



Product Specification

Part Name: 3.5 inch TFT Display Module

Customer Part ID:

Topovision Part ID: TVT0350K3-I

Ver: A

Customer:
Approved by

From: Topovision Technology Co., Ltd.
Approved by

Notes:

1. Please contact Topovision Technology Co., Ltd. before assigning your product based on this module specification
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Topovision Technology Co., Ltd. for any intellectual property claims or other problems that may result from application based on the module described herein.

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Revision History

[illegible]

Special Notes

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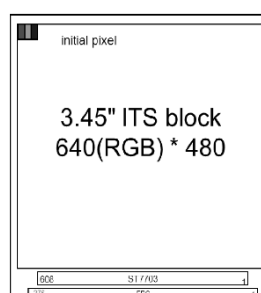
4. General Specifications

TVT0350K3-I is a color active matrix LCD module incorporating amorphous silicon TFT(Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The module contains 640x480 pixels. This product accords with RoHs environmental criterion.

Item	Content	Unit	Note
LCD Type	TFT	/	
Viewing direction	ALL	O'Clock	
Module outline	Refer to outline drawing	mm	1
Active Area(Φ)	70.08(W)*52.56(H)	mm	
Pixel Size	109.5	um	
Number of Dots	640 x 480	dots	2
Controller IC	NV3052	/	
Backlight Typs	6 chips white LEDs	/	
Interface Type	RGB 24bit	/	
F.P.C spec.	0.3	mm	3
Wight	--	g	
Input Voltage	1.8-3.3v	V	
Luminance for LCD	400	Cd/m ²	

Note 1:Refer to the outline drawing,you will find the detailed parameters,including the length,width,thickness

Note 2:Refer the LCD cell Drawing



Note 3:Refer to the outline drawing, Here, can find the size of FPC

5. Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Min	Max	Unit
Power Supply voltage	V _{DD}	-0.3	3.6	V
Logic Signal Input Voltage	V _{DDIO}	-0.3	3.6	V
Operating Temperature	Top	-20	70	°C
Storage Temperature	Tstg	-30	80	°C
High Temp & Hum Operation	60°C 85%RH,240 hrs			/
Thermal shoc (non-operation)	-30°C (30min)~80°C (30min), 50cycle			/

Note . The absolute maximum ratings are the values that must not be exceeded at any time for this product. It is not allowed for any of these ratings to be exceeded. In an extreme case, the product may be permanently destroyed.

6. Electrical Characteristics

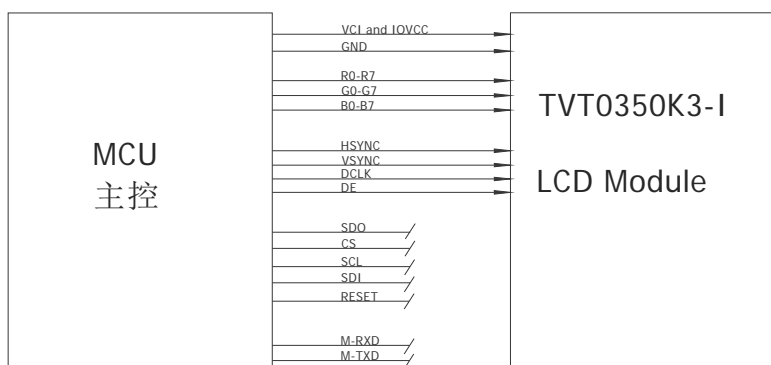
6.1 Typical Operation Conditions

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		V _{DD}	Ta=25℃	2.65	2.8	3.6	V	
Power supply		V _{IOVCC}	Ta=25℃	1.65	1.8	3.6	V	
Input voltage	‘H’	V _{IH}	V _{IOVCC} = 1.8V	0.7 V _{IOVCC}	-	V _{IOVCC}	V	
	‘L’	V _{IL}	V _{IOVCC} = 1.8V	0	-	0.3V _{IOVCC}	V	
Current Consumption		I _{CC1}	Normal mode	-	N/A	-	mA	
		I _{CC2}	Sleep mode	-	N/A	-	mA	

6.2 RGB Interface

The RGB only support the DE mode: HSYNC, VSYNC, DCLK and DE pin .

And We had preset the initialization code in LCM, so you don't need SPI to initialize this module.



In order to work properly, you should set the correct software parameters about resolution and timing parameter .

Below Table provide the timing parameter by Vertical-cycle and Horizontal cycle and PCLK frequency (Resolution for 720/640 horizontal x 1280 vertical display with Frame-Rate of 60Hz)

Parameters	Symbols	Min	Typ	Max	Unit
PCLK Frequency	FPCLK	-	63.61	-	MHz
Horizontal Synchronization	Hsync	2	2	-	PCLK
Horizontal Back Porch	HBP	4	42	-	PCLK
Horizontal Front Porch	HFP	4	44	--	PCLK
Hsync+HBP+HFP	-	58	88	-	PCLK
Horizontal Address(Display area)	HAdr	-	720	-	PCLK
Horizontal cycle	-	778	808	-	PCLK
Vertical Synchronization	Vsync	1	2	-	PCLK
Vertical Back Porch	VBP	4	14	-	PCLK
Vertical Front Porch	VFP	4	16	-	PCLK
Vsync+VBP+VFP	-	-	32	-	PCLK
Vertical Address(Display area)	Vadr	-	1280	-	PCLK
Vertical cycle	-	-	1312	-	PCLK
Frame-Rate			60		Hz

7. Backlight Characteristics

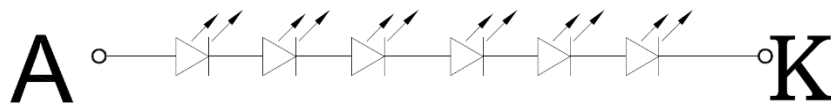
Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Forward voltage	V_f	$I_f=15\text{mA}$	16.8	18	19.2	V	
Forward current	I_{Led}	-		15	20	mA	
Number of LED	--	--		6		pcs	
Life Time	--	--	10000	20000	--	Hrs	Note3
Connection mode	P	--	6 serial			--	

Note 1: I_f is defined for one channel LED. There are total six LED channels in back light unit

Note 2: Optical performance should be evaluated at $T_a=25^\circ\text{C}$ only.

Note 3: I_f 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.



8. Interface Pin Connections

PIN.No	Symbol	Function
1-2	LED-	Backlight LED Ground
3-4	LED+	Backlight LED Power
5	YU	RTP top electrode
6	XR	RTP top right electrode
7	SDO/NC	No Connect; If necessary,please contact sales@topo-vision
8	RESET/NC	No Connect; If necessary,please contact sales@topo-vision
9	CS/NC	No Connect; If necessary,please contact sales@topo-vision
10	SCL/NC	No Connect; If necessary,please contact sales@topo-vision
11	SDI/NC	No Connect; If necessary,please contact sales@topo-vision
12-19	B0-B7	Blue Data Bit0-7
20-27	G0-G7	Green Data Bit0-7
28-35	R0-R7	Red Data Bit0-7
36	HSYNC	Horizontal Sync Input
37	VSYNC	Vertical Sync Input
38	DCLK	Dot Data Clock
39	M-RXD/NC	No Connect; It needs to be suspended
40	M-TXD/NC	No Connect; It needs to be suspended
41	IOVCC	Logic I/O power supply 1.65~3.6V
42	VCC	Power supply for analog circuits 2.5~3.6V
43	YD	RTP Bottom electrode
44	XL	RTP Left electrode
45-51	NC	No connect
52	DE	Data Enable Input
53	DGND	Ground
54	AVSS	Ground

9. Optical Characteristics

(Contrast, RT, viewing angle results are using CPT LC+ EWW Polarizer+ CPT's BLU (2L1D) reference only.) (Note1)

Item		Symbol		Condition	Min	Typ	Max	Unit	Note
Brightness		Bp		$\theta=0^{\circ}, \Phi=0^{\circ}$	320	400	--	Cd/m ²	2
Contrast Ratio		CR			600	800	--	--	3
Response Time		Tr+Tf		$\theta=0^{\circ}, \Phi=0^{\circ}$	--	25	50	ms	4
Viewing Angle	Vertical	U	--	CR≥10	75	85	--	Deg	5
		D	--		75	85	--		
	Horizontal	L	--		75	85	--	Deg	
		R	--		75	85	--		
Color Filter Chroma- cicity									

Note: The parameter is slightly changed by temperature, driving voltage and material

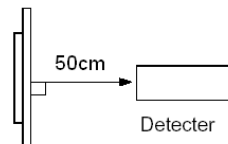
Note 1. Ambient condition: 25°C \pm 2°C, 60 \pm 10%RH, under 10 Lux in the darkroom

Note 2. The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value. Measurement equipment BM-7(TOPCON) (Φ 8mm)

Measuring condition:

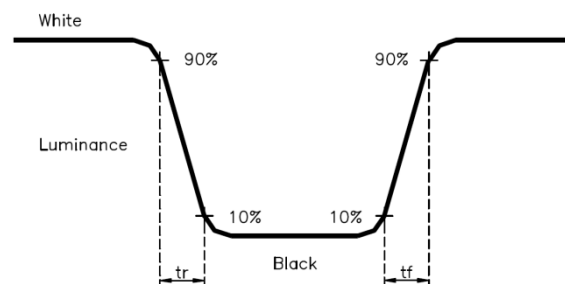
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on

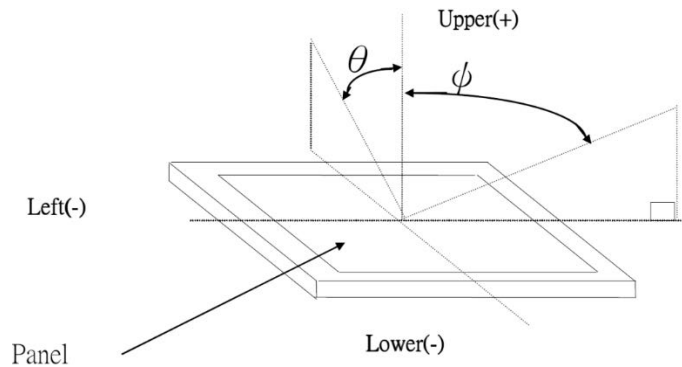


Note 3. Definition of Contrast Ratio: CR=White Luminance(ON)/Black Luminance(OFF)

Note 4. Definition of response time: The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ, Φ)



10. Reliability Test Items and Criteria

No	Test Item	Test Condition	Criterion
1	High Temperature Storage	80°C;240hrs	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30°C;240hrs	
3	High Temperature Operation	70°C;240hrs	
4	Low Temperature Operation	-20°C;240hrs	
5	High Temperature and High Humidity Operation	60°C,90%RH;240hrs	Not allowed cosmetic and electrical defects.
6	Thermal Shock	-30°C +80°C,0.5Hr;200cycles	
7	Vibration Test	10Hz~150Hz,100m/s ² ,120min	
8	Shock Test	Half-sine wave,300m/s ² ,11ms	

NOTE

1. All judgement of display are performed after temperature of panel return to room temperature.
2. Display function should be no change under normal operating condition.
3. Under no condensation of dew.
4. Topovision only guarantee the above 5 test items, and without guarantee the others.

11. Inspection Certeria

11.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

11.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1).

A area : center of viewing area

B area : periphery of viewing area

C area : Outside viewing area

For other defects, dividing two areas to make a judgment (according figure 2).

A zone : Inside Viewing area

B zone : Outside Viewing area

X1(A.A~V.A): 2mm X2(A.A~V.A): 2mm

Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm

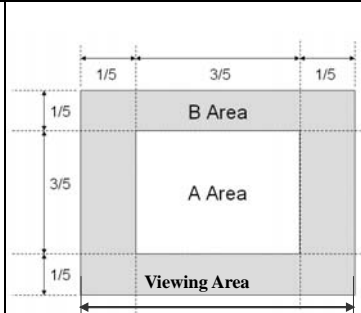


Figure 1

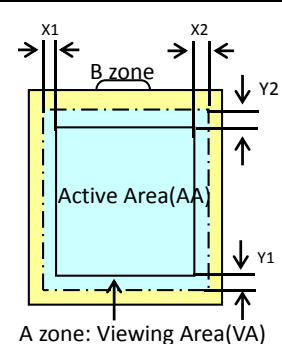


Figure 2

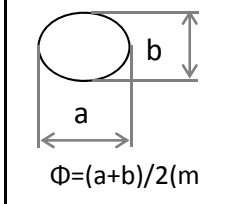
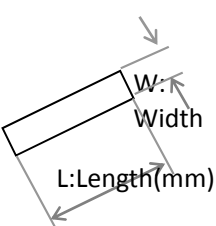
11.3 Inspection items and general notes

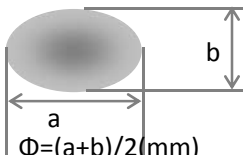

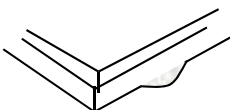
General notes	<p>Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and Topovision Technology Co., Ltd.</p> <p>Viewing area should be the area which Topovision guarantees.</p> <p>Limit sample should be prior to this Inspection standard.</p> <p>Viewing judgment should be under static pattern.</p> <p>Inspection conditions</p> <p>Inspection distance: 250 mm (from the sample) Temperature : 25±5 °C</p> <p>Inspection angle : 45 degrees in 6 o'clock direction (all defects in viewing area should be inspected from this direction)</p>	
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

11.4 Outgoing Inspection level

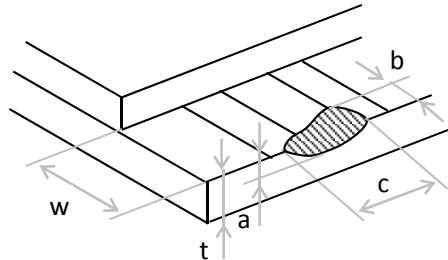
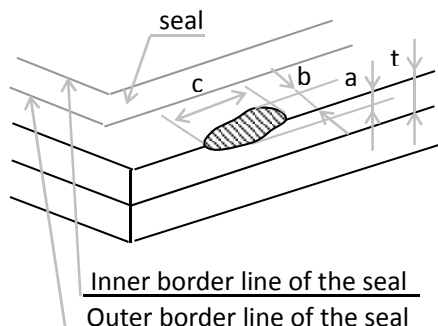
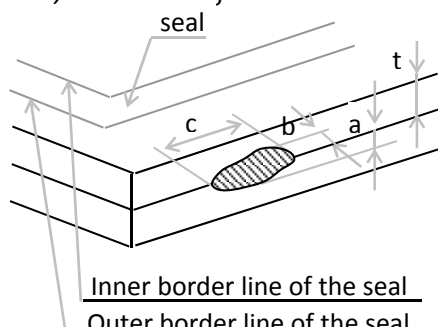
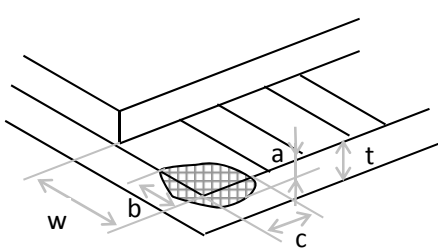
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Outline Dimension	See 13: Outline Drawing	See 13			II	0.065
Position finding Dimension Assemble Dimension	See 13: Outline Drawing	See 13			II	0.065
Note: Sampling standard conforms to GB2828						

11.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	$\Phi \leq 0.10$	Neglected	Neglected
			B	$0.10 < \Phi \leq 0.2$	1	
			C	$0.2 < \Phi$	0	
			D	-	-	
			Total defective point(B,C)		1	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass		A	$W \leq 0.02$	Neglected	Neglected
			B	$0.02 < W \leq 0.03$ $L \leq 1.0$	1	
			C	$0.03 < W \leq 0.05$ $L > 1.0$	0	
			D	$0.05 < W, 1.0 < L$	0	
			Total defective point(B,C)		1	
3	Bright spot		any size		none	none
4	Contrast variation		A	$\Phi < 0.2$	Neglected	Neglected
			B	$0.2 < \Phi \leq 0.3$	2	

			C	$0.3<\Phi\leq 0.4$	1	
			D	$0.4<\Phi$	0	
			Total defective point(B,C)		3	
5	Bubble inside cell		any size		none	none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	$\Phi\leq 0.1$	Neglected	Neglected
			B	$0.1<\Phi\leq 0.2$	1	
			C	$0.2<\Phi$	0	
7	Surplus glass	Stage surplus glass 	$B\leq 0.3\text{mm}$			
		Surrounding surplus glass 	Should not influence outline dimension and assembling.			
8	Open segment or open common		Not permitted			
9	Short circuit		Not permitted			
10	False viewing direction		Not permitted			
11	Contrast ratio uneven		According to the limit specimen			
12	Crosstalk		According to the limit specimen			
13	Black /White spot(display)		Refer to item 1			
14	Black /White line(display)		Refer to item 2			

Inspection items	Judgment standard	
	Category(application: B zone)	Acceptable number

15	Glass defect crack	i)The front of lead terminals	A	$a \leq t, \quad b \leq 1/5W, \quad c \leq 3\text{mm}$	Max.3 defects allowed	
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark		
		ii)Surrounding crack-non-contact side	$b < \text{Inner borderline of the seal}$			
						
		iii) Surrounding crack- contact side	$b < \text{Outer borderline of the seal}$			
						
		iv)Corner	A	$a \leq t, \quad b \leq 3.0, \quad c \leq 3.0$		
			B	Glass crack should not cover patterns u and alignment mark and patterns.		

Inspection items	Judgment standard
	Category(application: B zone)

16	PCB defect	<p>Component soldering:</p> <p>No cold soldering, short, open circuit, burr, tin ball</p> <p>The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1);</p> <p>the sheet component deviation:</p> <p>Pin deviates from the pad and contact with the near components is not permitted (Pic.2)</p>	
		<p>lead defect:</p> <p>The lead lack must be less than 1/3 of its width;</p> <p>The lead burr must be less than 1/3 of the seam;</p> <p>Impurities connect with the near leads is not permitted</p>	
		<p>Connector soldering:</p> <p>Soldering tin is at contact position of the plug and socket is not permitted</p> <p>No foundation is scald</p> <p>Serious cave distortion on plug and socket contact pin is not permitted</p>	
		<p>Glue on root of the speaker receiver and motor lead:</p> <p>The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.</p>	

12. Precautions for Use of LCD Modules

12.1 Handling Precautions

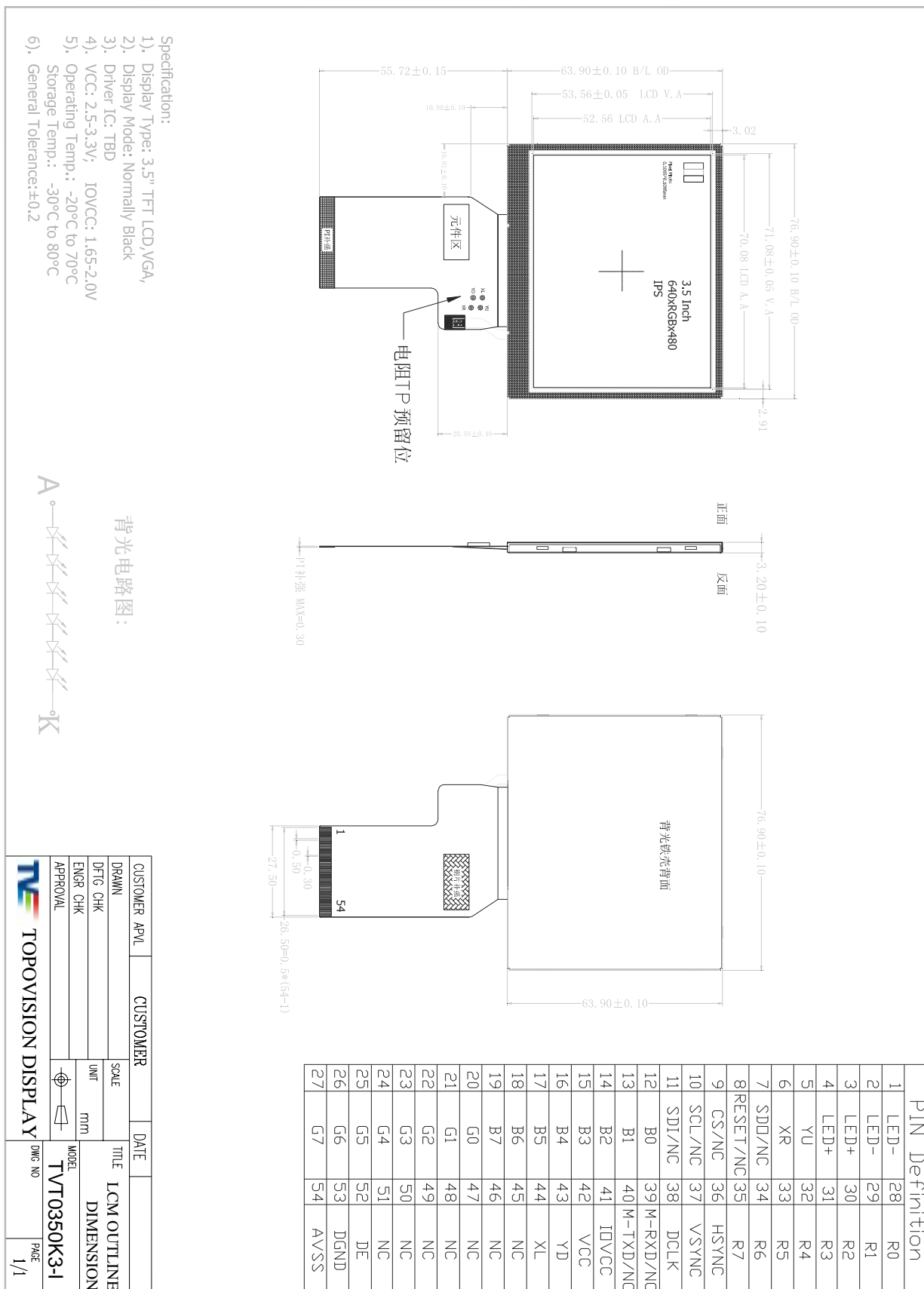
- 12.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 12.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- 12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 12.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 12.1.5 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 alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 12.1.6 Do not attempt to disassemble the LCD Module.
- 12.1.7 If the logic circuit power is off, do not apply the input signals.
- 12.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - a. Be sure to ground the body when handling the LCD Modules.
 - b. Tools required for assembly, such as soldering irons, must be properly ground.
 - c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - d. 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.

12.2 Storage precautions

- 12.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 12.2.2 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°C ~ 35°C
 - Relatively humidity: ≤80%**Remark:** If the LCD modules is covered with Touch Panel, in order to ensure the effectiveness of the protective film, its storage conditions are more harsh, the recommend condition is:
 - Temperature : 20±5°C
 - Relatively humidity: 60%±10%RH
- 12.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

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

13. Outline Drawing



CUSTOMER APVL	CUSTOMER	DATE
DRW		
DTG CHK	SCALE	TITLE
ENR CHK	UNIT	LCM OUTLINE
APPROVAL	mm	DIMENSION
		MODEL
		TVT0350K3-I
		DWG NO
		PAGE
		1/1



TOPOVISION DISPLAY