

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 1/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

Specifications

TFT-LCDmodule

Model No: QY40041A1-00

Customer name:

The project name:

For Customer's Acceptance	
Approved by	Comment

	Signature	Date
Prepared by		
Checked by		
Approved by		

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 2/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

Contents

1	General Description	3
1.1	Features	3
1.2	Application	3
2	Outline Dimension	4
3	Electrical Characteristics	5
3.1	TFT-LCD Module	5
3.2	Back-Light Unit.....	5
4	Block Diagram	6
5	TFT-LCM Interface Specification	7
6	Description of Interface'Signal.....	8
6.1	RGB Interface Timing Characteristics	8
6.2	DC Characteristics	8
6.3	AC Characteristics.....	9
6.4	Reset Characteristics	9
7	Optical Specification.....	10
8	Environment Absolute Maximum Ratings	13
9	Reliability Test Items	13
10	Inspection Standard.....	14
11	Package	15
12	Precautions	16
12.1	Handling	16
12.2	Storage.....	16
12.3	Operation	17
12.4	Touch Panel Mounting Notes	17
12.5	Others	18
13	Records of Version.....	19

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 3/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

1 General Description

QY40041A1-00 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit a backlight unit, The panel size is 3.95inch and thresolution is 320x480. High image quality a-Si TFT LCD module. Partial-screen display function is available. Sleep and Stand-by modes are available for power saving.

1.1 Features

No	Item	Specification	Remark
1	Display Mode	Normally Black	
2	Screen Size	3.95inch (diagonal)	
3	Resolution	320XRGBX480	
4	Color Number	16.7M	
5	Color Arrangement	RGB-stripe	
6	Driver IC	ILI9488	
7	Back Light	White LED*8	
8	Viewing Direction	12 O'clock	
9	Interface	RGB18BIT	
10	Surface Treatment	UV Cut	

1.2 Application

- ◆ Mobile phone.
- ◆ Portable multimedia device.

2 Outline Dimension

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Parameter	Specifications	Unit
Outline dimensions	60.88(W) x94.57(H) x 3.55+_0.1(D) (LCM,no include FPC)	mm
Active area	55.68(W) x83.52(H)	mm
Resolution	320(H)RGBx 480(V) dots	-
Dot size	0.174 (H) ×0.174	mm
Module brightness	260	cd/m ²

Figure 1: Module specification of the module

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 5/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

3 Electrical Characteristics

3.1 TFT-LCD Module

Ta=25°C

Item	Symbo	Value			Unit	Notes
		Min	Typ	Max		
Supply Voltage for logic	Vcc	2.5	2.8	3.3	V	
	Vci	2.5	2.8	3.3		
TFT Gate ON Voltage	VGH *	10	15	20	V	
TFT Gate OFF Voltage	VGL	-15	-8	-5	V	
Operating temperature	Top	-20		+70	°C	
Storage temperature	Tst	-30		+80	°C	

3.2 Back-Light Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Current	IF	--	160	200	mA	IF=160mA VF=3.1V
Forward voltage	VF	2.8	3.1	3.3	V	
Chroma	X	0.240		0.28		
	Y	0.250		0.29		
Brightness	L	5000			Cd/m2	
Uniformity	UBL	80			%	

- 8 LEDs used
- The luminous intensity of LED is strongly dependent on the driving current.
- It is recommended the input of backlight to be constant current rather than constant voltage.

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 6/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

4 Block Diagram

Pin No.	Symbol	Functional	Notes
1	YU	Y+	
2	XL	X-	
3	YD	Y-	
4	XR	X+	
5	VCC	Power supply 2.8v	
6	IOVCC	Power supply 1.8v	
7	TE	For IC Test	
8	CS	chip select signal	
9	RS/DCX	The SPI interface (DCX): The signal for command or	
10	WR/SCL	WRX: Writes strobe signal to write data when WRX is “Low” in 80-series MPU	
11	RD	Reads strobe signal to write data when RDX is “Low” in 80-series MPU interface	
12	SDA	register select signal.	
13	SDO	Serial data output pin used for the SPI Interface.	
14	GND	Power Ground	
15~32	DB0-DB17	Data interface	
33	GND	Power Ground	
34	DE	Data enable signal	
35	PCLK	Serial data clock signal interface	
36	HSYNC	Horizontal sync	
37	VSYNC	Vertical sync	
38	RESET	The external reset input	
39,40,41	IM2-IM0	The System interface mode select	
42	LEDA	Power supply for backlight anode input terminal.	
43~48	LEDK	Power supply Cathode input for backlight	

5 TFT-LCM Interface Specification

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 7/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

6 Description of Interface'Signal

6.1 RGB Interface Timing Charateristics

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
VS	t _{VSYS}	VSYS setup time	10	-	-	ns	
	t _{VSYNH}	VSYS hold time	10	-	-	ns	
HS	t _{HSYS}	HSYS setup time	10	-	-	ns	
	t _{SCYCR}	HSYS hold time	10	-	-	ns	
	t _{HVPD}	HSYS to VSYNC falling edge	400	-	-	ns	
PCLK	t _{DCYC}	PCLK cycle time	33	-	125	ns	
	t _{DLW}	PCLK "L" pulse width	11	-	-	ns	
	t _{DHW}	PCLK "H" pulse width	11	-	-	ns	
	f _{DFREQ}	PCLK frequency	8	-	30	MHz	
DE	t _{DCSS}	DE setup time	10	-	-	ns	
	t _{DCSH}	DE hold Time	10	-	-	ns	
D0~D23	t _{DDS}	RGB Data setup time	10	-	-	ns	
	t _{DDH}	RGB Data hold time	10	-	-	ns	

6.2 DC Characteristics

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-02-16

No.	Item	MIN	TYP	MAX	Unit
1	Vcom voltage	-1.7	-1.5	-1.3	V
2	Vgl voltage	-11.5	-10.5	-9.5	V
3	Vgh voltage	14	15	16	V
4	Vdl voltage	-4.2	-4	-3.8	V
5	Vdh voltage	3.8	4	4.2	V
6	OE time[T1]	--	0.3	--	ms
7	Vgata line charging time[T2]	--	3.2	--	ms
8	Vdata line charging time[T3]	--	16.7	--	ms
9	Dummy gate line	VCOM	VCOM	VCOM	\

6.3 AC Characteristics

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
WRX	tWC	Write cycle	33	-	ns	
	tWRH	Control pulse "H" duration	15	-	ns	
	tWRL	Control pulse "L" duration	15	-	ns	
RDX(ID)	tRC	Read cycle (ID)	160	-	ns	When read ID data
	tRDH	Control pulse "H" duration (ID)	90	-	ns	
	tRDL	Control pulse "L" duration (ID)	45	-	ns	
RDX(FM)	tRCFM	Read cycle (FM)	400	-	ns	When read from frame memory
	tRDHFM	Control pulse "H" duration (FM)	250	-	ns	
	tRDLFM	Control pulse "L" duration (FM)	150	-	ns	
D/CX	tAST	Address setup time (Write)	0	-	ns	
		Address setup time (Read)	10	-	ns	
	tAHT	Address hole time	2	-	ns	
D[17:0]	tdST	Data setup time	15	-	ns	
	tdHT	Data hold time	10	-	ns	
	trAT	Read access time (ID)	-	40	ns	
	trATFM	Read access time (FM)	-	150	ns	
	tODH	Output disable time	5	-	ns	

Note 1) VDDI=1.65 to 3.3V, VDD=2.3 to 4.8V, VSS=VSSI=DVSS=0V, Ta=-30 to 70 °C (to +85 °C no damage)

VDD means VDDA, VDDR, VDDB and VSS means VSSA, VSSR, VSSB

Note 2) The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 20% and 80% of VDDI for Input signals.

6.4 Reset Timing

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-02-16

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
RESX	tRESW	Reset "L" pulse width (Note 1)	10	-	-	μ s	
	tREST	Reset complete time (Note 2)	-	-	5	ms	When reset applied during Sleep In Mode
			-	-	120	ms	When reset applied during Sleep Out Mode

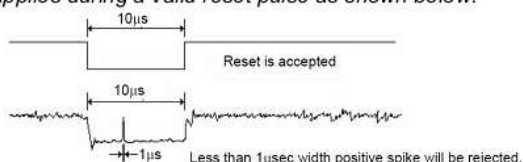
Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5 μ s	Reset Rejected
Longer than 10 μ s	Reset
Between 5 μ s and 10 μ s	Reset Start

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

Note 3) During Reset Complete Time, values in OTP memory will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 5ms after a rising edge of RESX.

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 120msec

7. Optical Specification

深圳市千一显示科技有限公司

Doc.No.:

REV : A

PAGE : 10/19

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-02-16

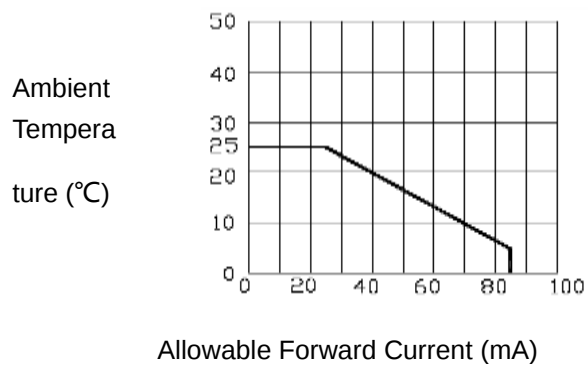
Item			Specification	Unit	Remark
Active Area (H x V)			55.68 x 83.52	mm	Single Chip
Number of Dots (H x V)			320 (RGB) x 480	dot	Single Chip
Pixel Size (H x V)			0.174x0.174	mm	Single Chip
Dimension (H x V x D)			58.68x 90.32x0.8	mm	Not include polarizer
Display Type			Transmissive	-	-
Display Mode			Normally White	-	-
View Direction			12 o'clock	-	-
Temperature Range	Storage		-30 ~ 80	℃	-
	Operating		-20 ~ 70	℃	
Response Time			30 (Typ.)	ms	(1) (4)
Contrast Ratio			500 (Typ.)	-	(1) (3)
Viewing Angle			Up-down : 70/60 (Typ.), Left-right : 70/70 (Typ.)	deg.	(1) (2) Viewing Angle base on Using EWV polarizer Reference Only
Chromaticity (CIE 1931)	NTSC Ratio		60% (Typ.)	%	(1) (6)
CF only Chromaticity (CIE 1931)	Red	Rx	0.638±0.02	-	(1) (4) Under C light (Viewing normal angle ΘX = ΘY=0°)
		Ry	0.339±0.02		
	Green	Gx	0.290±0.02		
		Gy	0.592±0.02		
	Blue	Bx	0.135±0.02		
		By	0.145±0.02		
	White	Wx	0.304±0.03		
		Wy	0.341±0.03		
Panel Transmittance			5.39% (Typ.)	%	(1) (5)
Color Filter Structure			RGB Vertical Stripe	-	-
Weight			10.47	g	Single Chip

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 13/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

8 Environment Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Operation temperature range	Top	-10	60	°C	Ambient
Storage temperature range	Tst	-20	70	°C	Ambient

- Corrosive gas environment is not acceptable.
- TFT-LCD color will change slightly depending on environment temperature. This phenomenon is reversible. Current reduction rate of LED backlight is according to the graph indicated below:



SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

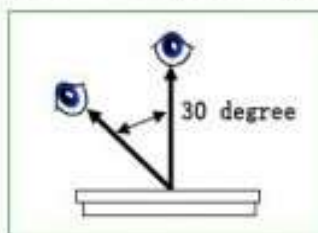
EFFECTIVE DATE : 2019-02-16

10 Inspection Standard

This standard apply to TFT module specification.

1. Inspection condition:

Under daylight lamp 20~40W, product distance inspector'eye 30cm.incline degree 30° .



2. Inspection standard

NO.	Item	Inspection standard	Rate															
2.1	Dot	Case of Dot defect is below ① Bright Dot (whit spot) : "0" ② Dark Dot (black spot) : "0" (In case of Dark Dot on Main TFT LCD) - NG if there's full Dot defect. - Damaged less than the size of sub-pixel is not counted as defect - Dots darker than the size of sub-pixel are not defined as bright dot defect <table><tr><th>area size (mm)</th><th>Acceptable number</th></tr><tr><td>$\Phi \leq 0.10$</td><td>ignore</td></tr><tr><td>$0.10 < \Phi \leq 0.15$</td><td>3</td></tr><tr><td>$0.15 < \Phi \leq 0.20$</td><td>2</td></tr><tr><td>$0.25 < \Phi \leq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \Phi$</td><td>0</td></tr></table>	area size (mm)	Acceptable number	$\Phi \leq 0.10$	ignore	$0.10 < \Phi \leq 0.15$	3	$0.15 < \Phi \leq 0.20$	2	$0.25 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	minor			
area size (mm)	Acceptable number																	
$\Phi \leq 0.10$	ignore																	
$0.10 < \Phi \leq 0.15$	3																	
$0.15 < \Phi \leq 0.20$	2																	
$0.25 < \Phi \leq 0.25$	1																	
$0.25 < \Phi$	0																	
2.2	line	<table><tr><th colspan="2">Size (mm)</th><th>Acceptable number</th></tr><tr><td>ignore</td><td>$W \leq 0.03$</td><td>ignore</td></tr><tr><td>$L \leq 4.0$</td><td>$0.03 < W \leq 0.04$</td><td>2</td></tr><tr><td>$L \leq 4.0$</td><td>$0.04 < W \leq 0.05$</td><td>1</td></tr><tr><td></td><td>$0.05 < W$</td><td>Treat with dot non-conformance</td></tr></table>	Size (mm)		Acceptable number	ignore	$W \leq 0.03$	ignore	$L \leq 4.0$	$0.03 < W \leq 0.04$	2	$L \leq 4.0$	$0.04 < W \leq 0.05$	1		$0.05 < W$	Treat with dot non-conformance	
Size (mm)		Acceptable number																
ignore	$W \leq 0.03$	ignore																
$L \leq 4.0$	$0.03 < W \leq 0.04$	2																
$L \leq 4.0$	$0.04 < W \leq 0.05$	1																
	$0.05 < W$	Treat with dot non-conformance																

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 16/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

	Carton outline size: 400×295×145 (mm)
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12 Precautions

Please pay attentions to the followings as using the LCD module.

12.1 Handling

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.
- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.
- (j) Do not lift the FPC of Touch Panel.

12.2 Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 17/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

ultraviolet ray for a long time.

- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

12.3Operation

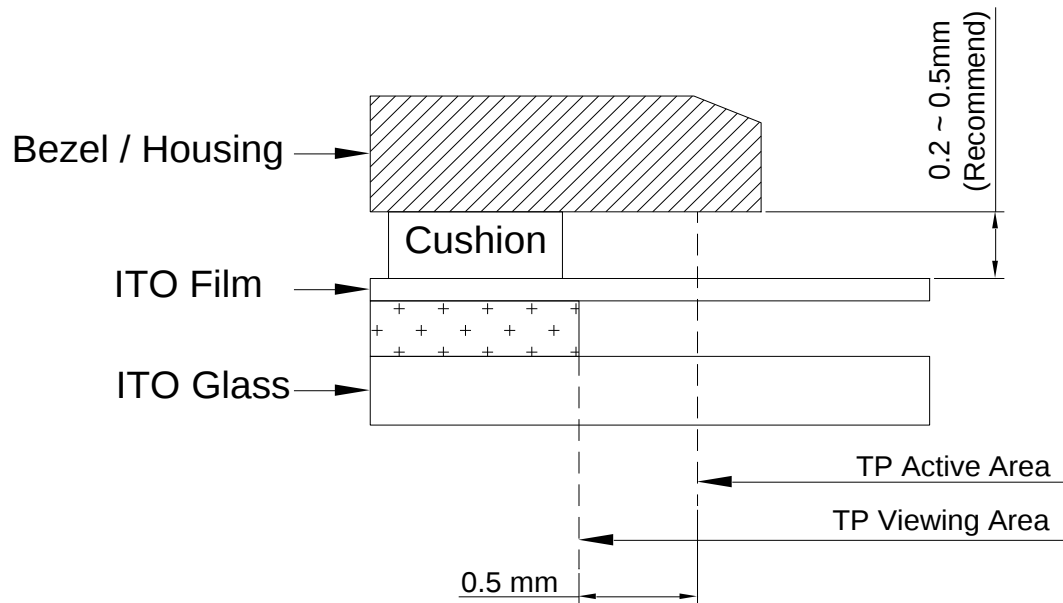
- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.
- (h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the liquid is accumulated near the air vent.
- (i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

12.4Touch Panel Mounting Notes

- (a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.
- (b) The cushion must be placed out of the Viewing Area.
- (c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.

深圳市千一显示科技有限公司	Doc.No.:	
	REV : A	PAGE : 18/19
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	EFFECTIVE DATE : 2019-02-16	

(d) Mounting example:



The corner part has conductivity. Do not touch any metal part after mounting.

12.5Others

- If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

