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Production Custom designs Installation

Mechanical design



MODEL NO : ET013QV06-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2021-01-08

☐ Preliminary Specification

☒ Final Product Specification

Customer : _____

Approved by	Notes

Youri Confirmation

Prepared by	Reviewed by	Approved by
John	Johnny	Wang

1. Introduction

1.1 Scope of application

LCD specification: Dots 240xRGBx240.

As to basic specification of the driver IC, refer to the IC (GC9A01) specification and data book.

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

1.2 TFT features:

Structure: TFT PANNEL+IC +FPC+BL;

IPS Type LCD

240dot-segment and 240 dot-common outputs;

262K Color can be selected by software;

White LED back light;

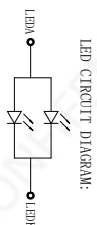
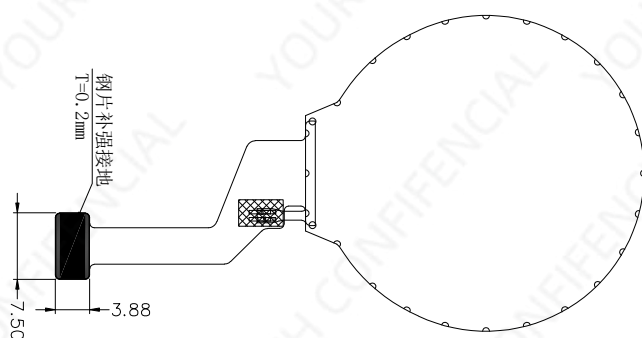
4line SPI interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	240(H) RGB × 240(V)	Dots
Pixel arrangement	RGB Vertical Stripe	--
Pixel Pitch (H*V)	0.0975(H) × 0.0975(V)	mm
Active area	23.40(H) × 23.40(V)	mm
Viewing direction	ALL O'CLOCK	-
TFT Driver IC	GC9A01	
TFT interface	4line SPI interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	35.60(W) × 38.10(H) × 1.56(T)	mm
Touch structure	--	
Touch Driver IC	--	-
Touch Interface	--	

No. SYMBOL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	GND	RSET	CS	CS	D/C	SCL	SDA	GND	GND	NC	LEDA	LEDA	LEBK	LEBK	NC	NC	TE	GND	NC	VDD	VDD	NC	GND	GND



- NOTES:
1. DISPLAY TYPE: 1.28", 240x240 TFT LCD
 2. DISPLAY MODE: Transmissive **Normally Black**
 3. VIEWING DIRECTION: ALL 0'clock
 4. DRIVER IC: GC9A01
 5. LCM (White 9 AVG 1/9) :
Brightness: 500cd/m² (TYP)
Uniformity: 80% (MTN)
 6. BACK LIGHT: 2 chip white LEDs If=40mA, Vf=2.8V-3.3V
 7. OPERATING TEMP: -20°C TO 60°C, STORAGE TEMP: -30°C TO 70°C
 8. * Critical Parameter, () ref Parameter, [] cpk Parameter
Unspecified Tolerances: ±0.20mm
 9. Modification mark:
SUGGESTION: TP window size unilateral increase 0.3~0.5mm than LCM A. A
 10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS
- LEDA ●

PART NO.:		ET013QV06-T		MODULE NO.:		00	
DRAWN BY:		LJ		PROJECTION:			
CHECKED BY:				DATE:			
APPROVED BY:				DATE:			
				SCALE: N. T. S.		UNIT: mm	
				SHEET: 1		OF 1	

3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T _{OPR}	-20	+60	°C
LCM Storage Temperature	T _{STG}	-30	+70	°C
Humidity	RH	-	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage for(DC/DC)	VDD	2.6	2.8	3.3	V	
TFT Gate ON Voltage	VGH	--	13	--	V	*1,*2
TFT Gate OFF Voltage	VGL	--	-10	--	V	*1,*2
TFT Common Voltage	Vcom	--	0	--	V	*3

Note:

*1. VGH is TFT Gate operating Voltage.

*2. VGL is TFT Gate operating Voltage.

The storage structure of this model is C_{ST}(Storage on Common)

*3. Vcom must be adjusted to optimize display quality _Cross talk, Contrast Ratio and etc.

4.2 Back-Light Unit Characeristics

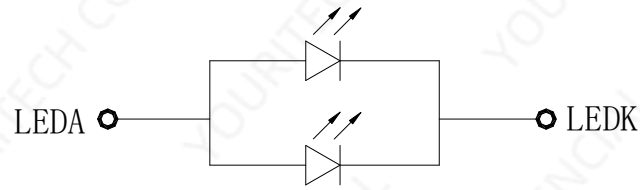
The back-light system is an edge-lighting type with 2 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	2.8	--	3.2	V	-
Forward current	I _F	--	40	-	mA	-
Luminance(With LCD)	L _v		500	--	cd/m ²	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

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

Backlight circuit diagram shown in below:



5. Module Function Description

Pin No.	Symbol	LCM Description	remarks
1	GND	Ground	
2	RESET	Global reset pin	
3	NC	NC	
4	CS	Chip select signal input pin	
5	D/C	Register select signal.	
6	SCL	Synchronous clock signal pin	
7	SDA	input/output signal pin	
8	GND	Ground	
9	GND	Ground	
10	NC	NC	
11	LEDA	Power supply for backlight anode input terminal.	
12	LEDA	Power supply for backlight anode input terminal.	
13	LEDK	Power supply for backlight cathode input terminal.	
14	LEDK	Power supply for backlight cathode input terminal.	
15	NC	NC	
16	NC	NC	
17	TE	Tearing effect signal is used to synchronize MCU to frame memory	
18	GND	Ground	
19	NC	NC	
20	VCC	Power supply : 2.6V ~ 3.3V	
21	VCC	Power supply : 2.6V ~ 3.3V	
22	NC	NC	
23	GND	Ground	
24	GND	Ground	

6. Timing Characteristics

Serial Interface Timing Characteristics (4-line SPI system)

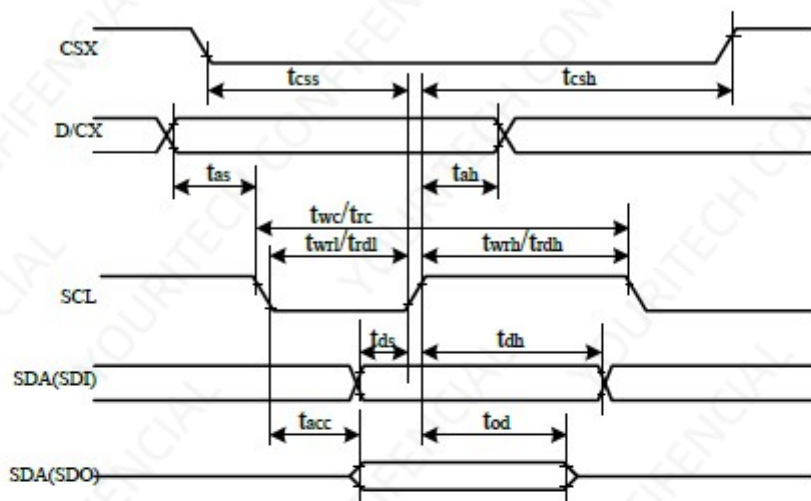
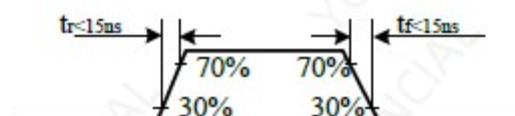


Table48.

Signal	Symbol	Parameter	min	max	Unit	Description
CSX	t_{css}	Chip select time (Write)	20	-	ns	
	t_{csh}	Chip select hold time (Read)	40	-	ns	
SCL	t_{wc}	Serial Clock Cycle (Write)	10	-	ns	
	t_{wrh}	SCL "H" Pulse Width (Write)	5	-	ns	
	t_{wrl}	SCL "L" Pulse Width (Write)	5	-	ns	
	t_{rc}	Serial Clock Cycle (Read)	150	-	ns	
	t_{rdh}	SCL "H" Pulse Width (Read)	60	-	ns	
	t_{rdl}	SCL "L" Pulse Width (Read)	60	-	ns	
D/CX	t_{as}	D/CX setup time	10	-	ns	
	t_{ah}	D/CX hold time (Write/Read)	10	-	ns	
SDA/SDI (Input)	t_{ds}	Data setup time (Write)	5	-	ns	
	t_{dh}	Data hold time (Write)	5	-	ns	
SDA/SDO (Output)	t_{acc}	Access time (Read)	10	-	ns	

Note: $T_a = 25^\circ\text{C}$, $IOVCC = 1.65\text{V to } 3.3\text{V}$, $VCI = 2.5\text{V to } 3.3\text{V}$, $AGND = VSS = 0\text{V}$

Figure99.



Reset Timing:

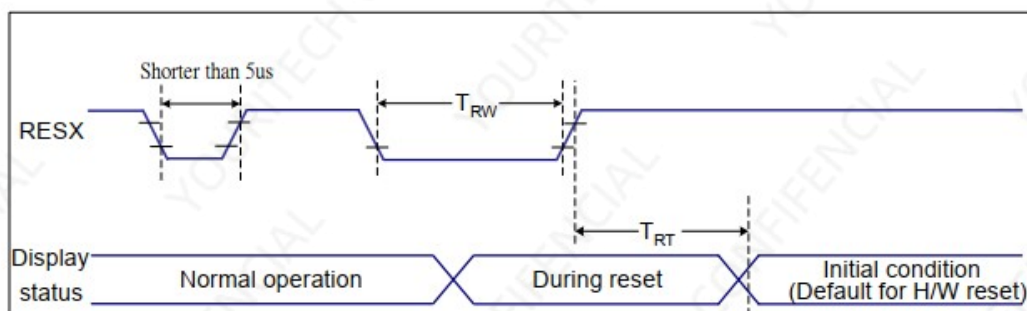


Figure 7 Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, $T_a=25^\circ\text{C}$

Related Pins	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

Table 9 Reset Timing

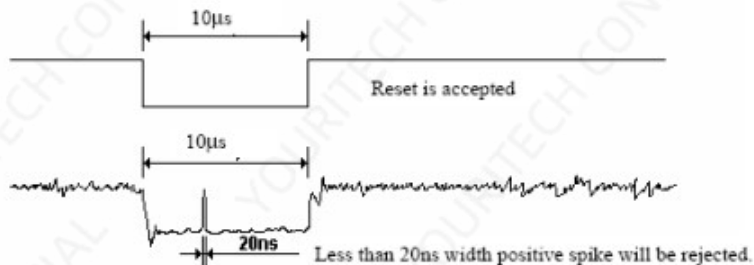
Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.
2. 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 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. 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 Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7.Optical Characteristics

Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T (%)	Θ=0 Normal viewing angle	(4.4)	(4.9)	—	%	Measuring with normal polarizer , Reference Only Base on Vop=5.1V
Transmittance (without Polarizer)		T (%)		(13.5)	(15.0)	—	%	
Contrast Ratio		CR		900	1100	—	—	(1)(2)
Response Time		T _R +T _F		—	30	35	msec	(1)(3)
Color Gamut	(%)			55	60		%	C-light
Color Chromaticity (CIE1931)	White	W _x		-0.02	(0.324)	+0.02	—	(1)(4) CF glass C-light
		W _y			(0.347)			
	Red	R _x			(0.644)			
		R _y			(0.333)			
	Green	G _x			(0.325)			
		G _y	(0.566)					
	Blue	B _x	(0.134)					
		B _y	(0.124)					
Viewing Angle	Hor.	Θ _L	CR>10	80	85	—	(1)(4) Measuring with normal polarizer , Reference Only	
		Θ _R		80	85	—		
	Ver.	Θ _U		80	85	—		
		Θ _D		80	85	—		
Optima View Direction		Free						(5)

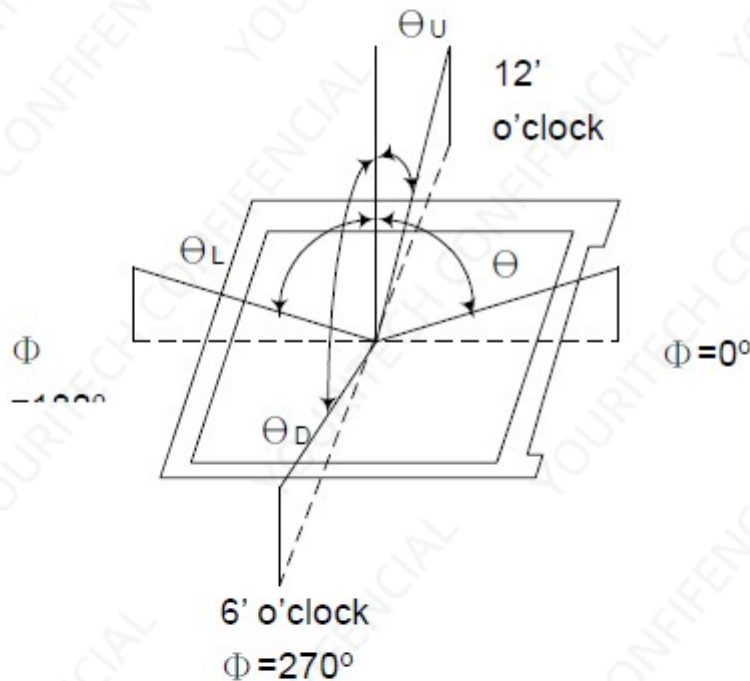
Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

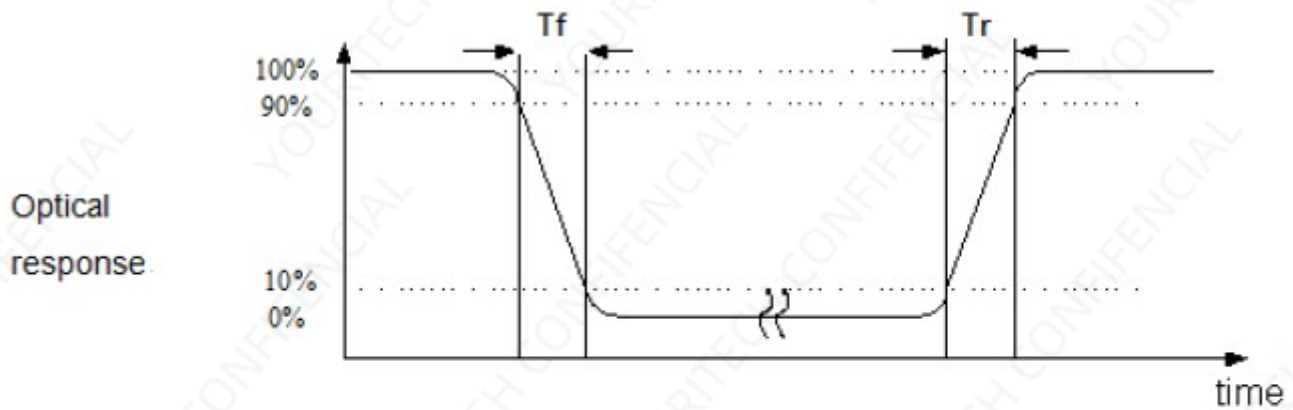
Note (1) Definition of Viewing Angle:



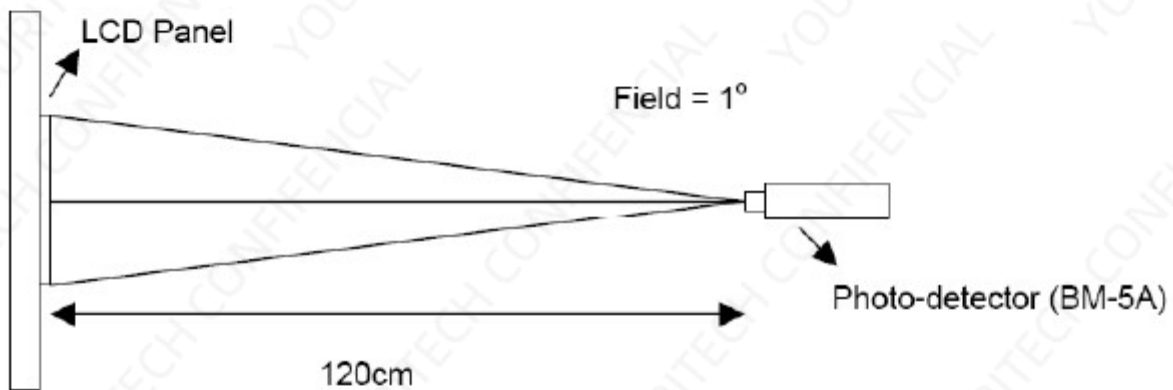
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

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

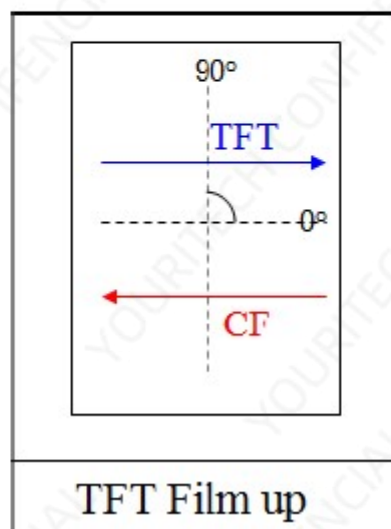
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)



8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+70°C / 96H	1. Functional test is OK. Missing Segment, short, unclear segment non-display, display abnormally and liquid crystal leakage un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Temp. Operating	+60°C / 96H	
4	Low Temp. Operating	-20°C / 96H	
5	High Temperature / Humidity storage	50°C x 90%RH / 96H	
6	Thermal and cold shock	Static state, -30°C (30min) ~60°C (30min), 50 cycles	

9. Packing Method----TBD

- END -