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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

TFT Display Module

Part Number

E70RB-FS400-N

Overview

7.0" TFT: 800x480 (156.4x104.59), LVDS, All View, Special Temperature Range, Operating Temp: -30°C-85°C, Storage Temp: -40°C-90°C, Transmissive, No touch panel, 400 nits, RoHS Compliant. Controller: SC5004/SC5005

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 7.0'TFT-LCD contains 800X480 pixels, and can display up to 65K/262K/16.7M colors.

* Features

-Low Input Voltage: 3.3V(TYP)
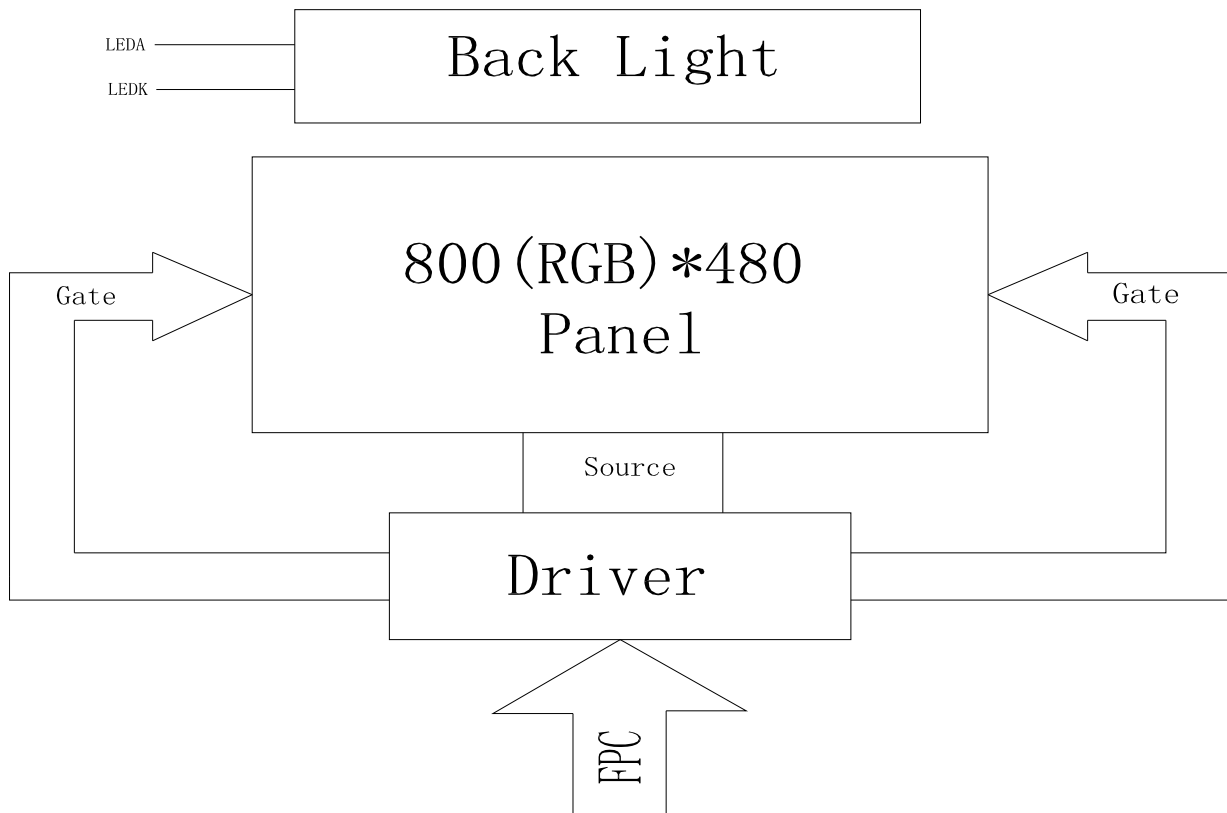
-Display Colors of TFT LCD: 65K/262K/16.7M colors

Interface: 6/8BIT LVDS

General Information Items	Specification Main Panel	Unit	Note
Display area(AA)	152.40(H) *91.44(V) (7.0inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	800(RGB)*480	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1905(H) x 0.1905 (V)	mm	-
Viewing angle	ALL	o'clock	-
TFT Controller IC	SC5004/SC5005	-	-
Display mode	Transmissive/Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-40～+90	℃	-

* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		165.40		mm	-
	Vertical(V)		104.59		mm	-
	Depth(D)		5.8		mm	-
Weight			TBD		g	-

1. Block Diagram

```
LEDA ─────┌─────────────────────────────┐
          │          Back Light          │
LEDK ─────└─────────────────────────────┘

          ┌─────────────────────────────┐
  Gate ──▶│        800(RGB)*480          │◀── Gate
          │           Panel              │
          └─────────────────────────────┘
                   Source
              ┌──────────────┐
              │    Driver     │
              └──────────────┘
                     ▲
                    FPC
```

Note: The upper case window must be smaller than the LCD UP POL shape of 0.3mm or more to prevent the POL white side!

7.0"TFT
800(RGB)*480
ALL Sighi

Pin	Name
1	NC
2	VDD
3	VDD
4	NC
5	RESET
6	STBYB
7	GND
8	RXIN0-
9	RXIN0+
10	GND
11	RXIN1-
12	RXIN1+
13	GND
14	RXIN2-
15	RXIN2+
16	GND
17	RXCLKIN-
18	RXCLKIN+
19	GND
20	RXIN3-
21	RXIN3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	NC
28	SELB
29	NC
30	GND
31	LED-
32	LED-
33	L/R
34	U/D
35	XR
36	YD
37	XL
38	YU
39	LED+
40	LED+

NOTES:
1. DISPLAY TYPE: 7.0", TFT-LCD, 16.7M COLORS
2. DISPLAY MODE: Normally Black
3. VIEWING DIRECTION: ALL
4. DRIVER IC: IC:SC5004(Source),SC5005(Gate)
5. INTERFACE: 6/8 BIT LVDS
6. VDD: 3.3V
7. OPERATING TEMP: -30°C TO 85°C
   STORAGE TEMP: -40°C TO 90°C
8. BACK LIGHT: LED WHITE, 27 LED, 180mA, 9.9±0.3V
9. RoHS COMPLIANT.

L/R	1	Set left to right scan direction
L/R	0	Set right to left scan direction.
U/D	0	Set top to bottom scan direction
U/D	1	Set bottom to top scan direction

SELB	Input data format selection
0	8-bit mode
1	6-bit mode

B1 CIRCUIT DIAGRAM

FocusLCDs.com LCDs MADE SIMPLE®

DRAWING NAME: E70RB-FS400-N
PARTS NO.
TOLERANCE()
TOLERANCE UNLESS: X.X±0.3
OTHERWISE SPECIFIED: X.XX±0.2
Drawn, Checked, Approve
Unit mm
Scale 1:1 Page 1/1

3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC		
2	VDD	Supply voltage(3.3V).	P
3	VDD	Supply voltage(3.3V).	P
4	NC		
5	RESET	Reset pin. The chip is in reset state when RESETB=0.	I
6	STBYB	Standby mode setting pin. The chip is in standby mode when STBYB=0.	I
7	GND	Ground.	P
8	RXIN0-	- LVDS differential data input	I
9	RXIN0+	+ LVDS differential data input	I
10	GND	Ground.	P
11	RXIN1-	- LVDS differential data input	I
12	RXIN1+	+ LVDS differential data input	I
13	GND	Ground.	P
14	RXIN2-	- LVDS differential data input	I
15	RXIN2+	+ LVDS differential data input	I
16	GND	Ground.	P
17	RXCLKIN-	- LVDS differential clock input	I
18	RXCLKIN+	+ LVDS differential clock input	I
19	GND	Ground.	P
20	RXIN3-	- LVDS differential data input	I
21	RXIN3+	+ LVDS differential data input	I
22	GND	Ground.	P
23	NC		
24	NC		
25	GND	Ground.	P

26	NC		
27	NC		
28	SLEB	Input data format selection. SLEB=0, 8-BIT SLEB=1, 6-BIT	I
29	NC		
30	GND	Ground.	I
31	LED-	LED Cathode	P
32	LED-	LED Cathode	P
33	L/R	Horizontal shift direction (source output) selection(NOTE1)	I
34	U/D	Vertical shift direction (gate output) selection(NOTE1)	I
35	XR	Touch panel Right Glass Terminal	A/D
36	YD	Touch panel Bottom Film Terminal	A/D
37	XL	Touch panel LIFT Glass Terminal	A/D
38	YU	Touch panel Top Film Terminal	A/D
39	LED+	LED Anode	P
40	LED+	LED Anode	P

NOTE1

L/R	1	Set left to right scan direction
L/R	0	Set right to left scan direction.
U/D	0	Set top to bottom scan direction
U/D	1	Set bottom to top scan direction

4. LCD Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$	--	1000	--		2
Response time	Rising	$T_{R+}T_F$	Normal viewing angle	--	35	40	msec	3
	Falling			--				
Color gamut		S(%)		--	70	--	%	
Color Filter Chromacicity	White	W_X		0.287	0.307	0.347		
		W_Y		0.306	0.346	0.386		
	Red	R_X		0.619	0.639	0.659		
		R_Y		0.318	0.338	0.358		
	Green	G_X		0.307	0.327	0.347		
		G_Y		0.558	0.578	0.598		
	Blue	B_X		0.123	0.143	0.163		
		B_Y		0.047	0.067	0.087		
Viewing angle	Hor.	Θ_L	CR>10	--	85	--		
		Θ_R		--	85	--		
	Ver.	Θ_U		--	85	--		
		Θ_D		--	85	--		
Option View Direction			Free					

Note (2) Definition of Contrast Ratio (CR) :

measured at the center point of panel

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

Note (3) Definition of Response Time : Sum of T_R and T_F
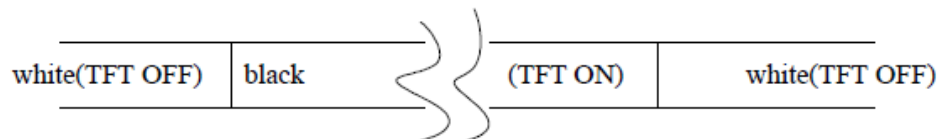
Optical response
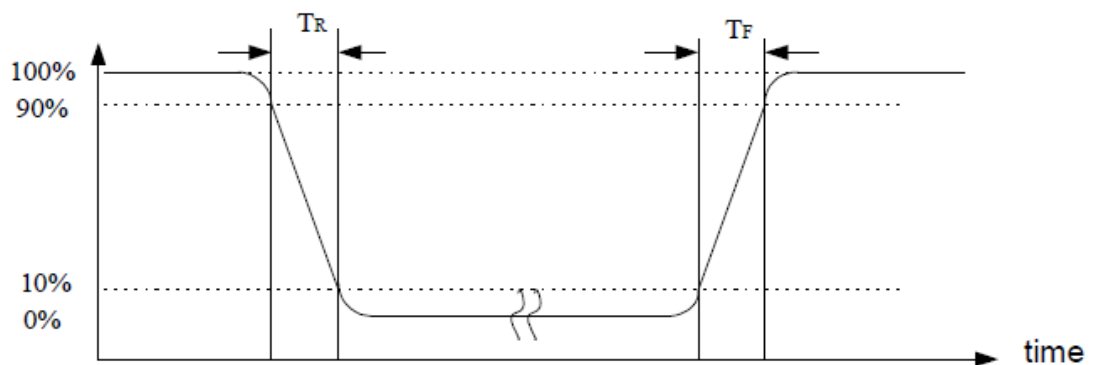
5. Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	4.0	**V**
Operating temperature	T_{OP}	-30	+85	℃
Storage temperature	T_{ST}	-40	+90	℃

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Digital Supply current	IDD	--	190	--	mA	
Level input voltage	V_{IH}	0.7VDD	-	VDD	V	
	V_{IL}	GND	-	0.3VDD	V	
Level output voltage	V_{OH}	0.8VDD	-	VDD	V	
	V_{OL}	GND	-	0.2VDD	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 27 chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	170	180	--	mA	
Forward Voltage	V_F	--	9.9	--	V	
LCM Luminance	L_V	350	400	--	cd/m2	Note3
LED life time	Hr	50000	--	--	Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at

Ta=25℃ and IL=180mA. The LED lifetime could be decreased if operating IL is larger than 180mA. The

constant current driving method is suggested.
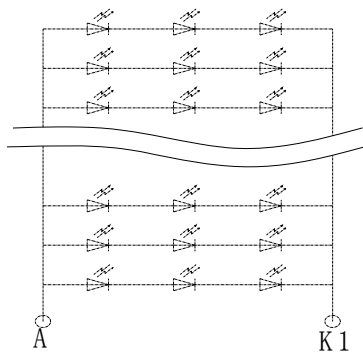
NOTE 3：Luminance Uniformity of these 9 points is defined as below:
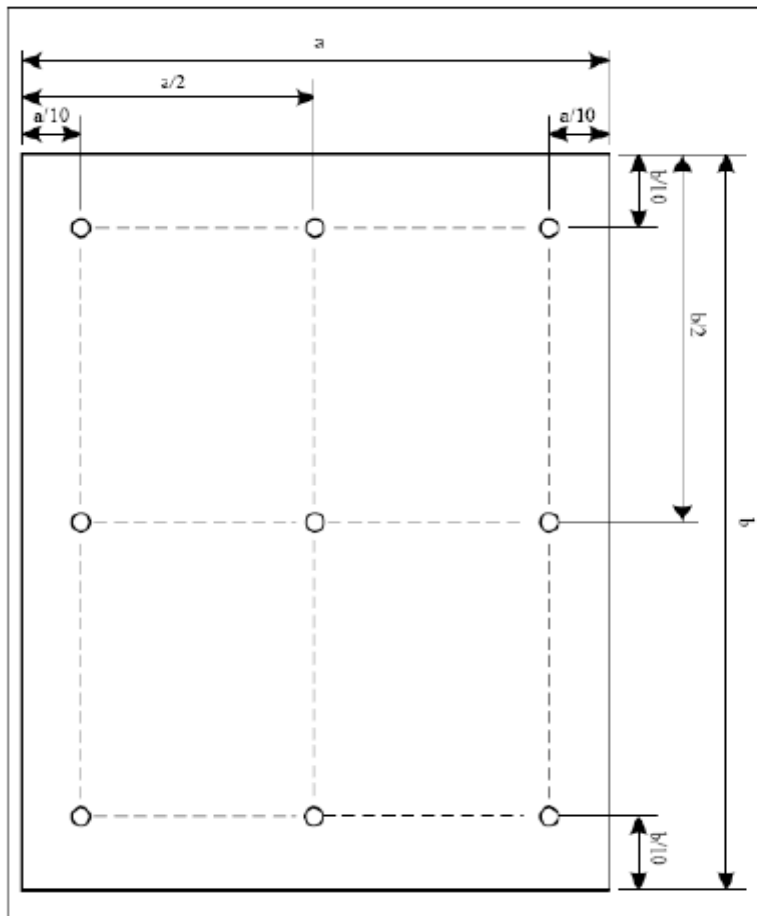
$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. AC Characteristic

6.1 LVDS receiver characteristic
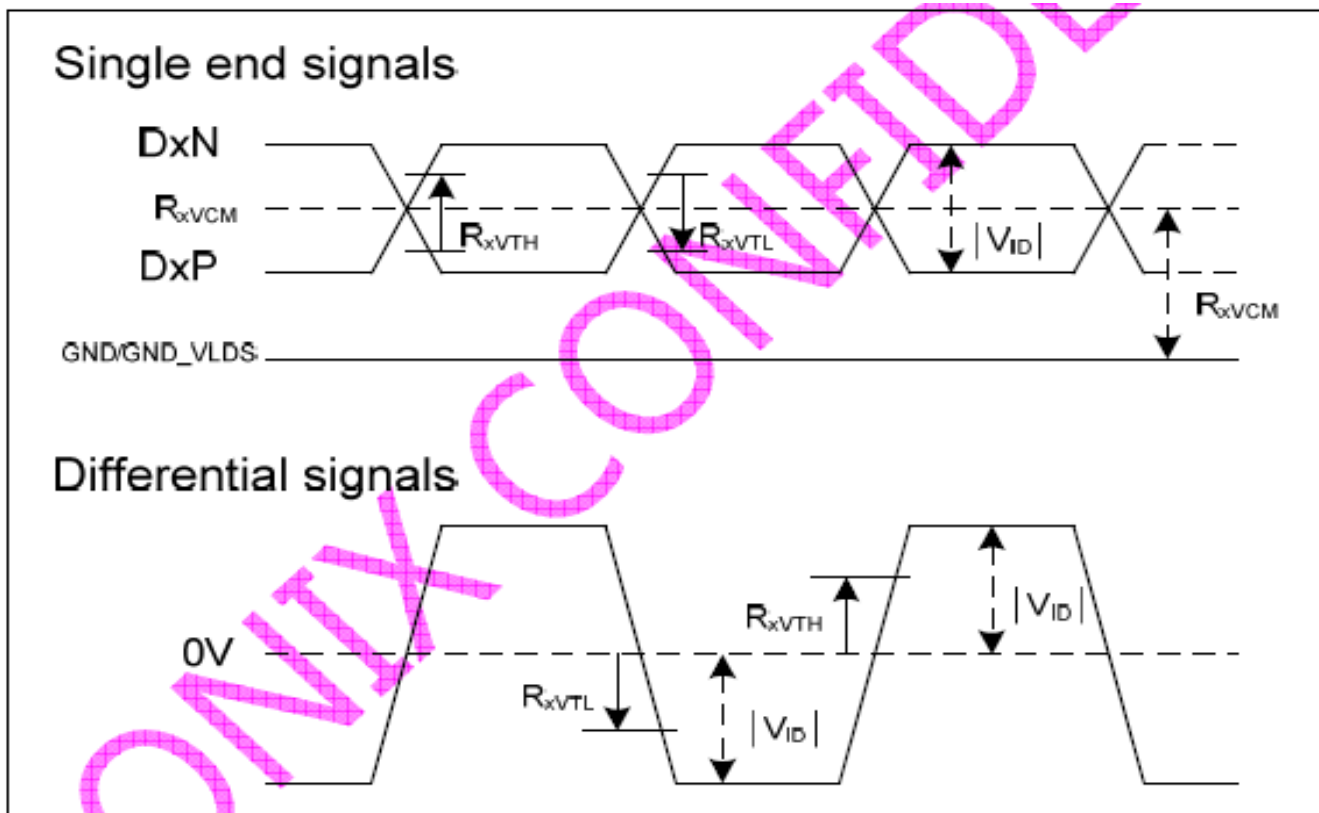
LVDS AC characteristic (VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-20~85℃)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Clock Frequency	R_{xFCLK}	20		80	MHz	
Input data skew margin	T_{RSKM}	400			ps	$|V_{ID}|$ = 400mV, R_{xVCM}=1.2V R_{xFCLK}=80MHz
Clock high time	T_{LVCH}		4/(7xR_{x}FCLK)		ns	
Clock low time	T_{LVCL}		3/(7xR_{x}FCLK)		ns	
PLL wake-up time	TenPLL			150	us	

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Differential input high threshold voltage	R_{xVTH}			0.1	V	R_{xVCM} = 1.2V
Differential input low threshold voltage	R_{xVTL}	-0.1			V	
Input voltage range (singled-end)	R_{xVIN}	0		VDD-1.0	V	
Differential input common mode voltage	R_{xVCM}	$|V_{ID}|$/2		2.4-$|V_{ID}|$/2	V	
Differential input voltage	$|V_{ID}|$	0.2		0.6	V	
Differential input leakage current	RV_{xliz}	-10		10	uA	
LVDS Digital Operating Current	I_{VDD_LVDS}	-	10	15	mA	F_{CLK}=65 MHz , VDD_LVDS=3.3V Data pattern=55/H → AA/H (loop)
LVDS Digital Stand-by Current	I_{STBD_LVDS}	-	10	50	uA	RSTB=0 or STBYB=0 All functions are stopped CLKx & D0x connect to GND

T_{RKSM} : Receiver strobe margin
R_{SPOS} : Receiver strobe position
T_{SW} : Strobe width(internal DATA sampling window)
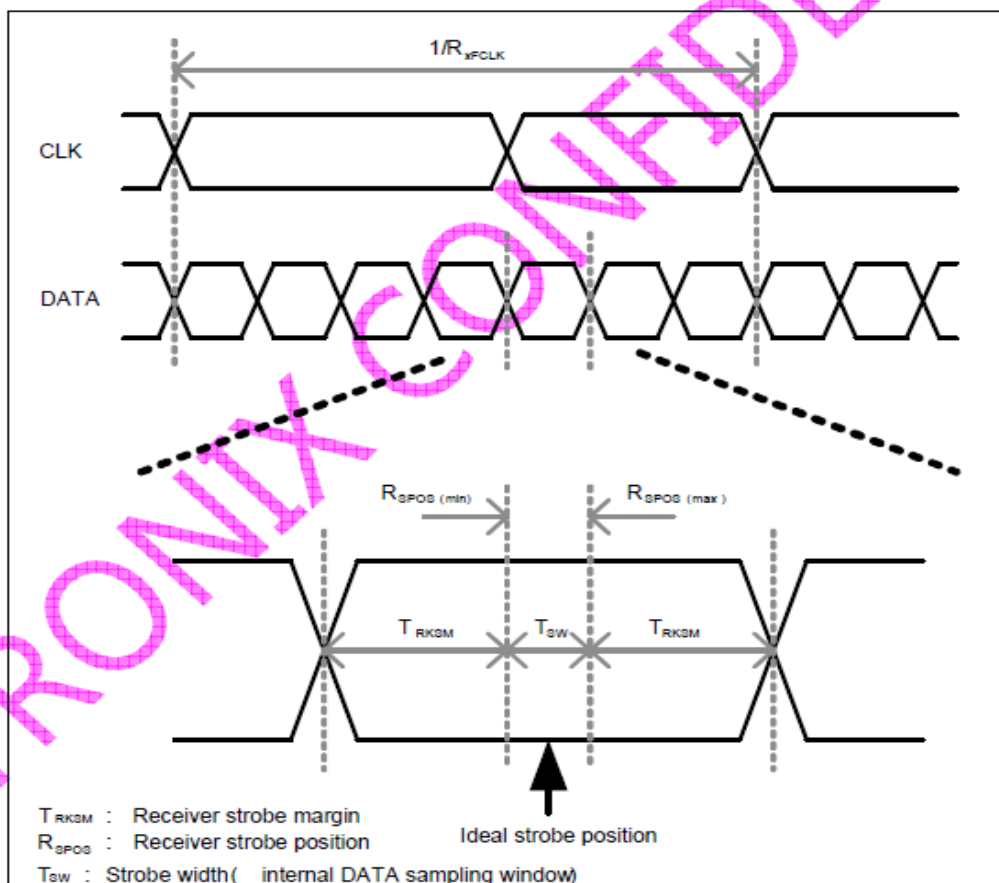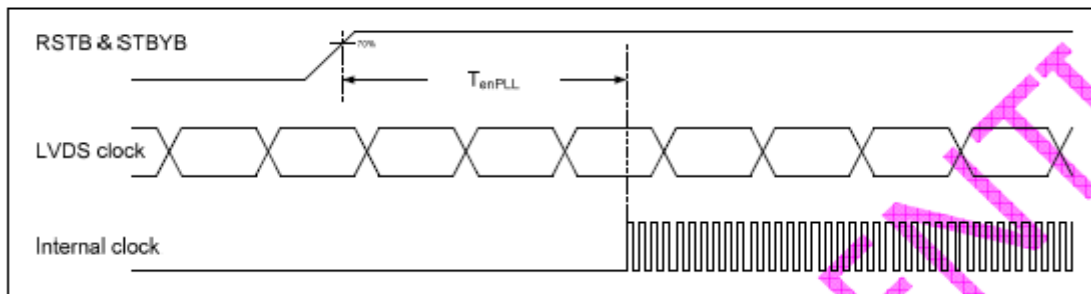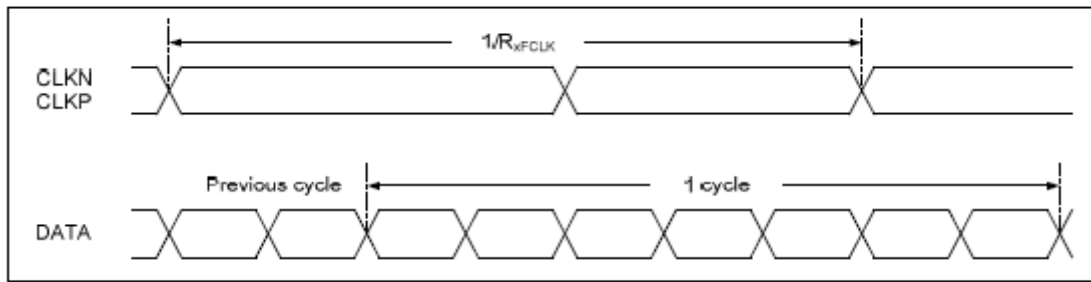
Spread Spectrum Clocking (SSC) tolerance of LVDS receiver

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Modulation frequency	SSC_{MF}			100	kHz	
Modulation rate	SSC_{MR}			+/-3	%	R_{xFCLK}=70MHz

6.2 Power on/off Sequence

For TFT-LCD module, please follow below timings to prevent IC damage from abnormal power on or off sequence.

Power on/off Sequence

$T1 \leq 3ms$

$1\,ms \leq T2$

$3.5\,ms \leq T3 \leq IBF\text{-}50\,ms$

$IBF\text{+}20\,ms \leq T3 + T4$

$0 < T5$

$20\,ms \leq T6 \leq 50\,ms$

$120\,ms \leq T7$

$120\,ms \leq T8$

$200\,ms \leq T9$
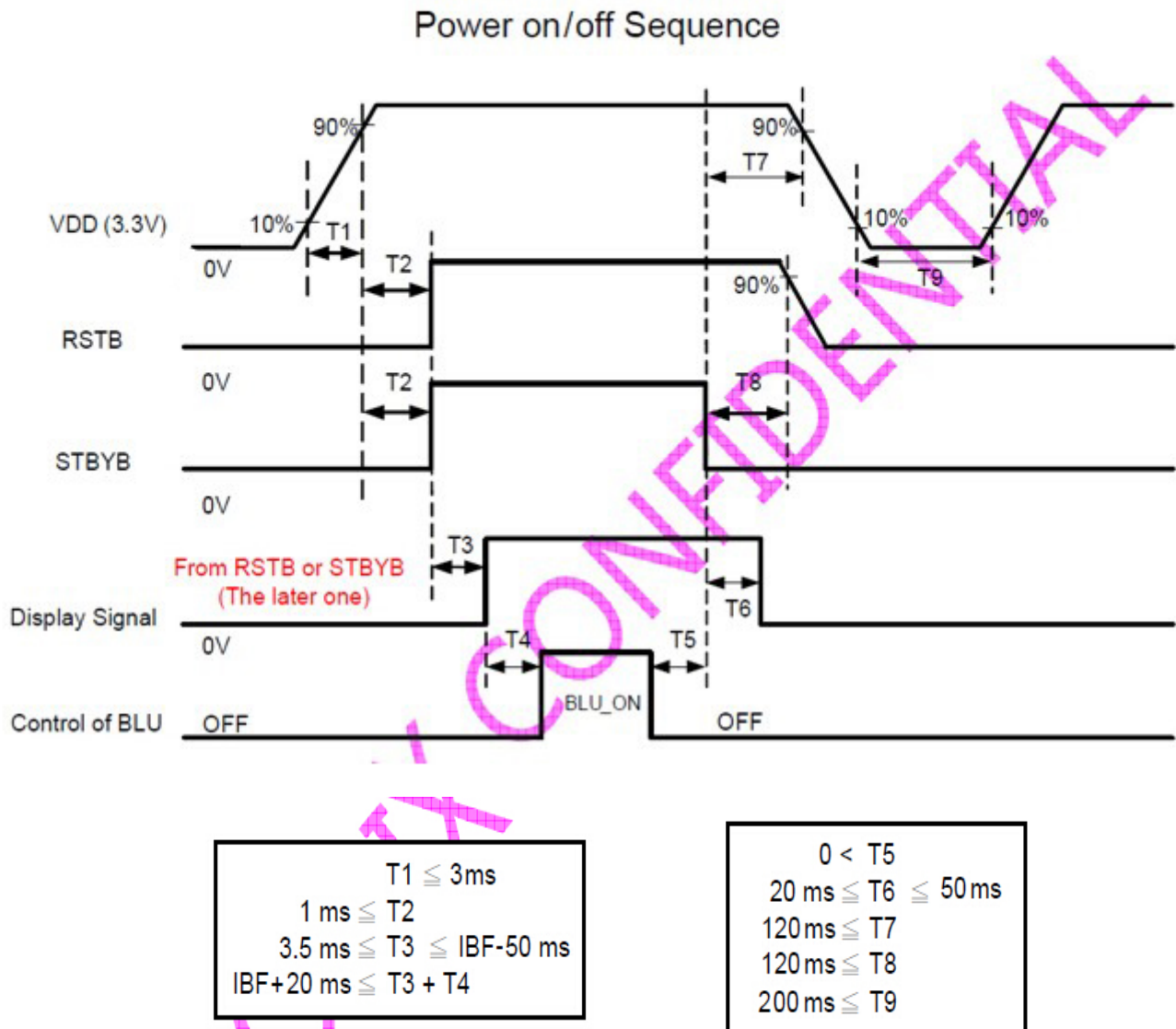
For continuously power off and on, please make sure the external VDD, VGH & VGL are discharged completely before you restart it.

Note that IBF is STSC5004's internal timing frames, selected by registers. Please refer to register list for detail.

7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

Temperature : 25±5℃

Humidity :   65%±10%RH

Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm
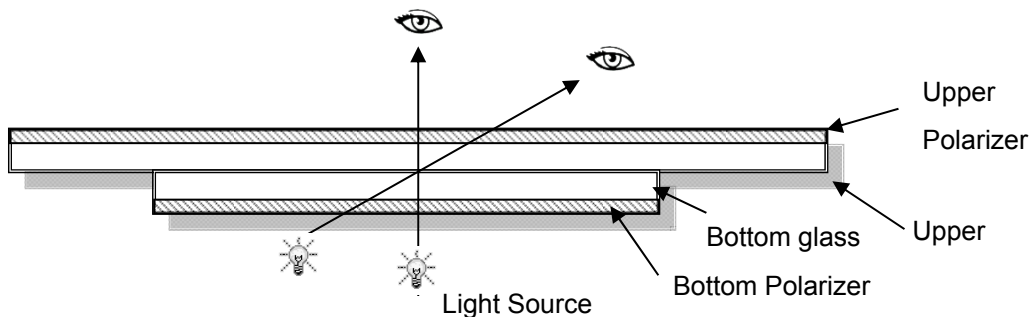
7.1.2 Definition
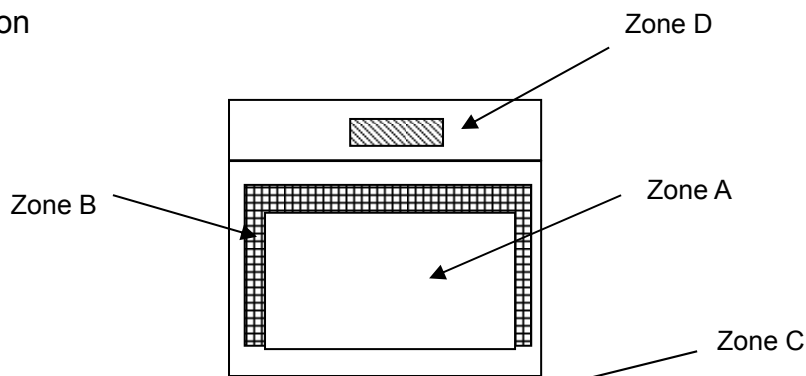
Zone A : Effective Viewing   Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance

after assembly by customer

7.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ

AQL:
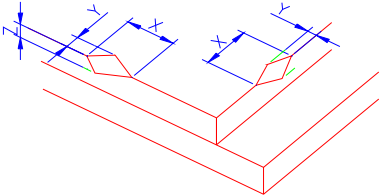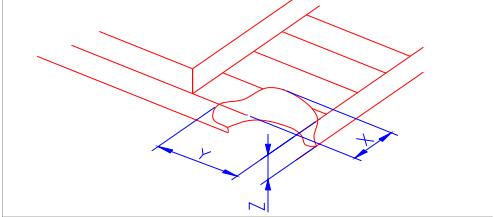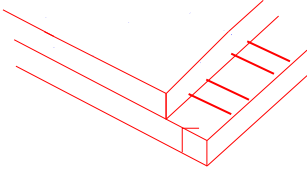
Major defect	Minor defect
0.65	1.5
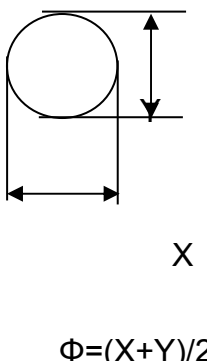
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot，Dim spot,Polarizer　Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	
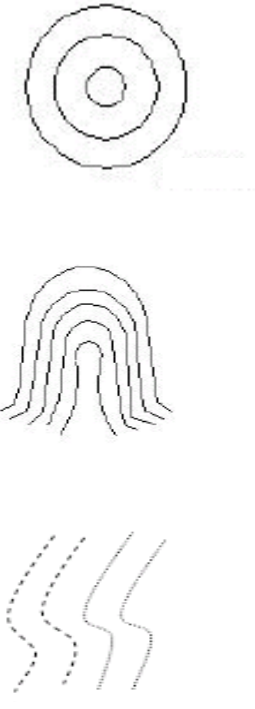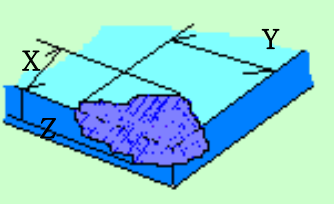
7.1.4 Criteria (Visual)
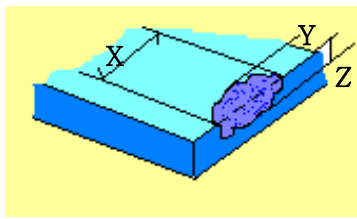
Number	Items	Criteria(mm)		
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken			
		X	Y	Z
		≤3.0mm	<Inner border line of the seal	≤T
	(2)LCD corner broken			
		X	Y	Z
		≤3.0mm	≤L	≤T
	(3) LCD crack	Crack Not allowed		

2.0	Spot defect X $\Phi=(X+Y)/2$	① light dot （LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）

① light dot （LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.10	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

②Dim spot （LCD/TP/Polarizer dim dot, light leakage、 dark spot）

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.5	3(distance≧10mm)		
Φ>0.5	1		

④Pixel bad points （light dot，Dim dot，color dot）

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore		Ignore
0.2<Φ≤0.3	2(distance≧10mm)		
Φ>0.4	1		

⑤ Polarizer   Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.4	4(distance≧10mm)		
0.4<Φ≤0.5	3		
Φ>0.5	1		

3.0	Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)	Width(mm)	Length(mm)	Acceptable Qty		
				A	B	C
		Φ≤0.05	Ignore	Ignore		Ignore
		0.05<W≤0.06	L≤5.0	N≤3		
		0.07<W≤0.08	L≤4.0	N≤2		
		0.08<W	Define as spot defect			

4.0	Electronic Components SMT	Not allow missing parts，solderless connection，cold solder joint，mis match，The positive and negative polarity opposite

5.0	Display color& Brightness	1. Color：Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness：Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.

6.0	RTP Related	TP film bubble/ accidented spot	Size Φ(mm)	Acceptable Qty		
				A	B	C
			Φ≤0.1	Ignore		Ignore
			0.1<Φ≤0.25	4 （distance≧10mm）		
			0.25<Φ≤0.35	3		
			Φ>0.4	1		

		TP film scratch	Width(mm)	Length(mm)	Acceptable Qty		
					A	B	C
			Φ≤0.05	Ignore	Ignore		Ignore
			0.05<W≤0.06	L≤5.0	N≤3		
			0.07<W≤0.08	L≤4.0	N≤2		
			0.08<W	Define as spot defect			

		Assembly deflection	beyond the edge of backlight ≤0.2mm	
		Bulge (undulation included)	The ITO film plumped below 0.40mm, it's ok. <0.4mm	
		Newton Ring	Newton Ring area>1/3 TP area NG Newton Ring area≤1/3 TP area OK	
		TP corner broken X：length Y：width Z：height	X: X≤3mm Y: Y≤3mm Z: Z<COVER thickness * *Circuitry broken is not allowed.	

		TP edge broken X：length Y：width Z：height	X	Y	Z
			X≤4mm	Y≤2mm	Z<COVER thickness
			* Circuitry broken is not allowed.		

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

8. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85℃,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-30℃, 96HR	
High Temperature Storage	90℃, 96HR	
Low Temperature Storage	-40℃, 96HR	
High Temperature & High Humidity Storage	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-40℃,30 min ↔ 90℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80㎝(MEDIUM BOX)	

Remark:

1.The test samples should be applied to only one test item.

2.Sample size for each test item is 5~10pcs.

3.For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.

4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

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

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) 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.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

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

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.