

---

---

# Product Specification

Part Name: 3.50 inch TFT Display Module  
Element Touch ID: TLET0350S2-I ( IPS )

Customer:
Approved by



## **1. Introduction**

### **1.1 Scope of application**

This specification applies to the LCD module that is supplied by ELEMENT TOUCH TECHNOLOGY. This LCD module should be designed for mobile phone use.

LCD specification: Dots 320xRGBx240.

As to basic specification of the driver IC, refer to the IC (Sitronix:ST7272A) specification and data book.

All material & processing of the LCD module should be Lead Free.

### **1.2 TFT features:**

Structure: TFT PANNEL+IC +FPC1+BL;

IPS Type LCD

320 dot-segment and 240 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

RGB 24 bit interface

### **1.3 Applications:**

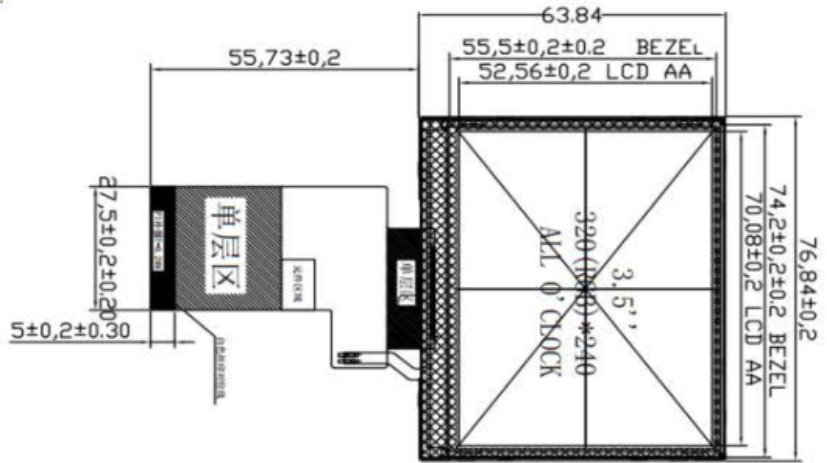
Mobile phone

MID

## 2. LCM General specification

<b>ITEM</b>	<b>Standard value</b>	<b>Unit</b>
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	320*3RGB(H)X240(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (W*H)	0.219(H) x0.219 (V)	mm
Active area	70.08(H) x 52.56(V)	mm
Module Size(W*H*T)	76.84 x 63.84 x3.27	-
Viewing direction	ALL O'CLOCK	
TFT Driver IC	ST7272A	-
TFT interface	SPI_24BIT RGB Interface	-
Approx. Weight	TBD	g
Touch structure		
Touch Driver IC		-
Touch Interface		
TP+LCM Size(W*H*T)		

### SPI\_24BITRGB接口



背光电路原理图  
BACKLIGHT CIRCUIT DIAGRAM

- NOTES:
1. DISPLAY TYPE: 3.5", 320\*240TFT LCD
  2. DISPLAY MODE: transmissive Normally Black
  3. VIEWING DIRECTION: ALL O'clock
  4. DRIVER IC: ST7272A
  5. LCM (White 9 AVG 1/6) :  
Brightness: TBDcd/m<sup>2</sup> (TYP)  
Uniformity: 80%(MIN)
  6. BACK LIGHT: 6 chip white LEDs If=20mA/LED, Vf=18-19.6V
  7. OPERATING TEMP: -20° C TO 70° C, STORAGE TEMP: -30° C TO 80° C
  8. \* Critical Parameter, ( ) ref Parameter, [ ] cpk Parameter  
Unspecified Tolerances: ±0.20mm
  9. SUGGESTION: TP window size unilateral increase 0.3~0.5mm than LCM A.A
  10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS

REV	DESCRIPTION	DATE
00	First Issue	2018-04-14
01		

1	LCM
2	LCM
3	LCM
4	LCM
5	LCM
6	LCM
7	LCM
8	LCM
9	LCM
10	LCM
11	LCM
12	LCM
13	LCM
14	LCM
15	LCM
16	LCM
17	LCM
18	LCM
19	LCM
20	LCM
21	LCM
22	LCM
23	LCM
24	LCM
25	LCM
26	LCM
27	LCM
28	LCM
29	LCM
30	LCM
31	LCM
32	LCM
33	LCM
34	LCM
35	LCM
36	LCM
37	LCM
38	LCM
39	LCM
40	LCM
41	LCM
42	LCM
43	LCM
44	LCM
45	LCM
46	LCM
47	LCM
48	LCM
49	LCM
50	LCM
51	LCM
52	LCM
53	LCM
54	LCM
55	LCM
56	LCM
57	LCM
58	LCM
59	LCM
60	LCM
61	LCM
62	LCM
63	LCM
64	LCM
65	LCM
66	LCM
67	LCM
68	LCM
69	LCM
70	LCM
71	LCM
72	LCM
73	LCM
74	LCM
75	LCM
76	LCM
77	LCM
78	LCM
79	LCM
80	LCM
81	LCM
82	LCM
83	LCM
84	LCM
85	LCM
86	LCM
87	LCM
88	LCM
89	LCM
90	LCM
91	LCM
92	LCM
93	LCM
94	LCM
95	LCM
96	LCM
97	LCM
98	LCM
99	LCM
100	LCM

CUSTOMER APVL	CUSTOMER	DATE	
DRAWN	SCALE	TITLE	LCM OUTLINE DIMENSION
DFTG CHK	UNIT		
ENGR CHK	MM		
APPROVAL	MODEL		
	TLET0350S2-I	DWG NO	
ELEMENT TOUCH		PAGE	1/1

### 3. Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T <sub>OPR</sub>	-20	+70	°C
LCM Storage Temperature	T <sub>STG</sub>	-30	+80	°C
TP Operating Temperature & Humidity(20% ~ 90%RH)	T <sub>OPR</sub>			°C
TP SStorage Temperature & Humidity(20% ~ 90%RH)	T <sub>STG</sub>			°C
Humidity	RH	-	90	%

### 4. Electrical Characteristics

#### 4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for I/O	VDDIO	3.0	--	3.6	V
Supply Voltage for(DC/DC)	VDD	3.0	3.3	3.6	V
Supply Voltage for(DC/DC)	AVDD				V
Supply Voltage for(DC/DC)	AVEE				V
Current Consumption	I <sub>DD</sub>	-	TBD	-	mA
	I <sub>DD-SLEEP</sub>		TBD		uA

#### 4.3 Back-Light Unit Characeristics

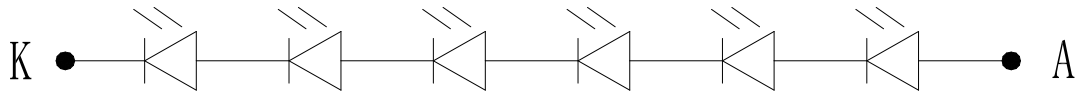
The back-light system is an edge-lighting type with 6 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V <sub>F</sub>	18	--	19.6	V	-
Forward current	I <sub>F</sub>	--	20	-	mA	-
Luminance(With LCD)	L <sub>V</sub>		400	--	cd/m <sup>2</sup>	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

- (1) The “LED life time” is defined as the module brightness decrease to 50% of original brightness at  $I_L=20\text{mA/LED}$ . The LED life time could be decreased if operating  $I_L$  is larger than 25mA/LED.

Backlight circuit diagram shown in below:



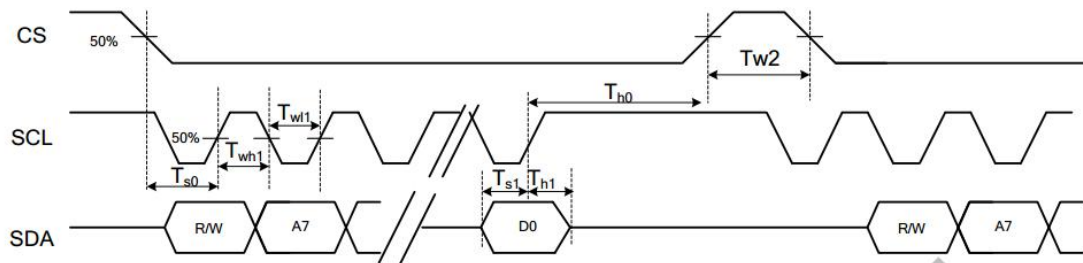
## 5. Module Function Description

### 5.1 LCM Pin Descriptions

Pin No.	Symbol	Description
1-2	LEDK	POWER SUPPLY- FOR BACKLIGHT CATHODE
3-4	LEDA	POWER SUPPLY+ FOR BACKLIGHT ANODE
5-7	NC	NC
8	RESET	RESET
9	SEKB	3-WIRE COMMUNICATION ENABLE.
10	SPCK	3-WIRE COMMUNICATION CLOCK INPUT. RISING EDGE LATCH.
11	SPDA	3-WIRE COMMUNICATION DATA INPUT/OUTPUT.
12-35	DB0-DB23	24-BIT MODE: BGR
36	HSYNC	Horizontal sync. Signal in RGB I/F
37	VSYNC	Vertical sync. Signal in RGB I/F
38	DCLK	Pixel clock signal in RGB I/F
39-40	NC	NC
41-42	VDD	POWER SUPPLY (2.8V)
43-47	NC	NC
48	XR	XR
48	YD	YD
50	XL	XL
51	YU	YU
52	DE	Data enable signal in RGB I/F mode 1
53	GND	GND
54	GND	GND

## 6. Timing Characteristics

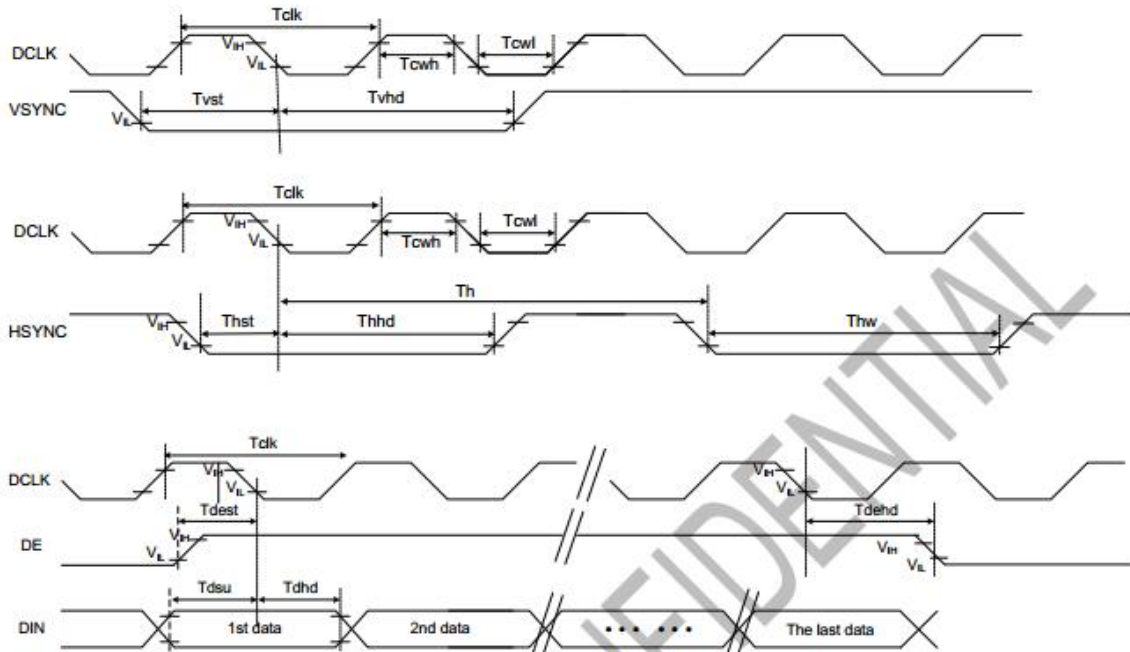
### System Bus Timing for 3-Wire SPI Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	$T_{s0}$	50	-	-	ns	
Serial Data Input Setup Time	$T_{s1}$	50	-	-	ns	
CS Input Hold Time	$T_{h0}$	50	-	-	ns	
Serial Data Input Hold Time	$T_{h1}$	50	-	-	ns	
SCL Write Pulse High Width	$T_{wh1}$	50	-	-	ns	
SCL Write Pulse Low Width	$T_{wl1}$	50	-	-	ns	
SCL Read Pulse High Width	$T_{rh1}$	300			ns	
SCL Read Pulse Low Width	$T_{rl1}$	300			ns	
CS Pulse High Width	$T_{w2}$	400	-	-	ns	



### System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	$T_{clk}$	40	50	60	%	
HSYNC Width	$T_{hw}$	2	-	-	DCLK	
HSYNC Period	$T_h$	55	60	65	us	
VSYNC Setup Time	$T_{vst}$	12	-	-	ns	
VSYNC Hold Time	$T_{vhhd}$	12	-	-	ns	
HSYNC Setup Time	$T_{hst}$	12	-	-	ns	
HSYNC Hold Time	$T_{hhhd}$	12	-	-	ns	
Data Setup Time	$T_{dsu}$	12	-	-	ns	
Data Hold Time	$T_{dhhd}$	12	-	-	ns	
DE Setup Time	$T_{dest}$	12	-	-	ns	
DE Hold Time	$T_{dehd}$	12	-	-	ns	

**Parallel 24-bit RGB Input Timing Table**

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Input Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
DCLK Frequency	Fclk	5	6	8	MHz		
DCLK Period	Tclk	125	167	200	ns		
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

## 7.Optical Characteristics

Items	Symbol	Condition	Specifications			Unit	
			Min.	Typ.	Max.		
Contrast Ratio	CR		-	800	-	-	
Response Time	T <sub>R</sub>		-	10	-	ms	
	T <sub>F</sub>		-	10	-	ms	
Chromaticity	Red	X <sub>R</sub>		/		-	
		Y <sub>R</sub>		/		-	
	Green	X <sub>G</sub>		/		-	
		Y <sub>G</sub>		/		-	
	Blue	X <sub>B</sub>		/		-	
		Y <sub>B</sub>		/		-	
	White	X <sub>w</sub>		0.28	0.31	0.34	-
Y <sub>w</sub>			0.29	0.32	0.35	-	
Viewing angle	Hor.	φ1(3 o'clock)	Center CR≥10	-	80	-	deg.
		φ2(9 o'clock)		-	80	-	
	Ver.	θ2(12 o'clock)		-	80	-	
		θ1(6 o'clock)		-	80	-	
Uniformity				----		%	

All left side data are based on Topovision product reference only

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

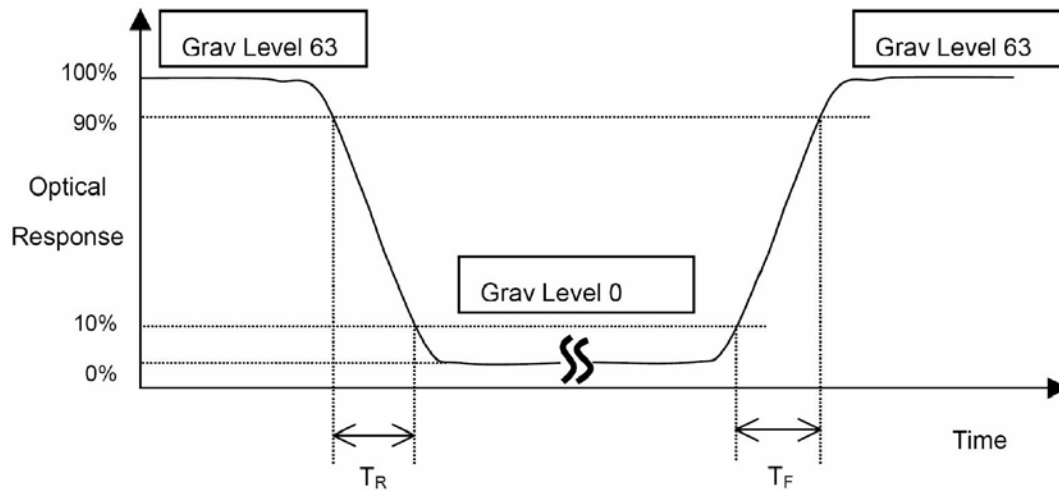
L63: Luminance of gray level 63

L0: Luminance of gray level 0

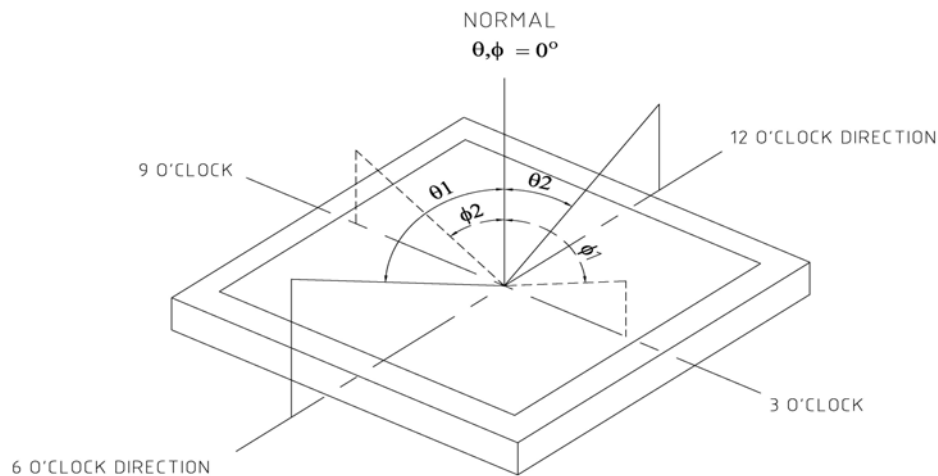
CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

Note 2: Definition of Response Time ( $T_R$ ,  $T_F$ ):



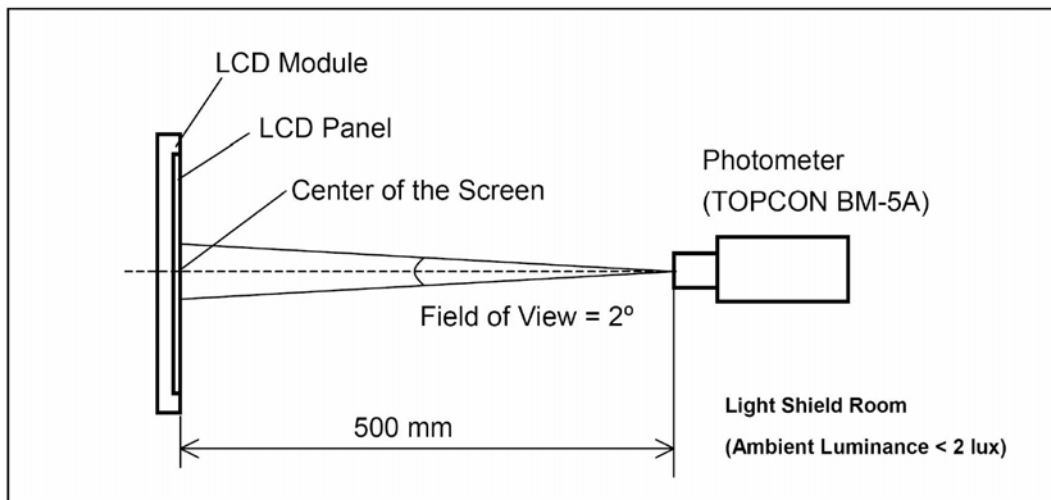
Note 3: Viewing Angle



The above “Viewing Angle” is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the “Viewing Angle” by applying Wide View Film.

Note 4: Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



## 8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+80°C / 24H	1. Functional test is OK. Missing Segment, short, unclear segment non-display, display abnormally and liquid crystal leakage are un-allowed.
2	Low Temp. Storage	-30°C / 24H	
3	High Temperature Operating	+70°C / 16H	
4	Low Temperature Operating	-20°C / 16H	
5	High Temperature / Humidity storage	50±5°C x 90%RH / 48H	2. No low temperature bubbles, end seal loose and fall, frame rainbow.
6	Thermal and cold shock	Static state, -30°C (1 hour) ~ 80°C (1 hour) ~ -30°C (1 hour), packaging, 10 cycles	
7	Vibration Test	Frequency: 10Hz~55Hz Amplitude: 1.0mm, 2 hours for each direction of X, Y	1. Function test is OK.
8	Dropping test	Pack products into the carton box. Drop it from 80cm height to ground. Once for each side of the carton	2. No glass crack, chipped glass, end seal loose and fall, epoxy frame crack and so on. 3. No structure loose and fall

## 9. Packing Method----TBD

- END -