EA TFT040-77AI

18 BIT RGB interface and optional touch panel

EA TFT040-77AITC
Dimension 94x94x3.8mm
Image similar

EA TFT040-77AINN
Dimension 75x79x2mm
Image similar

FEATURES

- 4.0" SQUARE TFT DISPLAY, IPS TECHNOLOGY
- 720X720 SQUARE SCREEN
- INTEGRATED CONTROLLER NV3052
- OPTIONALLY PCAP TOUCHPANEL OPTICALLY BONDED
- NO EXTRA ZIFF CONNECTOR NEEDED FOR TOUCHPANEL
- SUPER BRIGHT TYP 800 cd/m^2 (700 cd/m^2 INCL. PCAP)
- HIGH CONTRAST TFT PANEL
- 18 BIT RGB INTERFACE, 3 LINE SPI FOR INITIALISATION
- I²C INTERFACE FOR CAPACITIVE TOUCH PANEL (FT7511)
- WIDE TEMPERATURE RANGE (T$_{OP}$ -20 .. +70°C)
- INDUSTRIAL GRADE DISPLAY

ORDERING CODES

- 4.0" TFT, 720X720 IPS COLOR DISPLAY   **EA TFT040-77AINN**
- AS ABOVE BUT WITH OPTICALLY BONDED PCAP   **EA TFT040-77AITC**

ACCESSORIES

- ZIFF CONNECTOR 40 POS, 0.5 mm PITCH BOTTOM CONTACT   **EA WF050-40S**
- ZIFF CONNECTOR 40 POS, 0.5 mm PITCH TOP CONTACT   **EA WF050-40ST**
- ADAPTOR BOARD   **EA 9980-TFT**

REVISION

Date	Ref. Page	Revised No	Summary	Remark
2024-03-21		V0.9	First issue	Preliminary version
2025-05-22	4-7	V1.0		FPC and Pinout changed

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GENERAL DESCRIPTION

EA TFT040-77AINN / -77AITC is a TFT-LCD module. Technology is IPS which provides widest viewing angle without color shift. The display is composed of a TFT-LCD panel, driver IC, FPC, a backlight unit, optional capacitive sensor and cover. The 4.0″ display area contains 720 × 3(RGB) × 720 pixels and can display up to 262K colors. This product accords with RoHS .

Parameter		Specifications	Unit
Screen size		4.0(Diagonal)	inch
Resolution		720 × 3(RGB) × 720	Pixel
Active area		71.928 x 71.928	mm
Outline dimension (w./o. touch)		78.98(W) x 74.83(H) x 2.07(D)(Exclude FPC)	mm
Display Mode		Normally Black/Transmissive	
Driving method		TFT active matrix	
Pixel pitch		0.0999(H)x0.0999(V)	mm
Input Signals		18 bit RGB	
Surface treatment		-	
Color Depth		262K	Color
View Angle direction		Full	
Brightness		800 (typ.)	cd/m²
Temperature Range	Operation	-20~70	℃
	Storage	-30~80	℃
Input voltage		3.3	V
RoHS Compliance		RoHS	

FUNCTION BLOCK DIAGRAM

The following diagram shows the function block of the 4.0inch color TFT-LCD module:

DIMENSION EA TFT040-77AINN

ISSUE	MODIFY DESCRIPTION	DATE
T01	First Issue	2024.06.14
T02	Modify FPC,FPC pin assignment	2024.07.10
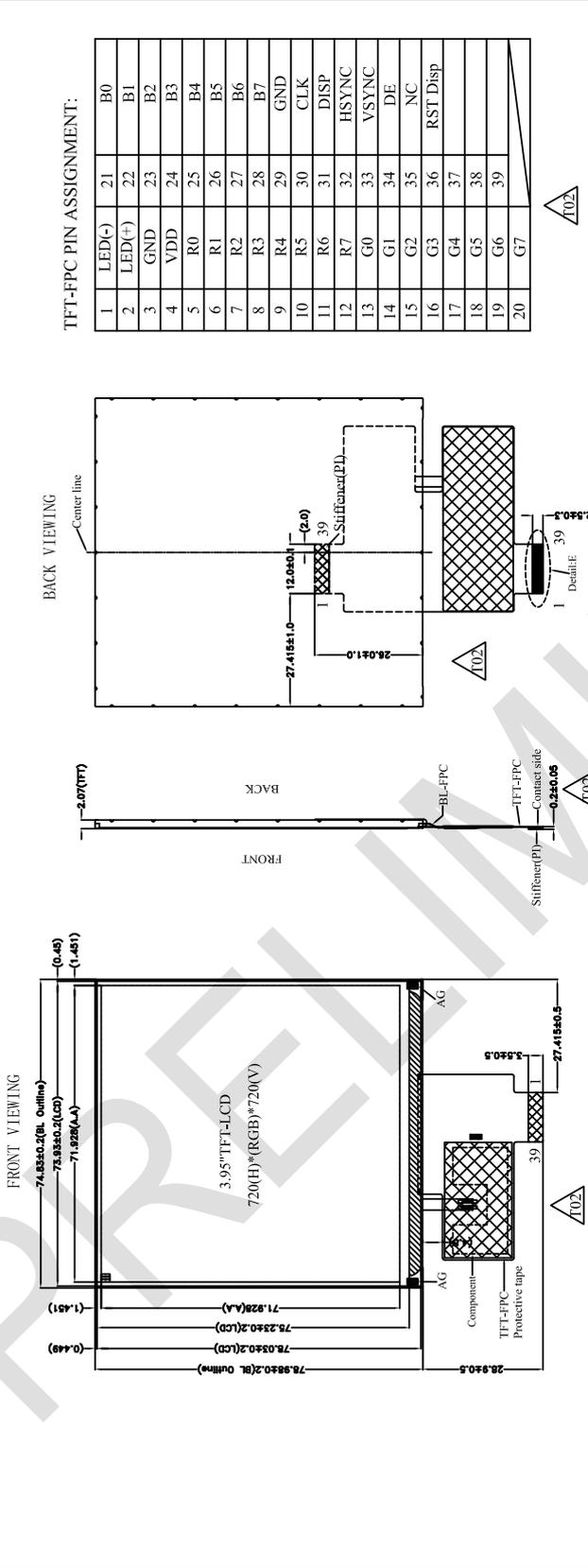
TFT-FPC PIN ASSIGNMENT:

1	LED(-)	21	B0	
2	LED(+)	22	B1	
3	GND	23	B2	
4	VDD	24	B3	
5	R0	25	B4	
6	R1	26	B5	
7	R2	27	B6	
8	R3	28	B7	
9	R4	29	GND	
10	R5	30	CLK	
11	R6	31	DISP	
12	R7	32	HSYNC	
13	G0	33	VSYNC	
14	G1	34	DE	
15	G2	35	NC	
16	G3	36	RST Disp	
17	G4	37		
18	G5	38		
19	G6	39		
20	G7			

Module Speciality

TITLE:	EA TFT040-77AINN	
PROJECT NO:		

▲ : Special characteristic
+ : Safety characteristic
Tolerance unless:x..x±0.3

▽ : Critical dimension
(..): Reference dimension
Otherwise specified:x.xx±0.2

THIRD ANGLE PROJECTION

	NAME	SIGN	DATE
DRAWN	Dai xia li		2024.07.10
CHECKED	Yang yong yu		
CHECKED	Lan li juan		
APPROVED	Yu hao		
REV: T02	UNIT: mm	SCALE:1/1	SHEET: 1 OF 1

Kind suggestion: VA of customer's application should be 0.5mm smaller than LCD VA in each side.

BACK VIEWING

Center line

Stiffener(PI)

FRONT VIEWING

3.95"TFT-LCD
720(H)*(RGB)*720(V)

Backlight Circuit for reference:

LEDK1

LEDA

Display Type	3.95"TFT-LCD(IPS) NORMALLY BLACK / TRANSMISSIVE
Display Resolution	720(H)*(RGB)*720(V)
Pixel Arrangement	0.0990(H)*0.0990(V)
Viewing Direction	ALL
LCD Controller/Driver	NV3052 (COG)
Logic Voltage	3.3V(Typ.)
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	LED SIDE (WHITE),14PCS, Vf=21.7V(Typ.),If=40mA(Constant). LCM surface luminance:800cd/m²(Typ.).
Reliability test	Normal
Remark	

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DIMENSION EA TFT040-77AITC

ISSUE	MODIFY DESCRIPTION	DATE
T01	First Issue	2023.11.21
T02	Modify FPC,FPC pin assignment	2024.07.10
T03	Modify cover,add double tape spraying the code information	2024.07.11
T04	Modify CTP-FPC,TFT-FPC add double tape	2024.07.26

TFT-FPC PIN ASSIGNMENT:

1	LED(+)	21	B0
2	LED(+)	22	B1
3	GND	23	B2
4	VDD	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	CLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSYNC
14	G1	34	DE
15	G2	35	NC
16	G3	36	RST Disp+CTP
17	G4	37	CTP SCL
18	G5	38	CTP SDA
19	G6	39	CTP INT
20	G7		

Module Speciality

TITLE:
PROJECT NO: EA TFT040-77AITC

▲ : Special characteristic
+ : Safety characteristic
Tolerance unless x.x±0.3

▽ : Critical dimension
(...): Reference dimension
Otherwise specified x.xx±0.2

THIRD ANGLE PROJECTION

	NAME	SIGN	DATE
DRAWN	Dai xia li		2024.07.26
CHECKED	Yang yong yu		
CHECKED	Lan li juan		
APPROVED	Yu hao		
REV: T04	UNIT: mm	SCALE:1/1	SHEET: 1 OF 1

DETAIL C
SCALE 2:1

Detail:E.Scale:2:1

Backlight Circuit for reference:

LEDA
LEDK

BACK VIEWING
Center line
VHB Adhesive
0.4mm(3M5915,black)
Double tape Pull tape2
Sensor
Cover
[TFT]
Double tape Pull tape3
Double tape(T:0.05mm)
Stiffener(PI)
Pull tape
Double tape pull tape
Stiffener (SUS304,T:0.2mm)
Double tape(T:0.1mm)
Double tape Pull tape1
Double tape Pull tape3

BL-FPC
BACK
FRONT
CTP-FPC
TFT-FPC
Stiffener(PI)
Contact side
Component

FRONT VIEWING
Center line
Protective film pull tape
Silk-screen black on the cover rear face (黑色印在盖板背面)
3.95"TFT-LCD(IPS)+3.95"CTP
720(H)*(RGB)*720(V)
Component
CTP-FPC Protective tape
Component
TFT-FPC Protective tape

Kind suggestion: VA of customer's application should be 0.5mm smaller than LCD VA in each side.

Display Type	3.95"TFT-LCD(IPS)+3.95CTP
Display Resolution	720(H)*(RGB)*720(V) NORMALLY BLACK / TRANSMISSIVE
Pixel Arrangement	0.0990(H)*0.0999(V)
Viewing Direction	ALL
LCD Controller/Driver	NV3052 (COG)
CTP Controller/Driver	GT911 (SMT)
Logic Voltage	3.3V(Typ.)
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	LED SIDE (WHITE),14PCS, Vf=21.7V(Typ.),If=40mA(Constant), LCM surface luminance:700cd/m²(Typ.).
Reliability test	Normal
Remark	

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PINOUT

TFT_FPC pin assignment:

Pin No	Symbol	Function	Remark
1	LED(-)	Power for LED backlight (Anode).	
2	LED(+)	Power for LED backlight (Cathode).	
3	GND	Ground	
4	VDD	Power supply for analog and digital circuit.	
5 ..12	R0...R7	Red data	
13..20	G0..G7	Green data	
14..28	B0..B7	Blue data	
29	GND	Ground	
30	CLK	Dot clock signal for RGB interface operation.	
31	DISP		
32	HSYNC	Horizontal synchronizing input signal for RGB interface operation.	
33	VSYNC	Vertical synchronizing input signal for RGB interface operation.	
34	DE	Data enable pin for RGB interface operation.	
35	NC	No connection.	
36	RESET	Global Reset Signal. Active Low.	
37	TP_SCL	I^2C clock input.	
38	TP_SDA	I^2C data input and output.	
39	TP_INT	External interrupt to the host.	

Datasheet for NV3052:

https://www.lcd-module.de/fileadmin/eng/pdf/zubehoer/NV3052CGRB-Datasheet-V01.pdf

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PIXEL FORMAT IMAGE

Following figure shows the relationship between input signal and LCD pixel format.

3.95'' 720RGBX720

Figure 1 Pixel Format Image

ELECTRICAL SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded may cause operation or damage to the unit. (GND = 0V, Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage for TFT-LCD	VCI	-0.3	4.5	V	
Power voltage for CTP	TP_VCI	2.7	3.6	V	
Operation Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

ELECTRICAL DRIVING TFT LCD PANEL

(Unless otherwise specified, voltage Referenced to GND,T_A =25℃, Note 3)

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power for digital circuit（CTP）	TP_VCI	3.0	3.3	3.6	V
Power for digital circuit	VCI	3.0	3.3	3.6	V
Logic input voltage(VIH)	VIH	0.7*VCI	-	VCI	V
Logic input voltage(VIL)	VIL	GND	-	0.3*VCI	V
Logic output voltage(VOH)	VOH	0.8*VCI	-	VCI	V
Logic output voltage(VOL)	VOL	GND	-	0.2VCI	V

BACKLIGHT SPECIFICATION

Item	Sym.	Min	Typ.	Max	Unit	Note
Voltage for LED backlight	V_L	19.6	21.7	23.8	V	Note 1
Current for LED backlight	I_L	-	40	-	mA	Note 2
Luminous Uniformity	Avg	80	-	-	%	
Life Time	-	20000	-	-	Hr	Note 3

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =40mA.
Note 2: Constant current.
Note 3: The " life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =40mA. The LED lifetime could be decreased if operating I_L is larger than 40mA.

AC CHARACTERISTIC

Reset timing characteristics
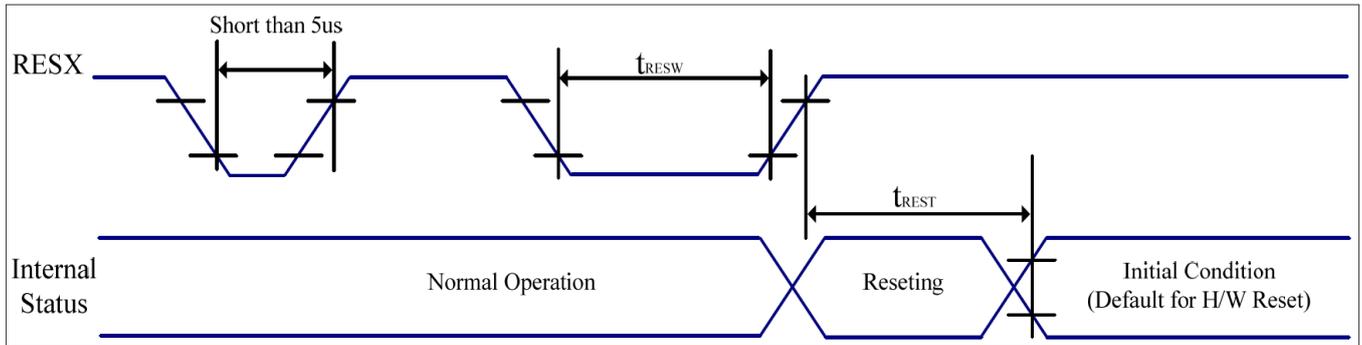
Figure 2 Reset timing characteristics

VSS=0V, IOVCC=1.65V to 3.6V, VCI=2.5V to 6.0V,Ta = -30℃ to 70℃

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	us
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Note1: Due to an electrostatic discharge on RESX line,spike does not cause irregular system reset according
To the table below.

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts (It depends on voltage and temperature condition.)

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Note 2: During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120ms, when Reset Starts in Sleep Out mode. The display remains the blank state in Sleep In mode) , then return to default condition for H/W reset.

Note 3: During Reset Complete Time, ID1/ID2/ID3 and VCOM value in OTP will be latched to internal register. After a rising edge of RESX, there is a H/W reset complete time (Trest) which lasted 5ms..The loading operation will be done every time during this reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:
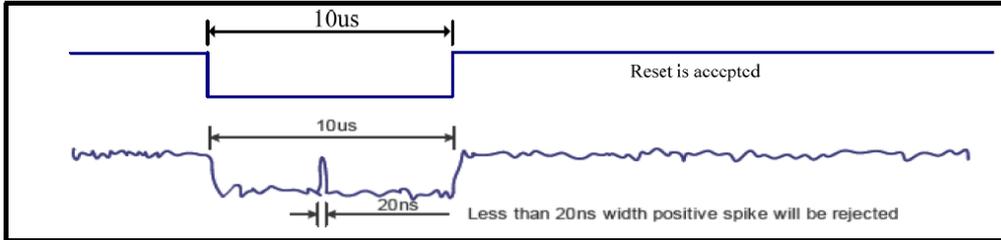
Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 msec.

Parallel 24/18/16-bit RGB Interface Timing Characteristics
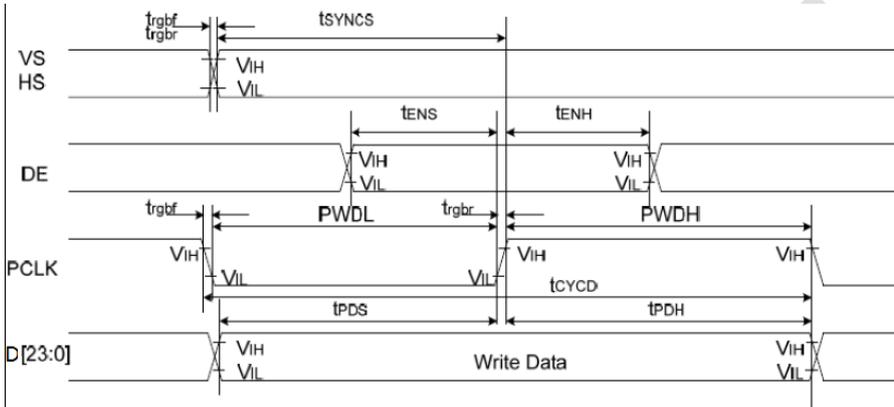
Figure 3 Parallel 24/18/16-bit RGB Interface Timing Characteristics

Signal	Symbol	Parameter	min	max	Unit	Description
VS/HS	tSYNCS	VS/HS setup time	5	-	ns	24/18/16-bit bus RGB interface mode
	tSYNCH	VS/HS hold time	5	-	ns	
DE	tENS	DE setup time	5	-	ns	
	tENH	DE hold time	5	-	ns	
D[23:0]	tPDS	Data setup time	5	-	ns	
	tPDH	Data hold time	5	-	ns	
PCLK	PWDH	PCLK high-level period	13	-	ns	
	PWDL	PCLK low-level period	13	-	ns	
	tCYCD	PCLK cycle time	28	-	ns	
	trgbr,trgbf	PCLK,HS,VS rise/fall time	-	15	ns	

Note 1: IOVCC=1.65 to 3.6V, VCI=2.5 to 6V, VSSA=VSS=0V, Ta=-30 to 70℃

Note 2: The rise time and fall time (tr, tf) of input signal is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

EA TFT040-77AITC (VERSION WITH PCAP)

This module provides standard I2C interface for communication. The used Touchpanel panel IC is Focaltech FT 7511. Datasheet with application example can be found under:
https://www.lcd-module.de/fileadmin/eng/pdf/zubehoer/FT5426_5526Application%20Note%20Ver01.pdf

INTERRUPT SIGNAL FROM CTPM TO HOST

As for standard CTPM, host needs to use both interrupt signal and I2C interface to get the touch data. CTPM will output an interrupt request signal to the host when there is a valid touch. Then host can get the touch data via I2C interface. If there is no valid touch detected, the INT will output high level, and the host does not need to read the touch data. There are two kinds of method to use interrupt: interrupt trigger and interrupt polling
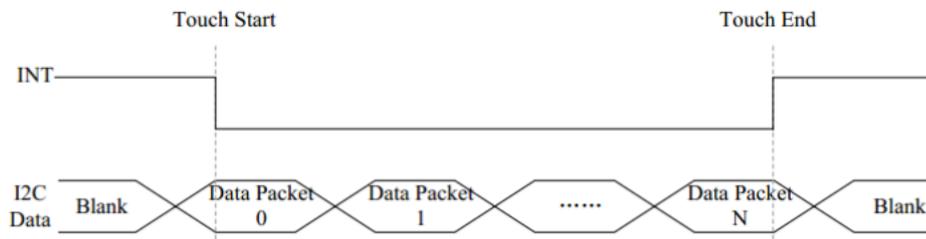
As for interrupt polling mode, INT will always be pulled to low level when there is a valid touch point, and be high level when a touch finished.
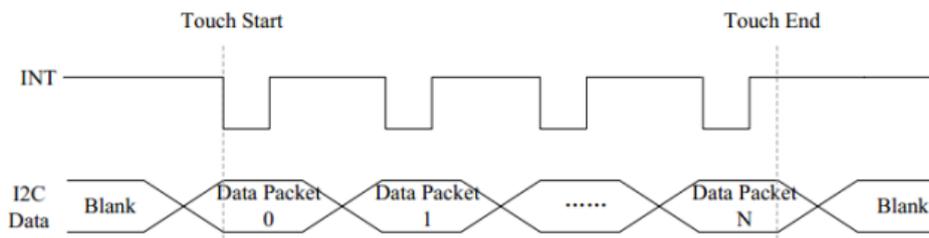
While for interrupt trigger mode, INT signal will be set to low if there is a touch detected. But whenever an update of valid touch data, CTPM will produce a valid pulse on INT port for INT signal, and host can read the touch data periodically according to the frequency of this pulse. In this mode, the pulse frequency is the touch data updating rate

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 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item		Condition.	Values			Unit	Note
			Min.	Typ.	Max.		
Contrast Ratio		Center	800	1000	-		Note(3)
Response time		tr + tf	-	25	35	ms	Note (4)
Viewing Angle (CR≥10)	θ$_L$	Φ=180°	80	85	-	Degree	Note(5)
	θ$_R$	Φ=0°	80	85	-		
	θ$_T$	Φ=90°	80	85	-		
	θ$_B$	Φ=270°	80	85	-		
Chromaticity		Wx	Typ-0.05	0.301	Typ+0.05		Note(2,6,7)
		Wy		0.341			
		Rx		0.625			
		Ry		0.347			
		Gx		0.317			
		Gy		0.593			
		Bx		0.137			
		By		0.061			
LCD Surface Luminance		-AINN	-	800	-	cd/m²	Note(7)
		-AITC (w.touch)	-	700	-		

Note 1. Test Conditions: VCI=3.3V, I$_L$=40mA (Backlight current).
Ambient condition：25℃±2℃，60±10%RH，under 2 Lux in the darkroom.

Note 2. Measure device：BM-5A (TOPCON)，viewing cone=2°.
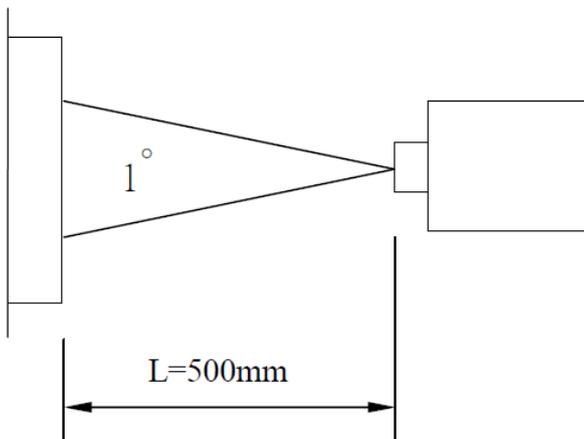
Note 3. Definition of Contrast Ratio：
CR = White Luminance (ON) / Black Luminance (OFF)
Note 4. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.
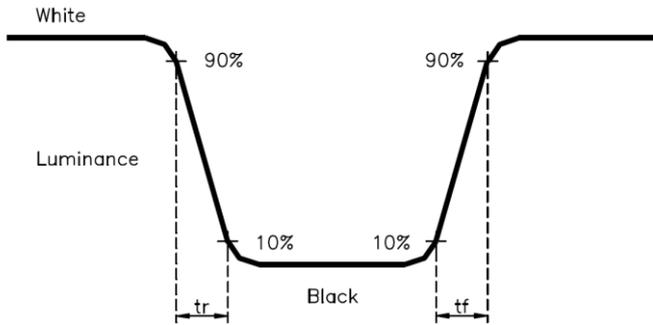
Note 5. Definition of view angle(θ，Φ)：
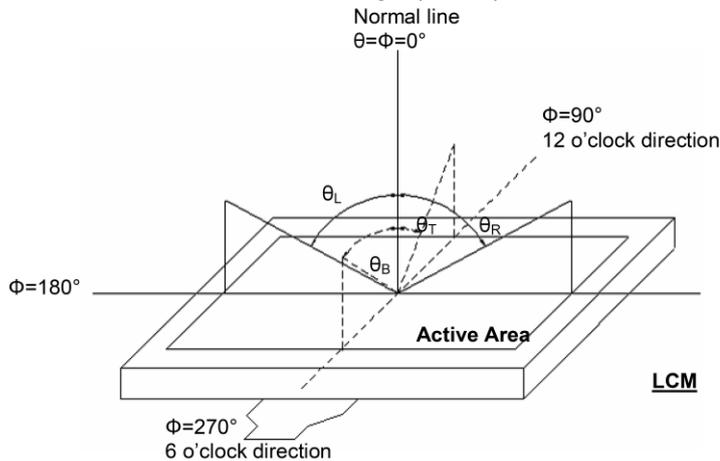
Note 6. Definition of color chromaticity (CIE1931),Color coordinates measured at center point of LCD.

Note 7. All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is I_L=40mA .

Note 8. Light source: C light.

QUALITY ASSURANCE

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=+80℃ Dry 240h	
2	Low Temperature Storage Test	Ta=-30℃ Dry 240h	
3	High Temperature Operation Test	Ta=70℃ Dry 240h	
4	Low Temperature Operation Test	Ta=-20℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60℃ 90%RH 240h	
6	Electro Static Discharge Test	Panel surface / top case. Contact / Air : ±6KV / ±8KV, 150pF, 330Ω	Non-operating
7	Vibration Test (non-operating)	Frequency range: 10Hz ~ 500Hz Sweep:5g, Vibration: Sinusoidal Wave, 30min for X,Y,Z direction.	
8	Thermal Shock Test	-30℃(0.5h) ~ 80℃(0.5h) / 100 cycles	

* Ta= Ambient Temperature

Note:

1. The test samples have recovery time for 2 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.

2. All the cosmetic specifications are judged before the reliability stress.

QUALITY UNITS

INSPECTION METHOD

An appearance inspection should be conducted at 30 cm or more distance/height from the inspector's eye sight to the LCD module surface under fluorescent light. The distance between LCD and fluorescent lamps should be 100 cm or more. Viewing angle for inspection is 45° from vertical against LCD.

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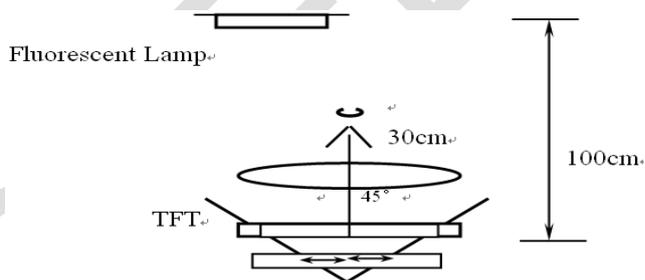
QUALITY LEVEL

The AQL for major and minor defects is defined as follows:

Partition	Definition	AQL
Major defect	Functional defective in product	0.25
Minor defect	Meet all functions of product but have some cosmetic defective	0.65

DEFINITION

The environmental condition of inspection

1）Ambient temperature ：22℃±5℃, 65±20%RH

2）Function inspection：less than 300Lux

3）Visual inspection：750±150Lux

Definition of dot defect

The size of a defective dot full of a whole dot, and all bright dot or dark dot defect must be visible through ND 5% filter.

Bright dot

Dots appear bright and unchanged in size in which TFT is displaying.

single dot
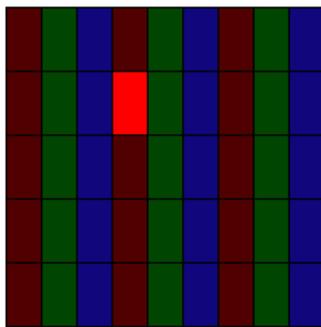
two adjacent dots
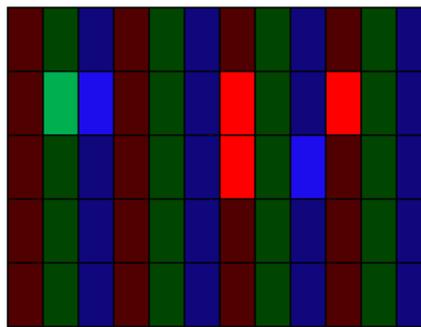
three adjacent dots
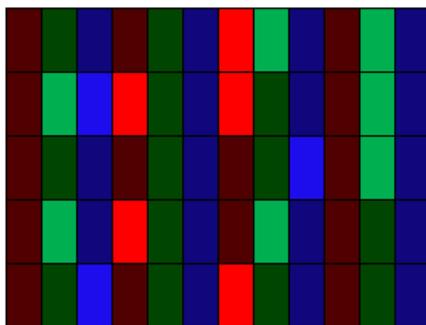
Dark dot

The same definition of bright dot, but always display dark

The usage of ND 5%

Use the ND 5% to cover bright dot within 2s,it should be judged OK if it's invisible.

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Visual Inspection Standard

Defect	Inspection	Criteria
1 Corner Broken （Minor）		1.A≤2.0 mm , B≤2.0 mm ,C≤T Ignore (No effect on function) 2. A＞2.0 mm ,or B＞2.0 mm, Not allowed
2 Corner Broken （Minor）		1. A≤1.5 mm , B≤1.5 mm , C≤T Ignore (No effect on function) 2. A＞1.5 mm, or B＞1.5 mm Not allowed 3. To be applied to both CF and TFT glass
3 Corner Broken （Minor）		1. A≤1.5 mm , B≤1.5 mm , C≤T Ignore (No effect on function) 2. A＞1.5 mm, or B＞1.5 mm Not allowed 3. To be applied to both CF and TFT glass
4 Pad Broken （Minor）		1. A≤0.8 mm, C≤T Ignore B Length Ignore (No effect on function) 2. A＞0.8 mm, Not allowed
5 Side Broken （Minor）		1. A≤0.8 mm, C≤T Ignore B Length Ignore (No effect on function) 2. A＞0.8 mm, Not allowed
6 Glass crack （Major）		Not allowed
7		
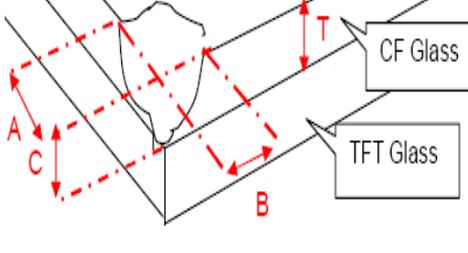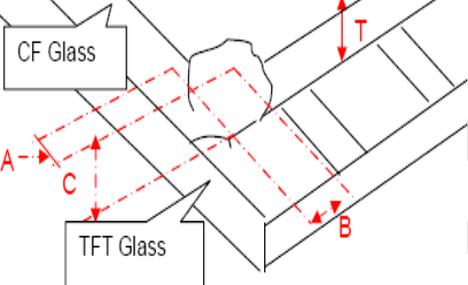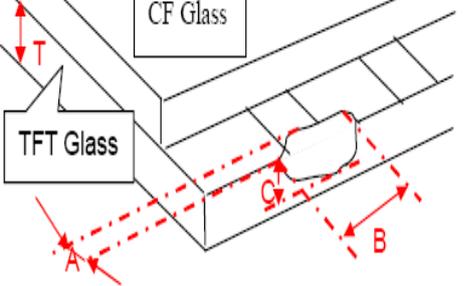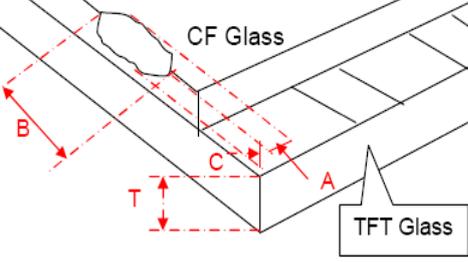
Spot defect: （Minor）	Foreign/Black/White/Bright Spot/POL dent or bubble $\Phi = a+b$	Note: | Dimensions	Acceptable Numbers
---	---
Φ≤0.1mm	Ignore
0.1mm＜Φ≤0.20mm	2
0.2mm＜Φ≤0.30mm	1
Φ＞0.30mm	0	 *1:defect that beyond AA area Ignored
8 Line defect （Minor）	Scratch ; Fiber	**Scratch** : | Dimensions	Acceptable Numbers
---	---
W≤0.03mm	Ignore
L≤5 mm 0.03mm＜W≤0.05mm	2
L≤5 mm 0.05mm＜W≤0.1mm	1
Beyond Above, Not Allowed	| **Fiber:** | Size	Acceptable Numbers
---	---
W≤0.03mm	Ignore
L≤5 mm 0.03＜W≤0.05mm	2
Beyond Above, Not Allowed		 Note: *1:defect that beyond AA area Ignored
9 (Minor)	Envelop silicon on glass	1. Silicon area not match with document request reject 2. Silicon not cover with all ITO reject 3. Glue wet to the LCD upper POL or the bottom POL. And the connector over the LCD PIN. (Include FFC、 FPC…etc) reject
10 (Major)	TCP IC/ FPC	1. the line broken off reject 2. oxidation/broken/fold-injury in acute angle / distortion on golden fingers reject 3. FPC protection cover fix no good or deflection over the drawing request reject 4.Scratch/Surface Dirty or mark that doesn't affect display Ignored
11 (Minor)	Backlight	1.The size don't match with the drawing . reject 2. Surface Dirty or mark that can not wipe out Ignored 3. Scald reject 4.Uneven or scratch on surface that doesn't affect display Ignored
12 (Major)	Weld	1.tack weld reject 2.welding short out reject 3.very little or too much tin reject
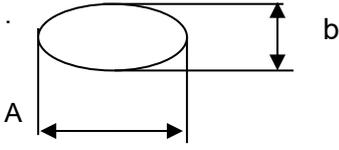
		4.FPC cock reject
13 （Minor）	LCD rainbow	1.area＞1/4 LCD display area reject 2.visible at display reject
14 （Minor）	protect film	Neglect any defect on protect film, such as: scratches/bubbles/particles
15 (Minor）	Chipping on Sensor(Corner) 	1.No damage on Mark & circuit： 2.X<2.0mm , Y<2.0mm ,Z≤ Thickness of Glass
	Chipping on Sensor(edge) 	1.No damage on Mark & circuit： 2.X<5.0mm , Y<2.0mm ,Z≤ Thickness of Glass
	Crack 	Rejected
16 （Minor）	Chipping on Conver 	Invisible from Front Surface X， Y≤0.25,Z≤1/2 Thickness of Glass
17 （Minor）	Pinhole	D≤0.25mm, N≤3; 0.25mm<D, Rejected, but can be fixed by oil paint.
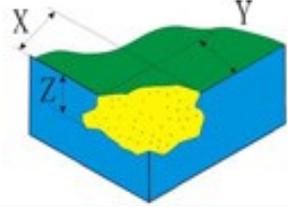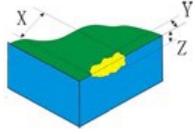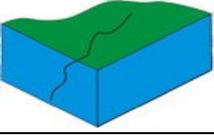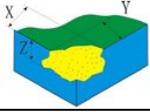
Electronic Inspection Standard:

Defect	Inspection	Criteria		
1 Spot defect （Minor）	Foreign particle/Black/ White spot/Bubble .etc.	**Dimensions**	**Acceptable Numbers**	
		Φ≤0.1mm	Ignore	
		0.1mm＜Φ≤0.20mm	2	
		0.2mm＜Φ≤0.30mm	1	
		Φ＞0.30mm	0	
		Note: *1:defect that beyond AA area Ignored		
2 Line defect （Minor）	Scratched ; Fiber	**Scratch:**		
		Dimensions	**Acceptable Numbers**	
		W≤0.03mm	Ignore	
		L≤5 mm 0.03mm＜W≤0.05mm	2	
		L≥5 mm or W≥0.05 mm	0	
		Fiber:		
		Size	**Acceptable Numbers**	
		W≤0.03mm	Ignore ,	
		L≤5mm 0.03＜W≤0.05mm	2	
		Beyond Above, Not Allowed		
		Note: *1:defect that beyond AA area Ignored		
3 （Minor）	Bright/dark dot By sub-pixel	**Dimensions**	**Acceptable Numbers**	
		Single bright dot	N ≤1	
		Two adjacent bright dots	reject	
		Three adjacent bright dots	reject	
		Single dark dot	≤2	
		Two adjacent dark dots	≤0	
		Three adjacent dark dots	reject	
		1:Total dot≤2		
4 （Minor）	Tiny Bright dot	Invisible by ND5% Filter, Ignore; If visible, Φ≤0.1mm, Ignore ; 0.1mm＜Φ≤0.2mm,N≤2 ; 0.2mm＜Φ≤0.30mm, N≤1		
5 （Major）	Display	1.Missing segment, missing word reject 2. no display. reject 3. Viewing angle not right. reject 4. Display abnormal reject		
6 （Major）	Mura/ hot spot/ Light leak (apply to all patterns)	judge by ND5% filter or limit sample		

7 （Major）	flicker	judge by ND 5% filter in grey pattern or limit sample
8 （Major）	Electricity parameter（ VoP/Current）	Over the production SPEC reject
9 （Major）	Backlight	1、 LED died off reject 2、 Display on uniformity Invisible by ND5% filter 3、 Brightness does not match the SPEC reject 4、light leak Invisible by ND5% filter
10 （Major）	Cross talk	Limit sample
11 （Major）	Touch defect	Reject

PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

MOUNTING PRECAUTIONS

(1) You must mount a module using arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)
(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

STORAGE

When storing modules as spares for a long time, the following precautions are necessary.
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal hexane.