PALM TECHNOLOGY CO., LTD.

The LCD(M) Specialist

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PART NO. : PT0242432T-C402-J

FOR MESSRS. :

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龐誼科技
13.04.28
發行

ACCEPTED BY : PROPOSED BY :

RECORD OF REVISION

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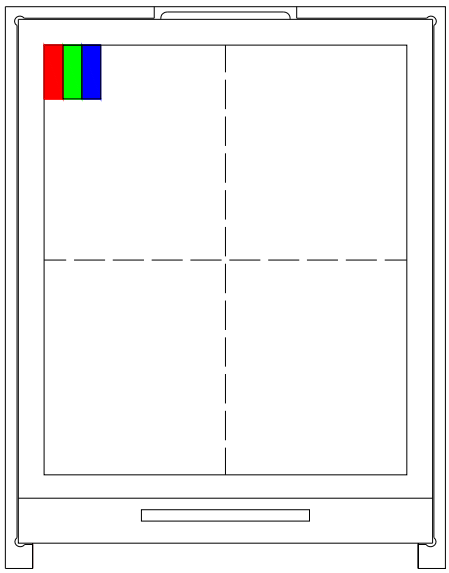
2013/04/28	ALL	-

1. General Description

This LCM PT0242432T-C402-J is a TFT LCD module, comprising a 720-channel source driver, a 320-channel gate driver, 240（RGB）x 320 dots graphic, and power supply circuit. The 262k color can be display.

This TFT-LCD has 2.4 inch diagonally measured active display area with QVGA resolution.



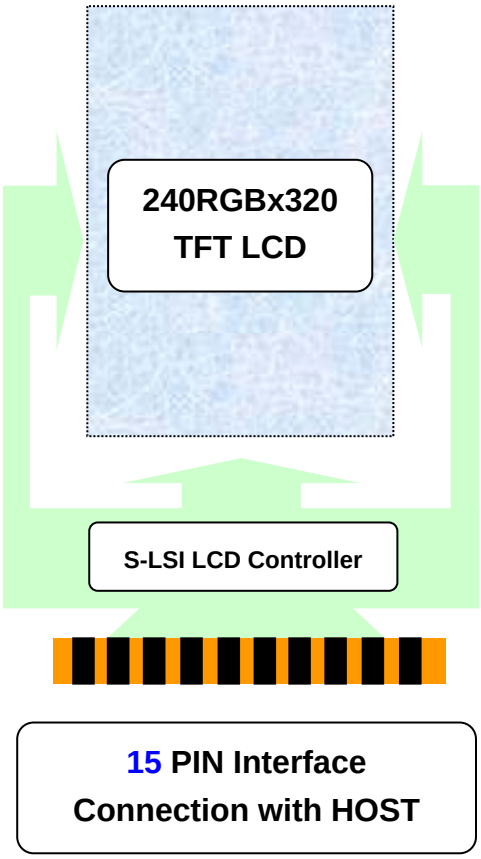
1.1 Mechanical Specifications

Item	Nominal Dimension	Unit
Dot Matrix	240 x RGB x 320	Dots
Module Size (W×H×T)	42.72 x 60.26 x 3.55	mm.
Active Area (W×H)	36.72 x 48.96	mm.
Pixel arrangement	RGB Stripe	mm.
Dot Pitch (W×H)	0.153 x 0.153	mm.
Color depth	262K（MAX）	colors
Interface	3-line SPI	-
Driving IC Package	COG	-

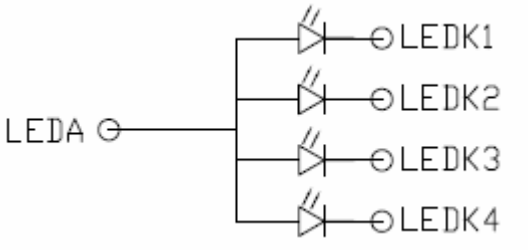
1.2 Display Specifications

Item	Nominal Dimension	Unit
Operating temperature	-20 ~70	℃
Storage temperature	-30~80	℃
LCD Type	a-Si TFT	-
LCD Mode	TN/Normal White	-
Backlight Type	LED x 4	PCS

1.3 Block Diagram



1.4 Back-light Unit



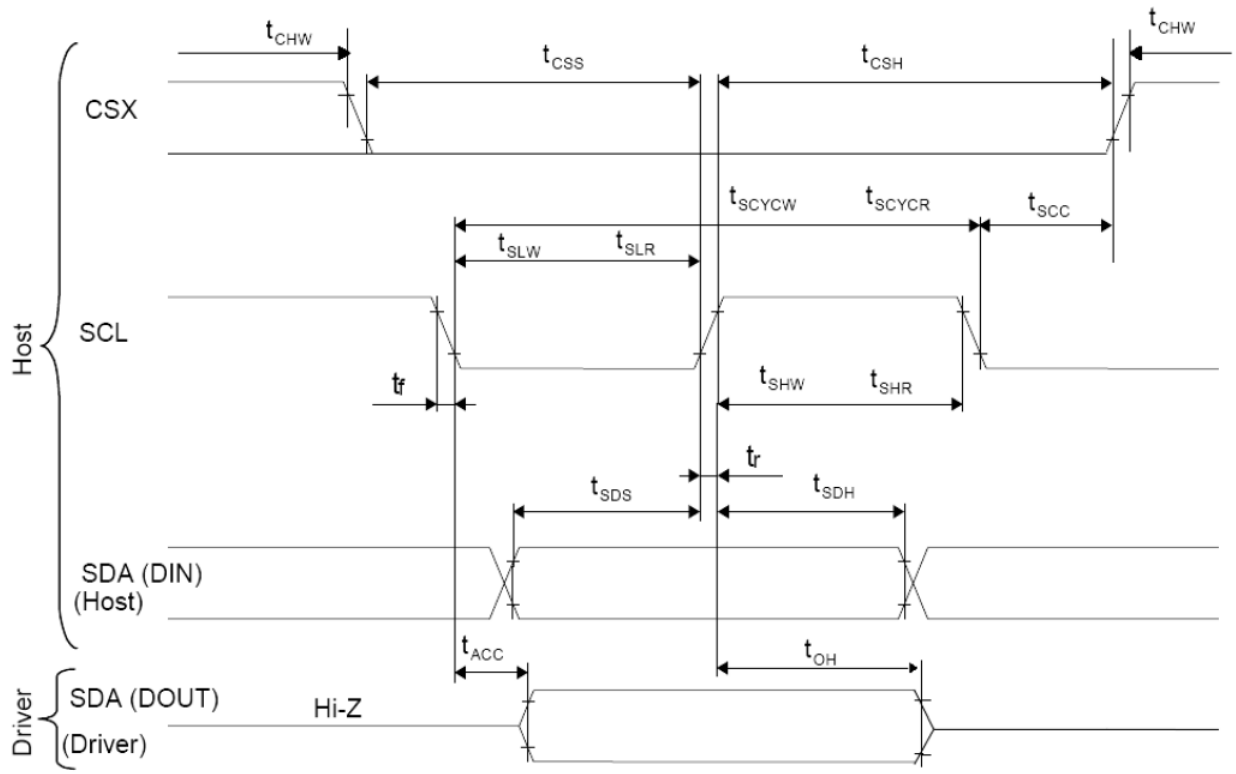
1.5 Touch Panel Characteristics

1. Type:FiIm to GIass(单膜)
2. Operating VoItage:≤10V
3. operation Temperature:-10℃～60℃
   Storage Temperature:-20℃～70℃
4. Connect MateriaI:FPC
5. Response Time:≤15ms
6. Linearity:≤1.5%
7. Transmittance: ≥80%
8. Surface Hardness≥3H(Pencil)
9. operation force:≤100g
10. Resistance:
    (Clear ard ITOFiIm)x:100Ω～600Ω
    (Stand ard ITOGIass)y:300Ω～900Ω

1.6 Interface Pin

Pin No	Pin Symbol	Level	Description
1	CSX	0V	Chip select
2	SDA	H/L	SPI data
3	SCL	H/L	SPI clock
4	YD	-	Touch panel bottom
5	XR	-	Touch panel right
6	YU	-	Touch panel top
7	XL	-	Touch panel left
8	VCC	2.8-3.2V	Power supply
9	LEDA	-	LED light, anode
10	LEDK1	-	LED light, cathode.
11	LEDK2	-	LED light, cathode.
12	LEDK3	-	LED light, cathode.
13	LEDK4	-	LED light, cathode.
14	RESET	H/L	Reset signal
15	GND	0V	Ground

2. Interface Timing



Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Supply voltage for System	VCC	+1.65	+3.6	V
Supply voltage for Interface Operation	VCC	+1.65	+3.6	V
Operate temperature range	TOP	-20	70	℃
Storage temperature range	TST	-30	80	℃

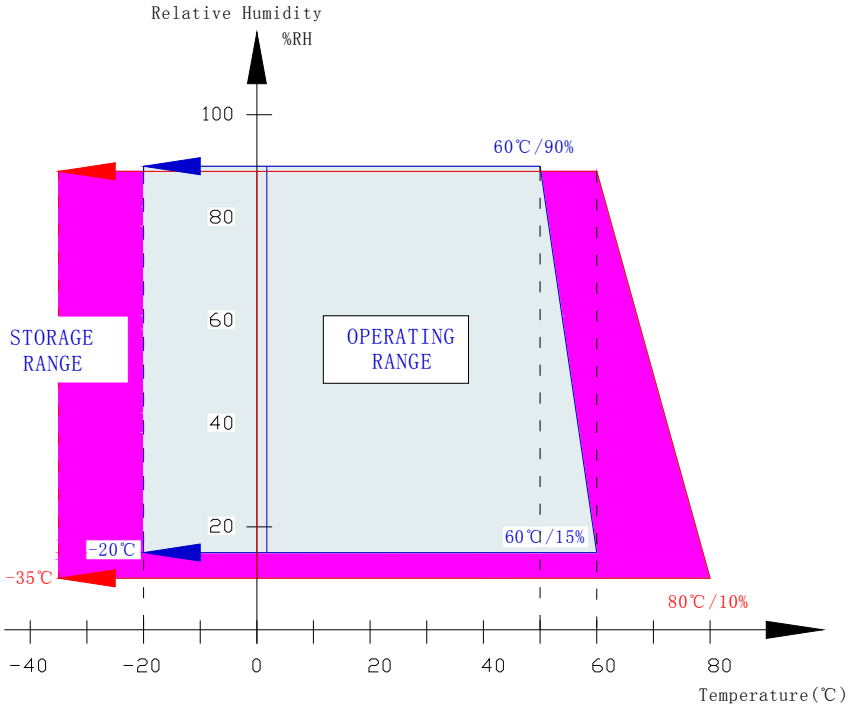
Note:

(1) 90%RH maximum humidity, 60℃ maximum wet-bulb temperature When operated at a temperature lower than 0℃,the LCD worked slowly and the screen appeared low-contrast images due to the characteristics of LC(Liquid Crystal).

(2) If any fixed pattern is displayed on LCD for minutes, image-sticking phenomenon may occur.

(3) Degradation could occur to pixels' TFT when DC BIOS is input into its gate-signal under POWER OFF WAITING STAND-BY & SLEEP MODE. Therefore, LCD should be turn off then.

(4) Please operate a LCD module on the basis of the recommended S/W(Register)



Temperature & Ilumidity Graph at Absolute Environment

DATA). If you want to change any part of the S/W, you must take driver's confirmation.

3.2 DC Characteristics

T_a= 25℃

Item	Symbol	Min	Typ	Max	Unit	Condition
Supply voltage for System	VCC	2.5	2.8	3.3	V	
Supply voltage for Interface Operation	VCC	2.5	2.8	3.3	V	
Input high level voltage	V_{IH}	0.8VDD	--	VDD	V	
Input low level voltage	V_{IL}	0	--	0.2VDD	V	
Power supply current	I_{CC}+ I_{CI}	--	TBD	--	mA	
Backlight forward voltage	V_F	2.8	3.2	3.6	V	
Backlight forward current	I_F	--	80	--	mA	
Backlight Uniformity	Avg	80	85	--	%	

4. Optical characteristics

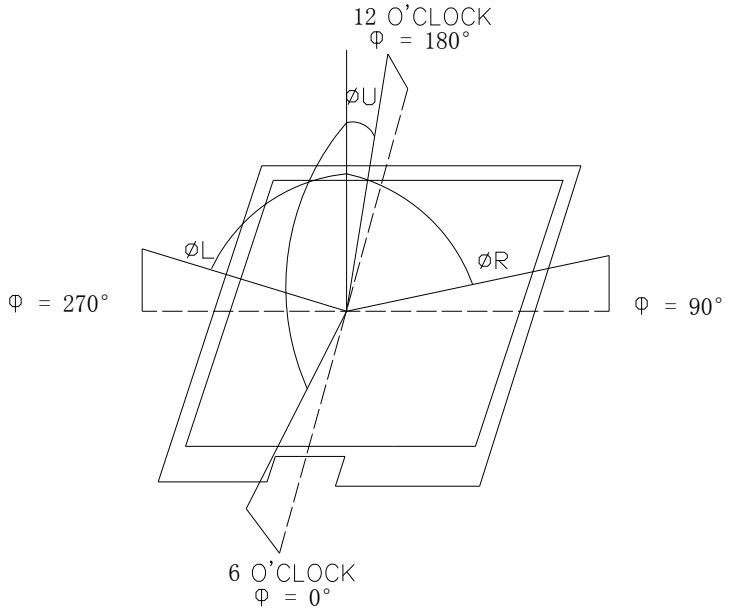
Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing angle		Left	CR≥10		45		Degree	(2)
		Right			45		Degree	
		Up			45		Degree	
		Down			20		Degree	
Color Chromaticity	Red	Rx	θ=0 Normal viewing angle	0.592	0.612	0.632	-	Color Chromaticity
		Ry		0.309	0.329	0.349	-	
	Green	Gx		0.279	0.299	0.319	-	
		Gy		0.547	0.567	0.587	-	
	Blue	Bx		0.124	0.144	0.164	-	
		By		0.090	0.110	0.130	-	
	White	Wx		0.288	0.308	0.328	-	
		Wy		0.305	0.325	0.345	-	
Contrast ratio		CR	optimal	-	250		-	(1)
Response time		Tr+Tf			30		ms	(3)
Luminance on surface If=80mA		Lv	Normally θx = θy = 0	250	350		cd/m^2	

Note (1) Definition of contrast ratio

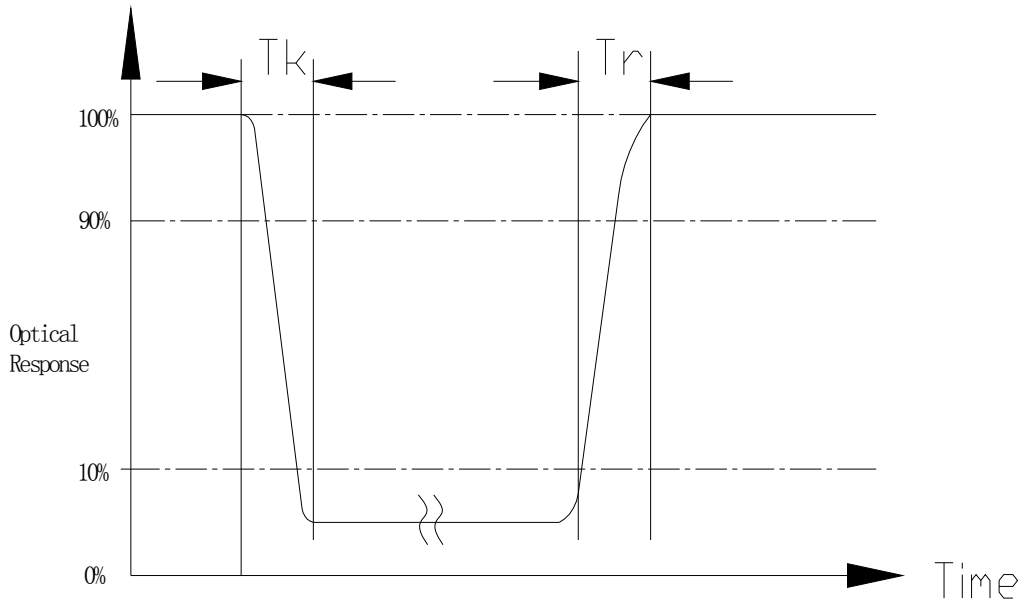
Measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixel white}}{\text{Luminance with all pixel black}}$$

Note (2) Definition of viewing angle



Note (3) Definition of response time: Tr+Tf



5. Reliability

5.1 Reliability Condition

*One single product test for only one item.

* Judgment after test: keep in room temperature for more than 2 hours.

Item No	Item	Condition	Remark
1	High temperature Operating	60℃, 120Hours	Finish product (With polarizer)
2	Low temperature Operating	-10℃, 120 Hours	Finish product (With polarizer)
3	High temperature Storage	70℃, 200 Hours	Finish product (With polarizer)
4	Low temperature Storage	-20℃, 200 Hours	Finish product (With polarizer)
5	High temperature & humidity Storage	50℃, 90%RH, 120 Hours	Finish product (With polarizer)
6	Thermal Shock Storage (No operation)	-10℃ , 30min.<=> 60℃ , 30min. 10 Cycles	Finish product (With polarizer)
7	ESD test	Voltage:±8KV R:330 ohm,C:150pF Air discharge,10 times	Finish product (With polarizer)
8	Vibration test	10 => 55 =>10 => 55 => 10 Hz, within 1 minute;Amplitude:1.5mm. 15 minutes for each Direction (X,Y,Z)	Finish product (With polarizer)
9	Drop test	Packed, 100CM free fall 6 sides, 1 corner, 3edges	Finish product (With polarizer)

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function: work normally

5.2 Inspection plan

Class	Item	Judgment	Class
Packing & Indicate	1.Outside and inside package	〝Model no.〞 , 〝lot no.〞 and 〝quantity〞 Should indicate on the package.	Minor
	2.Model mixed and quantity	Other model mixed…….rejected. Quantity short or over….rejected.	Critical
	3.Product indication	〝Model no.〞 should indicate on the product	Major
Assembly	4.Dimension,LCD glass scratch And scribe defect	According to specification or drawing	Major
Appearance	5.Viewing area	Polarizer edge or LCD's sealing line is visible in the viewing area …..rejected	Minor
	6.Blemish、black spot、 White spot in the LCD And LCD glass cracks	According to standard of visual inspection（inside viewing area）	Minor
	7. Blemish、black spot White spot and scratch on the polarizer	According to standard of visual inspection（inside viewing area）	Minor
	8.Bubble in polarizer	According to standard of visual inspection（inside viewing area）	Minor
	9.LCD's rainbow color	Strong deviation color（or Newton ring） of LCD ……rejected. Or according to limited sample （if needed, and inside viewing area）	Minor
	10.FPC	Burned area or wrong part number is on FPC. The symbol, character, and mark of FPC are unidentifiable. The stripped solder mask, A>1.0mm 0.3mm < stripped solder mask or visible circuit, A<1.0mm,and the number is ≧4 pieces. Particle between circuits in solder mask.. Circuit is peeled off or cracked. Any circuit risen or exposed. 0.2mm< Area of solder ball, A is ≦0.4mm,the number of solder ball is ≧3 pieces. The magnitude of solder ball, A is>0.4mm.	Minor

5.3 Standard of visual inspection

Class	Item	Judgment	Class
Electrical	11.Electrical and optical characteristics （contrast、VOP、chromaticity…etc）	According to specification or drawing. （inside viewing area）	Critical
	12.Missing pattern	Missing dot、line、character…..rejected	Critical
	13.Short circuit、wrong pattern display	Non display、wrong pattern display、current consumption out of specification……rejected	Critical
	14.Pin hole、pattern deformity	According to standard of visual inspection	Minor
	15.Black spot、white spot、black line、white line、slant line、background uneven、color uneven	Strong deviation color…..rejected Or according to limited sample full off screen（all black）…disregards	Minor
	16.Stick image （retention image）	Fixed test picture within two hours…rejected	Minor

Class: Minor

Item:
- Blemish、black spot、white spot in the LCD.
- Blemish、black spot、white spot and scratch on th polarizer

Judgment:

（A） Round type: unit: mm

Diameter（mm.）	Acceptable Q'ty
0.2<A	0

Note: A=（Length +Width）/ 2

（B） Liner type: unit: mm

Length	Width	Acceptable Q'ty
---	W≦0.03	Disregard
L≦5	0.03＜W≦0.05	3
L≦5	0.05＜W≦0.07	1
---	0.07＜W	Follow round type

Class: Minor

Item: Bubble in polarizer

Judgment: unit: mm

Diameter	Acceptable Q'ty
A≦0.3	Disregard
0.3＜A≦0.5	1
0.5＜A	0

Class: Minor

Item: Pin hole、Pattern deformity

Judgment: unit: dot size

Diameter	Acc. Q'ty
0.4<Φ	0

6. Precaution

6.1 Handling

(1) Protect the panel from static, it may cause damage to the CMOS Gate Array IC.

(2) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(3) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(4) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(5) Pins of I/F connector shall not be touched directly with bare hands.

(6) Refrain from strong mechanical shock and / or any force to the panel. In addition to damage, this may cause improper operation or damage to the panel.

(7) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.

(8) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.

(9) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

6.2 Storage

(1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the panel with temperature from 0 to 35℃ and relative humidity of less than 70%.

(2) The panel shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

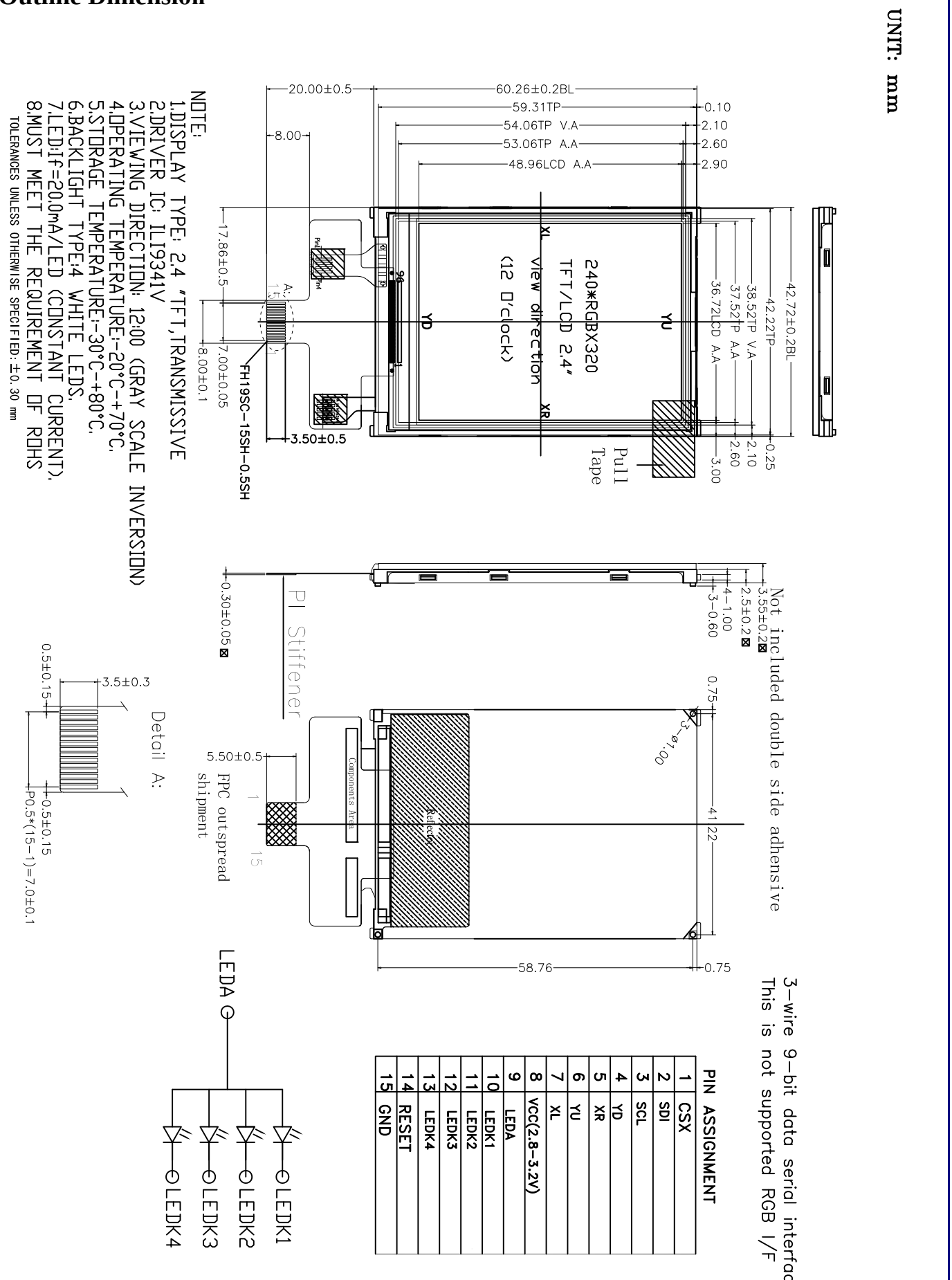
6.3 Operation

(1) The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.

(2) Do not exceed the absolute maximum rating value. (the supply voltage variation, Input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.

(3) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image" Sticks" to the screen.

7. Outline Dimension



8. Packing method

8.1 Packing Quantity (TBD)

8.2 Flowing chart (TBD)