,Z axes Repeats:6 Peak acc.:100 G Pulse duration: 6 ms (half sine wave) Non-Operating	IEC 60068-2-27Ea	-
9	Mechanical Vibration (Note 2)	-	3 directions: X,Y,Z axes Sweep time: 10 (1Oct/ min) Frequency: 10 -> 150->10 Hz 10-58 Hz: constant amplitude 0.75mm peak. 58-150Hz: constant acceleration 10g peak Sinusoidal , Non-Operating	IEC 60068-2-6Fc	-

Note 1: LCD panel surface temperature should not exceed 85ºC.

Note 2: For module internal structure robustness test purpose only. Customer application cluster design should take care of overall mounting robustness with display module.

7.1 Electrostatic Discharge (ESD)

Table 10: ESD Test Conditions

Test	Condition	Method	Remark	Sample Qty.
Human body model	R = 330Ω, C = 150pF, • Air discharge: ±15 KV to display surface • Contact discharge: ±8 KV to metal frame	IEC61000-4-2	Not operating	2pcs
Machine model	R = 0Ω, C = 200pF, ±200V to I/O pins	MIL-STD-883, method 3015	Not operating	

Note 1: The TFT-LCD panel and IC on module are sensitive to electrostatic discharge; please make sure equipments and operators are properly ground before and during handling

Note 2: As different customer application have different interfacing designs and assembly processes, the display module has no ESD protection circuitry. Customer is required to take special care on ESD level control in the assembly and test processes.

8. LCD Cosmetic Conditions

The defect categories covered in this specification include defects in the active area such as dot defects, blemishes and partly / completely malfunctioning displays as well as visual appearance of the complete product and packaging of the product.

8.1 Inspection Conditions and Test Patterns

Table 11: List of inspection conditions and test pattern`

Item	Condition	
Ambient lighting	Non-operating inspection 500~1000 Lux. Operating inspection < 200 Lux.	
Temperature /Humidity	22 ± 3°C with 65 ± 20%	
Driving condition	Equipment	Product specific test tool
	Test pattern	Black, White
	Supply voltage	Typical voltages as given in the specification
Inspection method	Time	≤ 1 minute
	Distance	35 cm ± 5 cm from display
	Viewing angle	Standard viewing angle of inspection shall be perpendicular to the display. Inspection at other viewing angles shall not exceed the range of specified viewing angles.

8.1.1 Dot and line defect criteria

Table 12: Dot & Line defect criteria

Item		R	G	B	Total (3)	Inspection pattern
Dot defects (1) (4) (5)	Single bright	1			5	(a) (c) (d) (e)
	Joined bright (2)(3)	0				
	Single dark	4				(b) (c) (d) (e)
	Joined dark (2)(3)	1				
Line defects		0				(a) (b) (c) (d) (e)

a. Black field
b. White field
c. R field
d. G filed
e. B field

Note:
(1) A dot (sub-pixel) containing a defect area larger than 50% of its size is counted as a defective dot as per above table. A dot containing a defect area smaller than 50% of its size will be ignored.
(2) 2 adjacent defective dots joined together are regarded as **1** joined dot defect.
(3) 2 or more adjacent dots joined together are not allowed.
(4) No more than 2 defective dots shall be allowed within a radius of 1 inch
(5) Dot and line defects would be ignored when not detecting under 5% ND filter

8.2 Blemishes and cosmetic anomalies

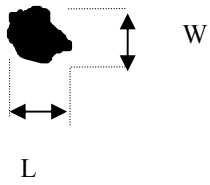
Note: The black border is the rim between the active area of the display and the metal front cover.

8.2.1 Circular defects

Table 13: Circular defects requirement – LCD

Size (mm)	Acceptance number	
	Active area	Black border
D ≤ 0.2	No count	No count
0.2 < D ≤ 0.3	3	
D > 0.3	0	

Remark: D = (Length + Width) / 2, for L and W.

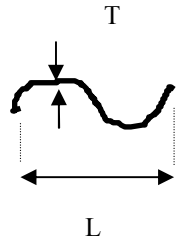


8.2.2 Long defects

Table 14: Long defects

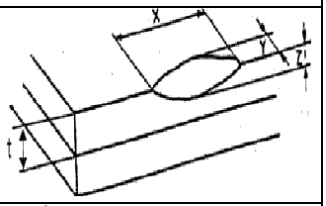
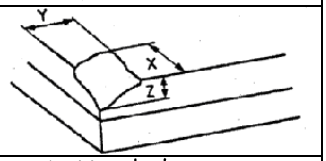
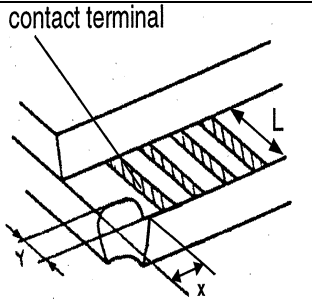
Size (mm)		Acceptance number	
		Active area	Black border
T ≤ 0.05		No count	No count
0.05 < T ≤ 0.08	L ≤ 2.5	3	
T > 0.08	-	0	

Remark: T = defect thickness, L = defect contour length.



8.2.3 Appearance defects

Table 15: Appearance defects

Defect Category	Defect Description	Criterion	Drawing Specification
Mechanical Damage	Chip on side/ corner	Y≦1mm & Z≦t， X ignore accept	
		X≦4mm & Y≦4mm & Z≦t accept	
	Chips on ledge, but not on ITO trace	X≦5mm & Y≦length of ledge accept	

8.2.4 Other cosmetic defects

Table 16: Bubble in polarizer

Item	Acceptance number		
	Size (mm)	Active Area	Black boarder
Bubble in polarizer	$D \leq 0.2$	No count	No count
	$0.2 < D \leq 0.3$	3	
	$D > 0.3$	0	

Remark: D = (Length + Width) / 2, for L and W.

Table 17: Galaxy type defect

Galaxy type	Acceptance number	Inspection pattern
Detectable bright dot defects with 5% ND filter Not more than 3 dots within a 15mm diameter. ◦	5	Pure black
Galaxy defects would be ignored when not detectable under 5% ND filter.	No count	Pure black
No consecutive galaxy dots along a line	0	Pure black

Table 18: Other cosmetic defects

Item	Criteria of acceptance	Inspection pattern
Residual shadow	Less than 3 seconds	All patterns
Light leakage	Not visible in 30º viewing cone	Pure black
Mura (Non-uniformity)	Invisible through a 5% ND filter	Pure back and pure white

Other defects refer to QUA-012B

8.3 Malfunctioning

Not allowed are:

- Malfunctioning display: no picture, distinct block or line failure
- Malfunctioning backlight
- Excessive start up time > 3 seconds

8.4 Appearance

Not allowed are:

- Type and/or serial number (if any) wrong, missing or not legible
- Offensive surface damage
- Connectors damaged
- Stains within active area, such as fingerprints or adhesive residuals
- Dirty appearance (cannot be removed with a dry cloth)

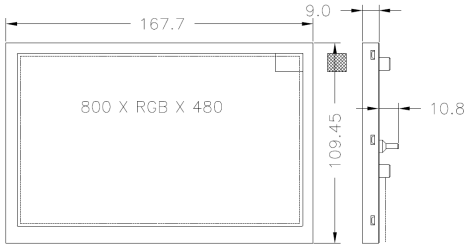
8.5 Packing

Not allowed are:

- Box damaged wet, badly taped or stapled causing the product not arriving in good condition at the customer
- Type or model number wrong (if any), missing or not legible

CONFIGURATION :

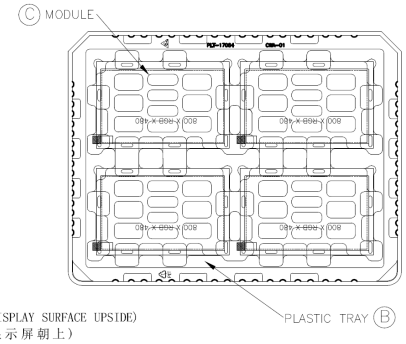
MS:COG-T700F2120-L2 R3-20170509A



REV	AMENDMENT	DATE

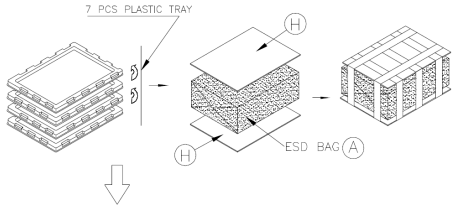
NO.	ITEM NO.	DESCRIPTION	QTY /BOX	BAAN UNIT	BOM DOSAGE	SIZE
K	SPE-12606730AP	PE FOAM SHEET	2	PCS	0.0834	320X170X30
J	SPE-18906730AP	PE FOAM SHEET	2	PCS	0.0834	480X170X30
I	SPE-18915030AP	PE FOAM SHEET	2	PCS	0.0834	480X380X30
H	PLB-15411404AB	PLASTIC SHEET	2	PCS	0.0834	390X290X4.0
E	LBE-102054-01	OUTER BOX LABEL	1	PCS	0.0417	102X54
D	CTN-197157106K	OUTER BOX	1	PCS	0.0417	500X400X270
C	COG-T700F2120-L2	MODULE	24	PCS		167.7X109.45X9.0
B	PLT-17084CWA-01	PLASTIC TRAY	7	PCS	0.2917	420x320X34
A	ESD-700615-01	ESD BAG	1	PCS	0.0417	700X615

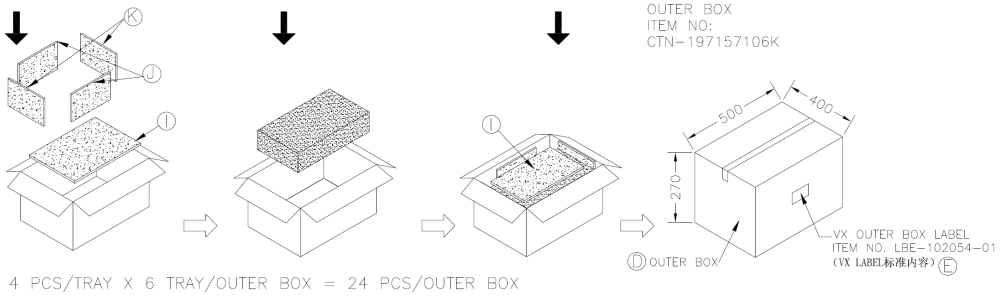
PLASTIC TRAY
ONE TRAY FOR 4 PCS MODULE
ITEM NO.:PLT-17084CWA-01
MATERIAL:TRANSPARENT PET T=1.2mm
PLASTIC TRAY SIZE: 420(L) X 320(W) X 34(H)mm



(DISPLAY SURFACE UPSIDE)
(显示屏朝上)

1. 4 PCS/TRAY X 6 TRAYS/OUTER BOX = 24 PCS/OUTER BOX.
2. EMPTY TRAY ADD ON TOP FOR ANTI-STATIC PURPOSE.
   (最上层吸塑盘为空盘)
3. EACH TRAY SHOULD BE ROTATED 180°.
   (每层吸塑盘需旋转180度摆放)
4. AFTER PUT THE TRAY INTO VACUUM BAG, SEAL THE OPENING BY TRANSPARENT TAPE
   (把吸塑盘装入真空袋后再用透明胶纸封住)
5. EACH BOX SHOULD BEPLACED ONE ANTI-STATIC PLASTIC SHEET ON THE TOP&BOTTOM.
   (每个纸箱之吸塑盘最上面&最下面须各放 1 块防静电胶板)





OUTER BOX
ITEM NO:
CTN-197157106K

1: 4 PCS/TRAY X 6 TRAY/OUTER BOX = 24 PCS/OUTER BOX
2: PUTTING THE PE FOAN SHEET (I) ON THE BOTTOM OF OUTER BOX
   (箱子底部放1片珍珠棉(I))
3: PUT THE TRAYS INTO THE BOX ,PUT THE PE FOAM SHEET (J) & (K) AROUND THE TRAYS
   (把吸塑盘放入外箱，胶盘四周放珍珠棉(J) & (K))
4: THEN PUT THE PE FOAM SHEET (I) ON THE TOP OF THE BOX
   (然后在最上面放1片珍珠棉(I))

TITLE: PACKING DRAWING

3rd ANGLE PROJECTION	UNIT mm	SCALE NOT TO SCALE

	NAME	SIGN	DATE
DRAWN	XU YANWEN		
CHECKED	LIU NANCY		
CHECKED			
APPROVED	TONY CAO		

VARITRONIX LIMITED

MODEL:
COG-T700F2120-L2

DRAWING NO.:
PD-COG-T700F2120-L2

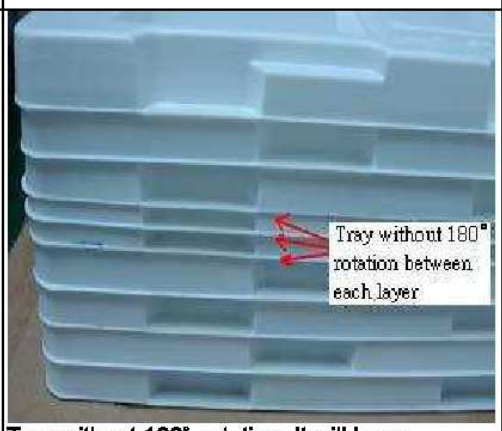
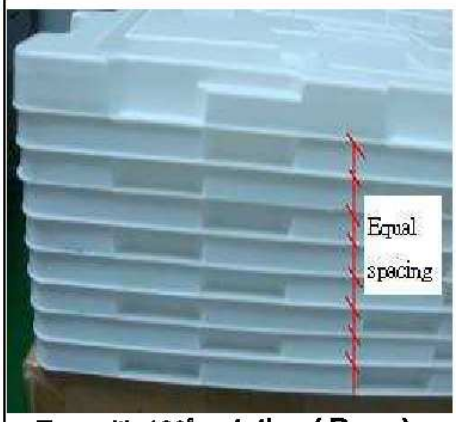
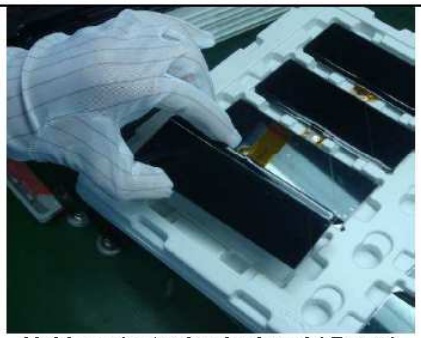
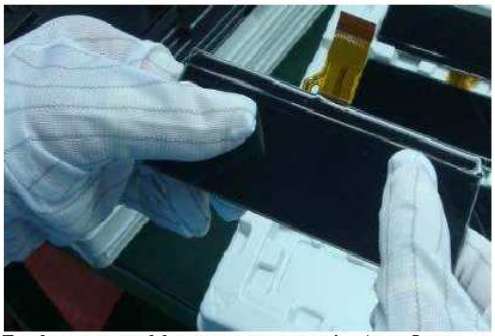
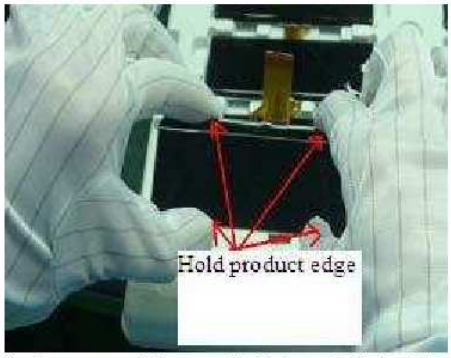
REV	DATE
0	2017.5.16

SHEET 1 OF 1

9. Handling Cautions

9.1 Packing removal and handling requirement

Requirement	Wrong	Correct
Get one package each times & hold the package by both hands with proper ESD shielding	 Hold the modules by one hand and without proper ESD shielding (Fail)	 Hold the modules by both hands (Pass)
Prohibit to stack inner package over 3 layers	 Over 3 layers (Fail)	 Not exceed 3 layers (Pass)
Total packing tray height must within 40 cm	 Over 40 cm (Fail)	 Lower than 40 cm (Pass)

Requirement	Wrong	Correct
Packing tray must rotate 180° in each layer when stack together	 Tray without 180° rotation, It will have pressure on the module (Fail)	 Tray with 180° rotation (Pass)
Prohibit to touch product surface by fingers	 Hold product and touch its surface (Fail)	 Hold product edge by hand (Pass)
During assembly, prohibit to press on product surface by fingers, Must hold the product edges by both hands	 During assembly, press on product surface (Fail)	 During assembly, use both hands to hold Product edge only (Pass)

9.2 Mounting of module

- Please power off the display module before it is disconnected or connected to the application.
- If the connection to the application is not good, following problems may result.
  1. Significant noise on signals between display module and application
  2. Unstable display performance
  3. Parts on the module will be heat up or damaged
- The polarizer is made of soft material and is susceptible to flaw. The display must be handled with care.
- Protective film (Laminator) is applied on surface for protection against scratches and dirts. Please avoid electrostatic charge build-up when peeling off the laminator.

9.3 Precautions in Mounting

- When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- Wipe off water drops or finger grease immediately when found. Prolonged contact with water may cause discoloration or spots.
- The TFT-LCD panel module contains glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- The TFT-LCD panel and IC on module are sensitive to electrostatic discharge; please make sure equipments and operators are properly ground before and during handling.

9.4 Adjusting module

- Adjusting volumes on the rear face of the module have been set to its optimal before shipment. Therefore, do not change any adjusted values. If adjusted values are changed, the display may not perform to specification.

9.5 Others

- Do not expose the module to direct sunlight or intensive ultraviolet rays for prolonged hours
- Store the module at room temperature condition.
- If LCD panel breaks, liquid crystal may escape from the panel. Avoid bringing it to eyes or mouth contact. When liquid crystal sticks on hands, clothes or feet, wash it out immediately with soap.
- Observe all other precautionary requirements as in handling general electronic components.
- Please adjust the voltage of common electrode as materials of attachment by 1 module.
- Do not expose the display module to harmful gases such as acid and alkali gasses, which will corrode electronic components.
- Do not disassemble the display module because it can cause permanent damage and will void the warranty agreement.

10. Definitions

Data sheet status	
Objective Specification	This data sheet contains target or goal specifications for product development.
Preliminary Specification	This data sheet contains preliminary data; supplementary data may be published later.
Product Specification	This data sheet contains final product specification.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating. Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operating of the device at these or any other conditions above those given in the Characteristics sections of the specification is not implied. Expose to limiting values for extended periods may affect device reliability. Device is functional within the limiting conditions doesn't imply the same performance over the covered conditions, customer is required to decide the best range for the final applications.	

11. Life Support Applications

These products are not designed for use in life saving appliances, devices or systems where malfunctioning of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree full non liability of Varitronix Limited for any damages or losses resulting from such improper use or sale.

"Varitronix Limited reserves the right to change this specification."

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