DOCUMENT TITLE
Specification of Product

DOCUMENT NUMBER
TFT-0105
This module uses RoHS material

CUSTOMER	
Project NUMBER	
CUSTOMER APPROVAL	
DATE	
Comment	

DEPARTMENT	NAME	SIGNATURE	DATE
DESIGN			
CHECK			
APPROVE			

REVISION   HISTORY

REVISION	DATE	NOTE	CHANGED BY	CHECKED BY
V1	2012-02-01	First release	LIU XIU ZHEN	WAN SI LEI Liu Xiu Zhen YANG GEN
	2012-11-14	change drawing	Paul	MIKE

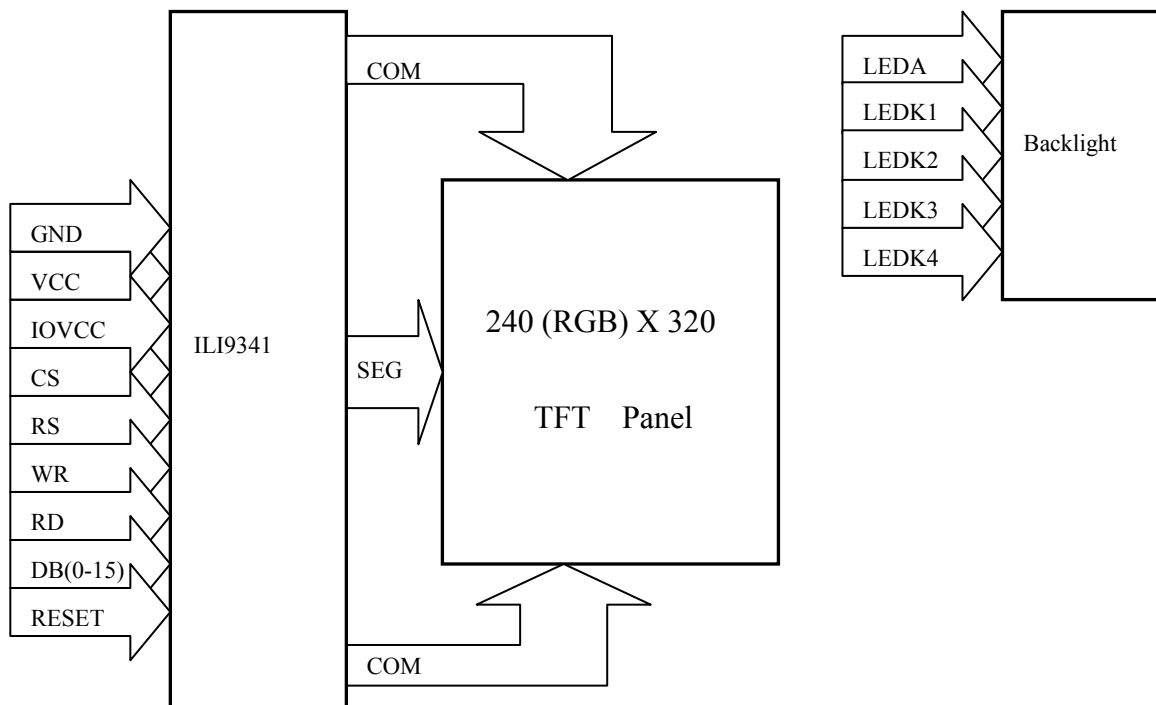# CONTENTS

Specification   of   90-A028-A01
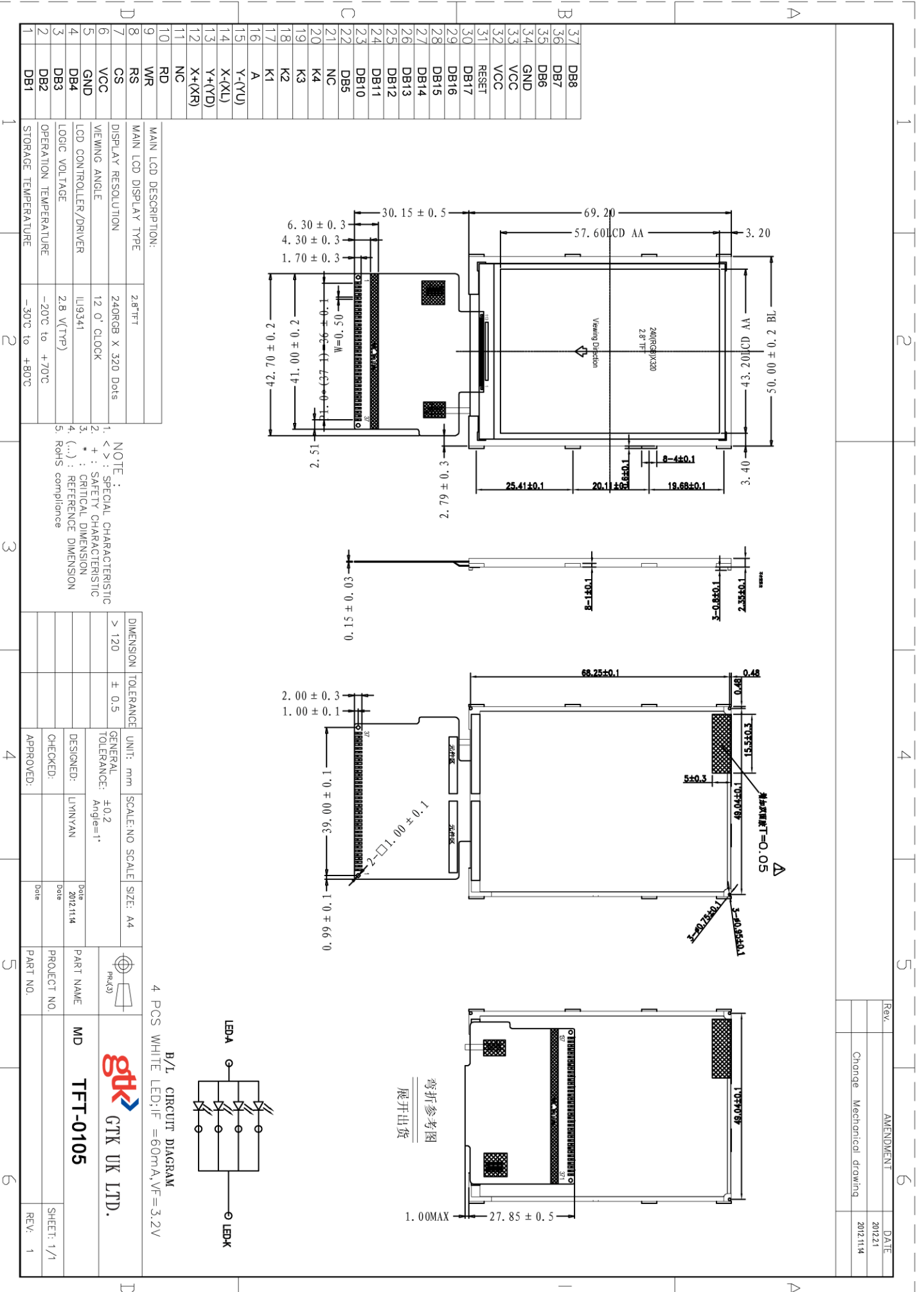
1. General Description:

The TFT-0105   model is a-si active matrix TFT di   splay module without
Touch panel. This module has 2.8 inch diagonally measured active area with 240
Horizontal by 320 vertical pixel array and this module can display 262K color.

2. General Feature:

Item	Contents	Unit
LCD Type	TFT transmissive, Normally white	/
Viewing direction	12 O'clock	O'clock
Outline dimensions	50 (W) x69.2(H) x 2.35(T)	mm
Active area	43.2 (W) x57.6 (H)	mm
Number of Pixels	240 (H) x (R.G.B.) x320(W)	Dot
Driver IC	ILI9341	/
Colors	262K	K
Backlight type	LED	/
TP	NC	/
Interface Type	8080 system 16 bit parallel	/
Weight	T.B.D.	g

3. Block Biagram

37	DB8	
36	DB7	
35	DB6	
34	GND	
33	VCC	
32	VCC	
31	RESET	
30	DB17	
29	DB16	
28	DB15	
27	DB14	
26	DB13	
25	DB12	
24	DB11	
23	DB10	
22	DB5	
21	NC	
20	K4	
19	K3	
18	K2	
17	K1	
16	A	
15	Y-(YU)	
14	X-(XL)	
13	Y+(YD)	
12	X+(XR)	
11	NC	
10	RD	
9	WR	
8	RS	
7	CS	
6	VCC	
5	GND	
4	DB4	
3	DB3	
2	DB2	
1	DB1	

MAIN LCD DESCRIPTION:

MAIN LCD DISPLAY TYPE	2.8"TFT
DISPLAY RESOLUTION	240RGB X 320 Dots
VIEWING ANGLE	12 O'CLOCK
LCD CONTROLLER/DRIVER	ILI9341
LOGIC VOLTAGE	2.8 V(TYP)
OPERATION TEMPERATURE	-20°C to +70°C
STORAGE TEMPERATURE	-30°C to +80°C

NOTE :
1. < > : SPECIAL CHARACTERISTIC
2. + : SAFETY CHARACTERISTIC
3. * : CRITICAL DIMENSION
4. (..): REFERENCE DIMENSION
5. RoHS compliance

DIMENSION	TOLERANCE
> 120	± 0.5

UNIT: mm

GENERAL TOLERANCE: ±0.2 Angle=1°

SCALE:NO SCALE   SIZE: A4

DESIGNED: LIYINYAN	Date 2012.11.14
CHECKED:	Date
APPROVED:	Date

PART NAME: MD
PROJECT NO.
PART NO.

TFT-0105

GTK UK LTD.

B/L CIRCUIT DIAGRAM
4 PCS WHITE LED:IF =60mA,VF=3.2V
LEDA   LEDK

SHEET: 1/1
REV: 1

Rev.
Change Mechanical drawing
AMENDMENT
DATE 2012.2.1 2012.11.14

240RGBX320
2.8" TF

Viewing Direction

30.15 ± 0.5   69.20
57.60LCD AA   3.20
6.30 ± 0.3
4.30 ± 0.3
1.70 ± 0.3
42.70 ± 0.2
41.00 ± 0.2
43.20LCD AA
50.00 ± 0.2 BL
2.51
2.79 ± 0.3
8-4±0.1
3.40
25.41±0.1   20.1±0.1   19.68±0.1

0.15 ± 0.03
8-1±0.1
3-0.88±0.1
2.35±0.1

68.25±0.1
0.48
15.5±0.3
5±0.3
49.0±0.1
2-□1.00 ± 0.1
39.00 ± 0.1
0.96 ± 0.1
3-□0.75±0.1
3-□0.85±0.1

27.85 ± 0.5
1.00MAX
49.0±0.1

Table 2　**Interface Signals**

Table 2

Pin No.	Symbol	Description
1-4	DB1-DB4	Date Bus
5	GND	Ground
6	VCC	Power Supply(TYP=2.8V)
7	CS	Chip selection pin
8	RS	A Register Select Signal
9	WR	Write strobe signal
10	RD	Read strobe signal
11	NC	NC
12	X+(XR)	TP　SIGNAL
13	Y+(YD)	
14	X-(XL)	
15	Y-(YU)	
16	A	Backlight anode
17-20	K1-K4	Backlight Cathode
21	NC	NC
22	DB5	Date Bus
23-30	DB10-DB17	Date Bus
31	RESET	Reset Pin
32	VCC	Power Supply(TYP=2.8V)
33	VCC	Power Supply(TYP=2.8V)
34	GND	Ground
35-37	DB6-DB8	Date Bus
		Backlight Cathode

5. ELECTRICAL CHARACTERISTICS:

DC CHARACTERISTICS

Parameter	Symbol	Min	TYP	Max	Unit
Supply voltage	VCC	2.3	2.8 \	3.6	V
Logic voltage	Iovcc	1.65	2.8	3.3	V
Input Current	Idd		TBD	TBD	mA
Input voltage H level	VIH	0.8Iovcc	-	Iovcc	V
Input voltage L level	VIL	0	-	0.2Iovcc	V
Output voltage H level	VOH	0.8Vcc	-	Iovcc	V
Output voltage L level	VOL	0	-	0.2Iovcc	V

Backlight CHARACTERISTICS   (IF =60 mA)

Parameter	Symbol	Min	TYP	Max	Unit
Forward voltage	Vf	3.1	3.2	3.3	V
Luminance(white display)	Lv	-	240	-	Cd/㎡
Brightness uniformity(white display)	Bu	80			%
Number of LED			4		pieceS
Connection mode			Parallel		

6. ABSOLUTE MAXIMUM RATINGS:

Parameter	Symbol	Min	Max	Unit
Supply voltage	VCC	-0.3	4.8	V
Logic voltage	Iovcc	-0.3	3.3	V
Input	Vin	-0.3	Iovcc+0.3	V
Operating temperature	Top	-40	85	°C
Storage temperature	Tst	-55	110	°C
Humidity	RH	-	90%(Max60°C)	Dot
Backlight Current	IBL	15	20	mA(each Led)

7.   Timing Characteristics

7.1   80-system bus interface operation

Ta = -20 °C to +70 °C, VCC = 2.80V, GND=0V.
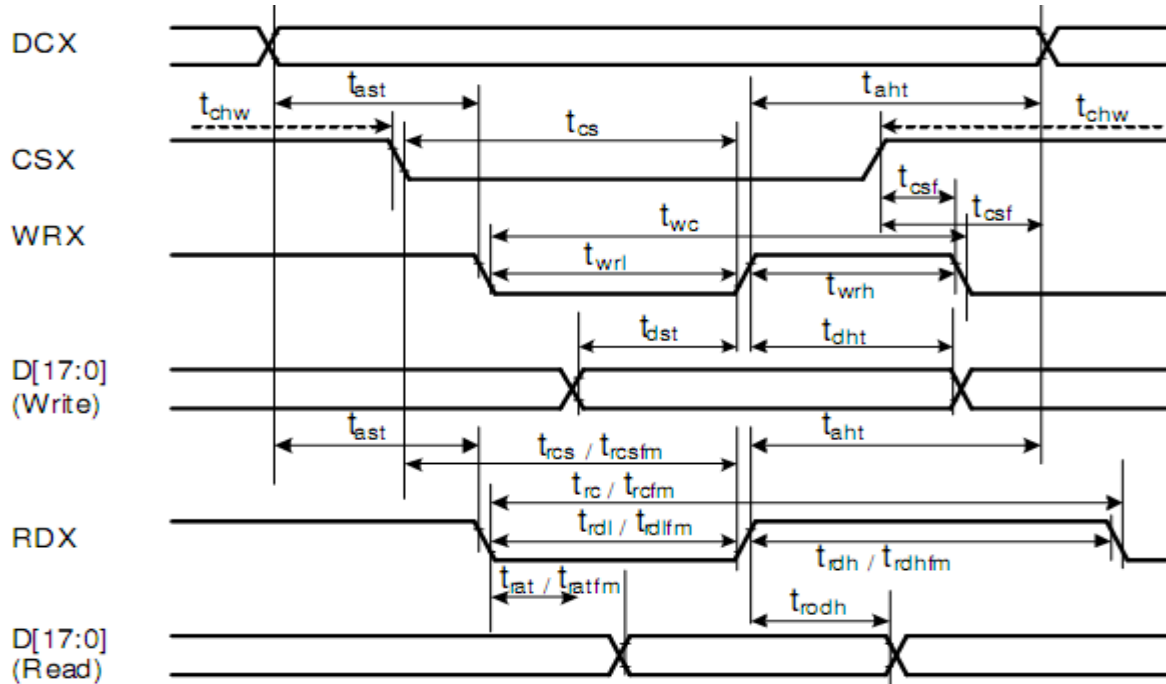
Figure 3: 80-system bus interface operation

Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{ast}	Address setup time	0	-	ns	
	t_{hat}	Address hold time (Write/Read)	10	-	ns	
CSX	t_{chw}	CSX "H" pulse width	0	-	ns	
	t_{cs}	Chip Select setup time (Write)	15	-	ns	
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	
	t_{csf}	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	t_{wc}	Write cycle	66		ns	
	t_{wrh}	Write Control pulse H duration	33	-	ns	
	t_{wrl}	Write Control pulse L duration	33	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from the frame memory
	t_{dhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
DB[17:0], DB[15:0], DB[8:0], DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dht}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{ratfm}	Read access time	-	340	ns	
	t_{rod}	Read output disable time	20	80	ns	

Note: Ta =   -40 to 85 °C, IOVCC=1.65V to 3.3V, VCI=2.3V to 4.8V, DGND=0V

7.2 Resetting
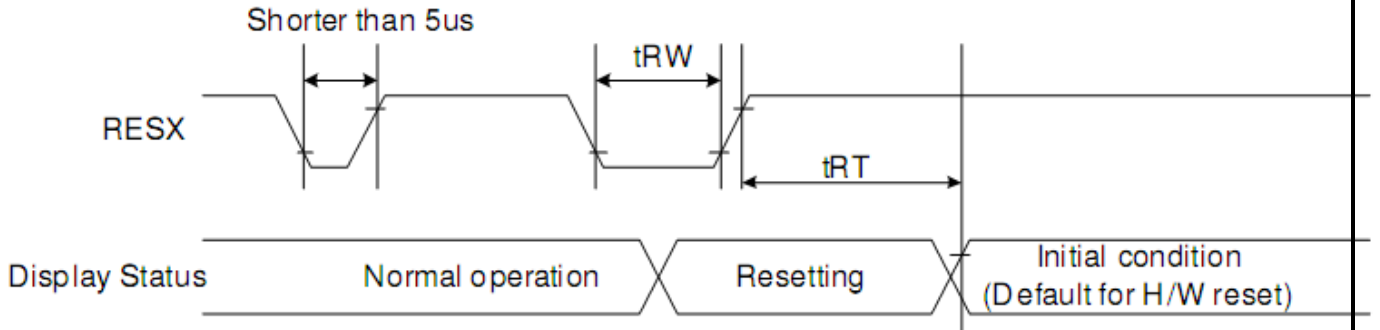
Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

8. Electro-Optical characteristics .

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of Φ and θ equal to 0°.

Measurement condition: Refer to next pages (C-light source, Halogen Lamp)

(Ta=25 ±2℃,VDD=2.8V,IB=15mA)

Item		Symbol	Condition	Min	Typ	Max	Unit
Contrast ratio (Center point)		C/R		-	250	-	-
Response Time	Rising: Tr	Tr		-	2	4	msec
	Falling:Tf	Tf		-	6	12	
Color Chromaticity (CIE 1931)	White	Wx	Note1 B/L On	0. 275	0. 305	0. 335	-
		Wy		0. 299	0. 329	0. 359	
	Red	Rx		0. 579	0. 609	0. 639	
		Ry		0. 302	0. 332	0. 362	
	Green	Gx		0. 270	0. 300	0. 330	
		Gy		0. 536	0. 566	0. 596	
	Blue	Bx		0. 112	0. 142	0. 172	
		By		0. 082	0. 112	0. 142	
Viewing angle	Hor	θ L1	C/R≥ 10 B/L On	35	45	-	Deg.
		θ R1		35	45	-	
	Ver	øU1		35	45	-	
		øD1		10	20	-	

Notes : 1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the TFT-LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black(Rise Time, Tr) and from black to white(Falling Time, Tf). For additional information see FIG 3.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the TFT-LCD surface. For more information see FIG 5.

LCD CELL

Optical Stage(x,y)

Detector

Light Source Spot Size
$\Phi = 12$ mm
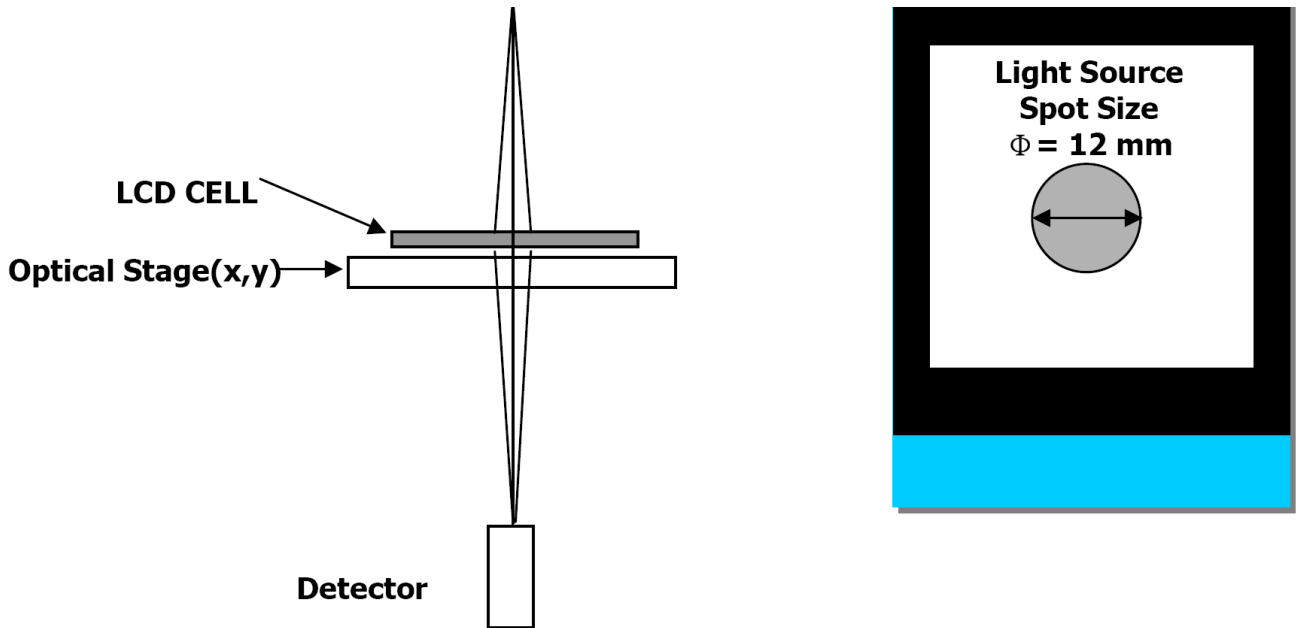
FIG. 2 The definition of Vth and Vsat
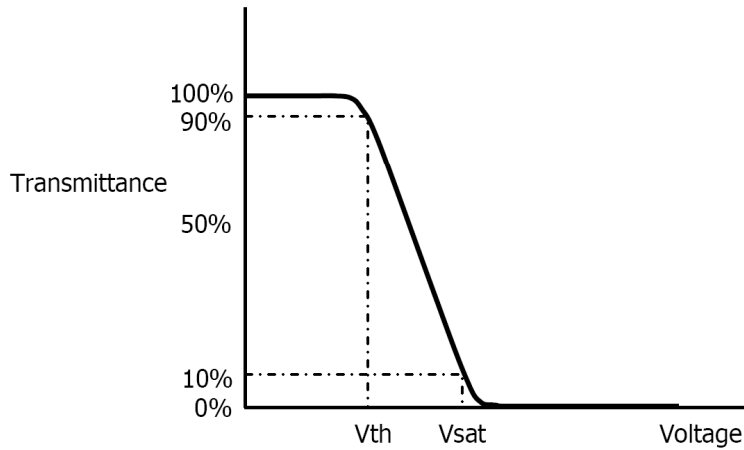
FIG. 3 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".
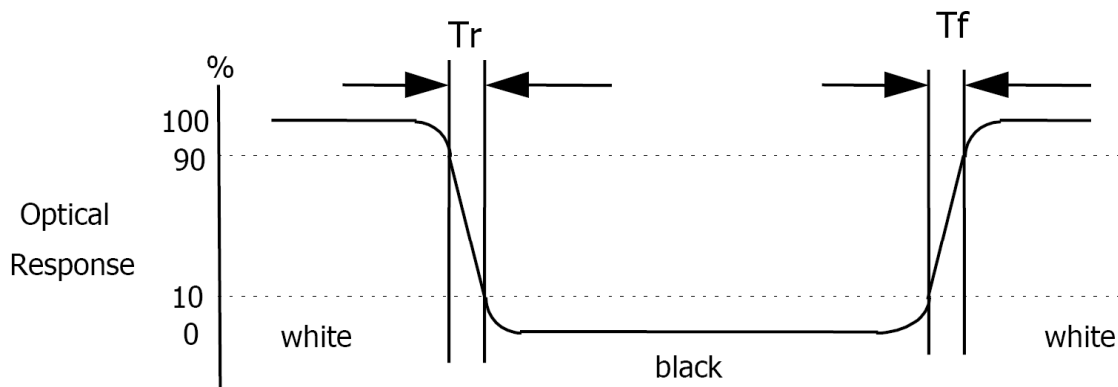
* Voltage conditions for Response time
Vgate : 19V DC
Vdata : 0V~3.3V DC
Vcom : 0V (Ground)

FIG. 4 The definition of viewing angle

　　　<dimension of viewing angle range>
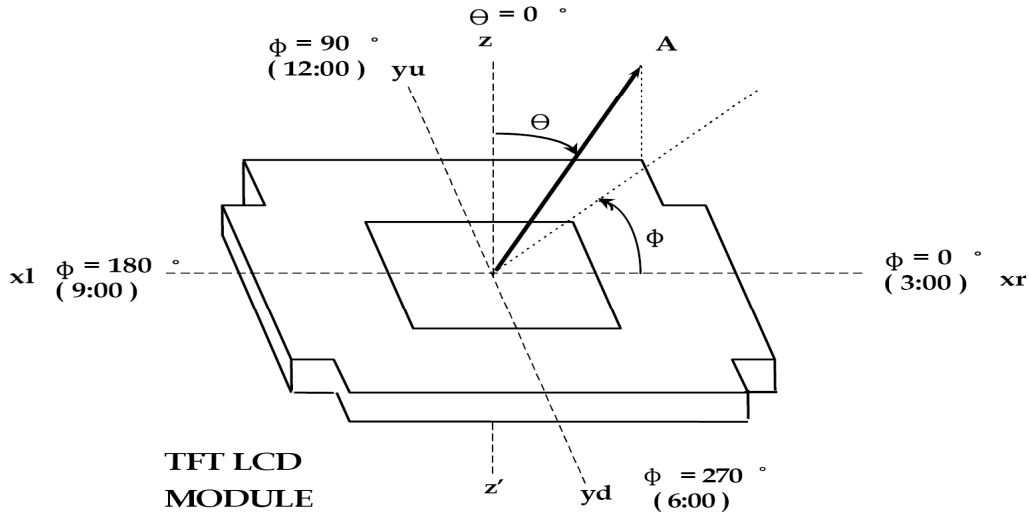
9. APPLICATION CIRCUIT

　　Please consult our technical department for detail information

10. INITIAL CODE

　　Please consult our technical department for detail information

11.　RELIABILITY TEST

11.1 Environment test

Test Item	Test Condition	Inspection after test
High Temperature Storage	70 °C 48hr	Inspection after 2~4hr storage at room temperature, the samples shall be free from defects:
Low Temperature Storage	-20°C 48hr	
HighTemperature Operating	60°C 48 hr	
Low Temperature Operating	-10°C 48hr	
Temperature Cycle	-20°C→ 25°C →80°C →25°C (30min) (5min) (30min) (5min) 20 cycles	1. Air bubble in the LCD 2.Sealleak. 3.Non-display 4.Glass crack 5.Missing segments; 6.Current Idd is twice higher than initial value. 7.Structure distortion
Damp Proof Test	50°C 90%RH / 120hr	
Vibration Test	Frequency: 10Hz ~ 55Hz ~ 10Hz Amplitude: 1.5mm Z direction for total 3hr (Packing condition)	
Dropping Test	Drop to the ground from 1m height, one time , every side of carton (Packing condition)	
ESD Test	Voltage: ±6Kv / R:330 ohm /C:150pf /Air discharge,10time	

Remark:

1. The test samples is ok before test and should be applied to only one test item.
2. Sample qty for each test item is 3~5pcs.
3. For Damp Proof Test, pure water(resistance>10Mohm)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. Using ionizer(an antistatic blower) is recommended at working area in order to reduce electro-static voltage. When removing protection film from LCM panel, peel off the tag slowly(recommended more than one second)while blowing with ionizer toward the peeling face to minimize ESD which may damage electrical circuit.
5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
6. Please use automatic switch menu or roll menu test mode when test operating mode.

11.2 Ultraviolet radiation irradiation test

After ultraviolet irradiation, samples have no deterioration of display quality.

12. Quality Guaranty

12.1 Manufacture assurance

Item		100％ test	Sampling	Reliability test
Raw material			O	O
LCM finished goods	Electrical function	O	O	O
	Appearance	O	O	O
	Physical characteristics		O	O
	Environmental condition		O	O

12.2 Inspection environment condition

12.2.1 Temperature and humidity：Room temperature(23±5℃)/ less than 70％RH.

12.2.2 Vision inspection distance：30cm at the upright direction

12.2.3 Inspection method：

12.2.3.1 The appearance inspection should be performed under a daylight lamp (Power of 40W/ Distance of 1.5m will be a standard at any disputation)

12.3.2.2 During the electrical functional test and the screen defect inspection，the LCD should light electrically and the environment light should be avoided with a lens hood or the test is performed under a dark condition

12.3 Sample plan：GB/T2828-03(Ⅱ)   AQL=1.0
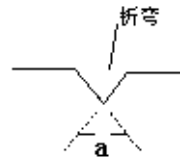
12.4 Dimension measurement

    11.4.1 Sample size：5pcs per shipment lot

    11.4.2 Criterion：Verify the important dimensions according to the appropriate drawing if needed and

should reject the dimensions that are out of the tolerance.

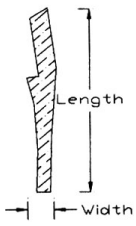**12.5 Appearance inspection**

    12.5.1 General Parts:

Item	Criterion	Remark
1.FPCA	The criterion for chip component solder point: IPC-A-610C CLASS 2 on general occasion。	Vision Inspection / Microscope
2.Back light	2.1 Defect of no light is unaccepted。 2.2 The brightness (test with BM-7 equipment) and power consume must meet SPEC	Vision Inspection / Microscope
3.Bezel	Any damage, distortion and other solder spark on the bezel surface is unaccepted。	
4.FPC	4.1 Criterion for bending and crease As picture 22, "a" is the angle composed of the extended lines of the crease .This angle must be morte than 90 degree. 4.2 The area of crack, damage, foreign material and air bubble is not allowed to be more than 1/5 of that of the enhancing film， 4.3 Golden finger should not be scraped obviously; Any stain and foreign on the finger is unaccepted. 折弯 Picture 22	Vision inspection / Microscope
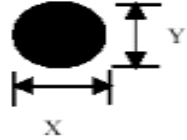
5.LCD screen	5.1 A protect plaster should be stuck to the screen based on the SPEC. 5.2 Any dust, finger mark, stain or other foreign material on the screen surface which can not be got rid of with soft cloth or air gun is unaccepted. 5.3 Defect of no display is unaccepted. 5.4 Defect of lack of line or cross-talk is unaccepted. 5.5 Abnormal chroma, brightness and contrast (compared with golden Sample and SPEC parameter) are unaccepted 5.6 Uneven back light (compared with golden Sample) or dark area is unaccepted. 5.7 Response time of menu change must meet SPEC. 5.8The LCD screen shift amount should not be more than 0.2mm based on the SPEC. 5.9The criterion should be loosened in judging of the defect in the area out of V.A.	Vision inspection

12.5.2 Cosmetic defects of LCM（Include Touch Panel and TFT）out of acceptable criteria are listed in below table

Inspection item	Criterion			Remark
Liner matter	Width (mm)	Length (mm)	Q'ty	
	W≤0.1	/	Ignore	
	0.1<W≤0.2	L≤5	3	
	W>0.2	/	0	
Scratch	Width (mm)	Length (mm)	Q'ty	As liner
	W≤0.03	/	Ignore	
	0.03m<W≤0.05	L≤5	2	
	0.05mm<W≤0.1	L≤2	2	
	W>0.1mm or L>2mm		0	
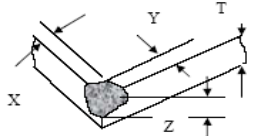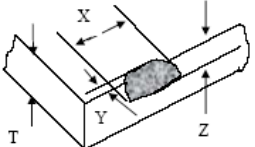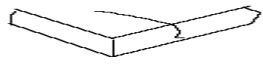
Fish eye on film/ Dent on film and Air bubble			Size：D=(X+Y)/2
	Size（mm）	Q'ty	
	D≤0.5	Ignore	
	0.5<D<1.0	2	
	D>1.0	0	

Dot			As fish eye
	Size (mm)	Q'ty	
	D≤0.15	Ignore	
	0.15<D≤0.25	2	
	0.25<D≤0.35	1	
	D>0.35	0	

Newton's ring	Rules irregular ≤1/3 TP area Function OK	As fish eye

Chip and crack	Corner chip	X≤3mm Y≤3mm Z≤T
	General chip	X≤3mm Y≤3mm Z≤T 0r X≤5mm Y≤1mm Z≤T
	Crack	0

12.5.3 TFT Pixel Inspection

    1) Pixel

      b-pixels (R+G+B)

    2) DOT

    1 sub-pixel   (R or G or B / or or)

    3) Bright/Dark Dot

   A sub-pixel (R,G, B dot) stuck off/on (electrical)

   Bright dots shall be counted on a black pattern and black dots on a pure R,G, B and white

       pattern.

    4) Adjacent Dot

     2 or 3 dots connected with neighboring dot.   (R,G or G,B or B,R or R,G,B)

12.5.4 TFT Pixel Dot Defect Criteria

Defect Mode	Acceptable Judgment Criteria	
	Dot Type	Quantity (ea)
Bright Dot	Random (Red, Blue, Green)	1
	2 or more adjacent dot defects	0
Dark Dot	Dark dot	3
	2 adjacent dots	1
	3 or more adjacent dots	0

12.6 Function test

12.6.1 To set the voltage and current based on the specification requirement of the product make the LCD electrically light, then test LCD, the product will be accepted if its LCD can display normally.

12.6.2 The product should be judged as fail if there is any test item fails in passing the test.

12.6.3 If the product fails in test, it should be tested serially two times again, if it pass the testing in the last two times, then it should be accepted.

12.7 Accepted criterion：For a out going lot, We inspect it based on above sampling plan and the corresponding acceptable criterion, if all inspection items meet the SPEC，this lot should be accepted and rejected otherwise.

12.8 Package and storage

12.8.1 Placement

    To handle lightly; to store in clear environment; to avoid direct daylight.

12.8.2 Cleaning method

Only soft cloth or equal material can be used to clean the screen gently. It is prohibited to use any stiff or other unproposed liquid to clean the screen. Especially below material is absolutely prohibited:

- Water
- Ketone
- Aromaticity compound

12.8.3 Package and storage method

1) Please place the product according to the method showed on the packing box.

2) All products should be handled and placed lightly avoiding any bump and knock, especially throw onto the earth.

3) Once the pack is opened, extreme temperature & humidity and dust should be avoided.

4) There must be Anti-ESD measure to protect the product during usage (the product include CMOS component)

5) All returned defective products should be rightly packaged with their original packing material and method.

6) To prevent modules from degradation, Do not operate or store them exposed direct to sunshine or high temperature/humidity

12.8.4 In case of storing for long period of time, the following ways are recommended:

1) Storage in polyethylene bag with opening sealed so fresh air outside can not enter in, and with no desiccant.

2) Placing in a dark place where neither exposure to direct sunlight nor light is keeping the storage temperature range.

3) Storing with no load on package surface by anything else.

13.0 General Precautions for touch panel

In order to prevent accidental use and performance deterioration, please keep the following precautions and inhibited points.

13.1.Transparency is an important factor for the product. So, please wear clean finger sacks, handling gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.

13.2. Do not put a heavy, hard or sharp object on the product.

13.3.Wipe off the stain on the product by using soft cloth moistened with ethanol. Take care not to allow ethanol to soak into the joint of upper Film and bottom glass. Do not use

any organic solvent or detergent other than ethanol.

13.4. Do not clean with a thing other than the finger such as hard or sharp edges like a finger nail etc. on the cloth, because it cause transparent conductive film cracks. Please advise this inhibition to your last customers

13.5. Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying operation excessive load. Do not operate by other than polyacetal pen (tip R0.8 or over) and/or a belly of a finger like a hard or a sharp edges such as a ball point pen, sharp pencil, sharp tiptoe, etc. Operation at the out of Active Area is out of our guarantee. Because, it causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

13.6. Design guide -----important massage, please read it carefully.

(1) **Electrical aspect**

1. Keep the voltage under DC 7V operating the T/P.

2. The Touch Panel cannot work correctly while touch two separate points at the same time.

3. The contact resistance need to be stabilized before read the position figure.

4. Please design the capacitor value of the touch panel in your sensing circuit and low-pass filters as it acts in an equivalent circuit.

(2) **Software**

It should be have the location calibration function in customer's software.

Please include "User calibration" in your software programming for long term using.

(3) **Mechanical Design**

Active Area

The linearity, durability, and the operating force is guaranteed inside this area.

1. Please design your function area inside the" Active Area", which is 1mm~1.5mm inside of the transparent insulation area.

2. Usually, the" Active Area" is equal or more than customer's display "Active Area".

3. Due to the construction and the material character, the durability of the input area at the edge is less than the center area; suggest not placing the key function at the edge area.

Unbearable Area

1. It still can be activated at this area, only the resistance is not stately, the linearity could not be guaranteed.

2. While in design, to prevent the potential problem is to avoid the housing of the unit to have any contact from the touch panel, or possible pressing on it while holding it. The contact causes the malfunction.

3. Normally, the durability is not guaranteed. The sliding in this area may cause the damage of the touch panel.

4. Usually the width of unbearable area is 1~1.5mm from "Active Area", please check our specific drawing for each size, or discuss with our engineer.

Transparent Insulation-area

1. The Insulation area is located outside the "Active Area" with a distance of 1~1.5mm. Please see the attached drawing of cross-section construction. It is to prevent the malfunction of the housing edge contacting the touch panel.

2. We suggest your housing design at least keep. 1.0mm outside the inner edge of Transparent Area. Please see the attached drawing of cross-section construction.
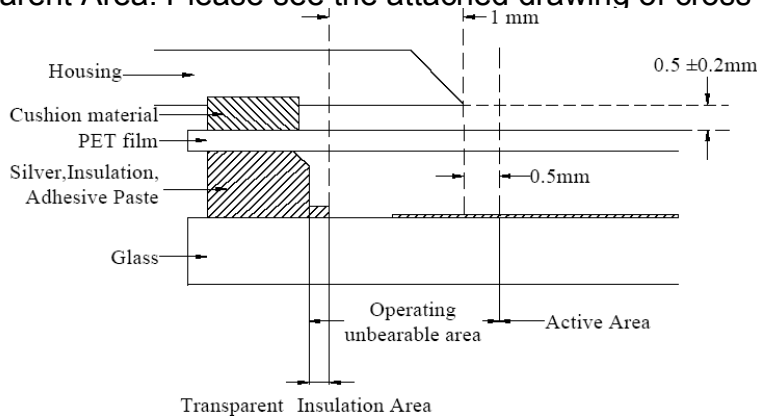
14.0 Other agreement

14.1 Criterion application