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Custom designs
Installation

Mechanical design



MODEL NO : ET013QV02-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2020-08-27

☐ 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 320xRGBx320.

As to basic specification of the driver IC, refer to the IC (ST7796DW) 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

320dot-segment and 320 dot-common outputs;

16.7M Color can be selected by software;

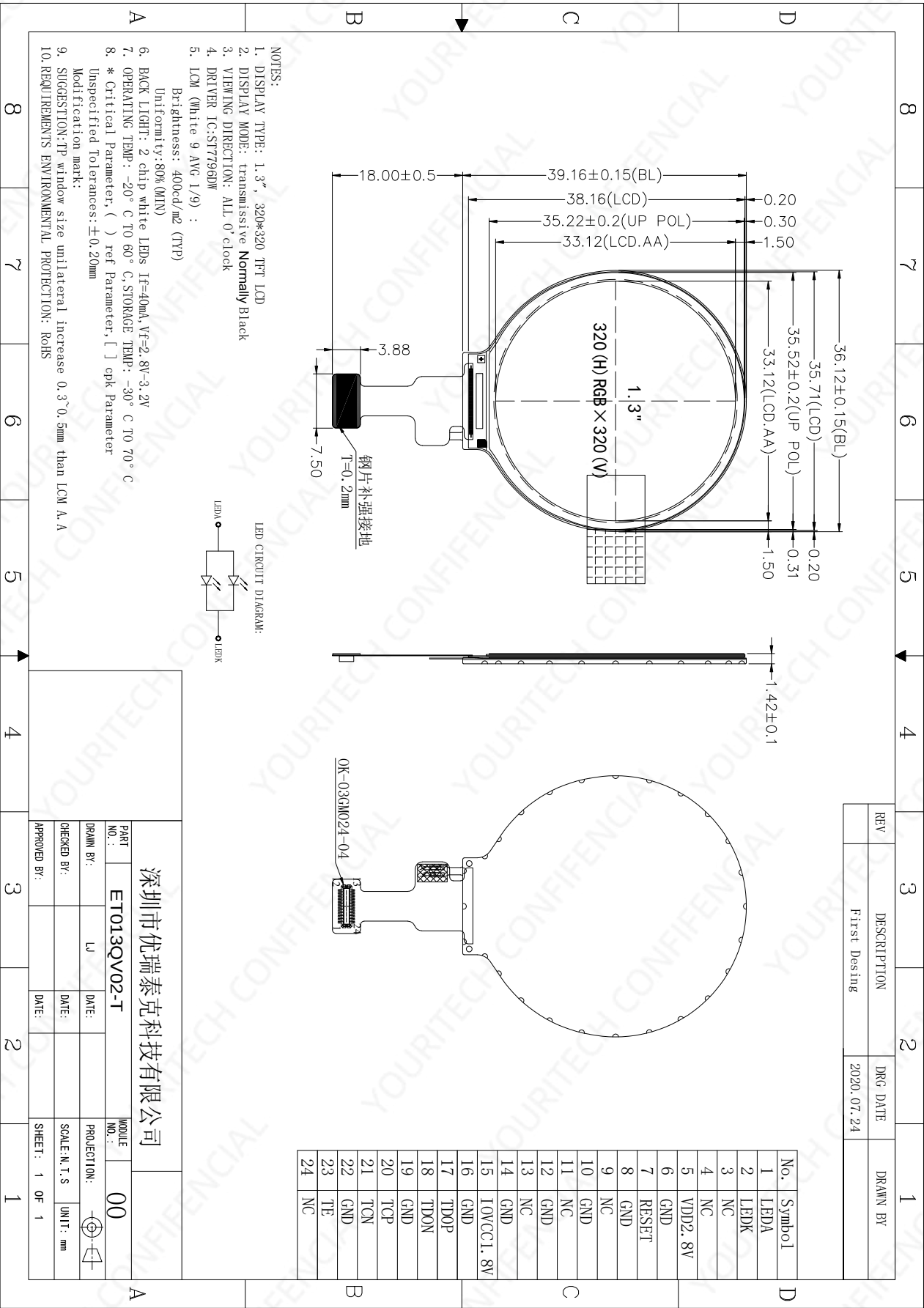
White LED back light;

1lane MIPI interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	320(H) RGB × 320(V)	Dots
Pixel arrangement	RGB Vertical Stripe	--
Pixel Pitch (H*V)	0.1035(H) × 0.1035(V)	mm
Active area	33.12(H) × 33.12(V)	mm
Viewing direction	ALL O'CLOCK	-
TFT Driver IC	ST7796DW	
TFT interface	1lane MIPI interface	-
Module Size(W*H*T)	36.12(W) × 39.16(H) × 1.42(T)	mm
Approx. Weight	TBD	g
Touch structure		
Touch Driver IC		-
Touch Interface		



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	
Supply Voltage for(IOVCC)	IOVCC	1.65	1.8	3.3	V	
TFT Gate ON Voltage	VGH	12.6	--	15.5	V	*1,*2
TFT Gate OFF Voltage	VGL	-8.3	--	-11.8	V	*1,*2

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)

4.2 Back-Light Unit Characteristics

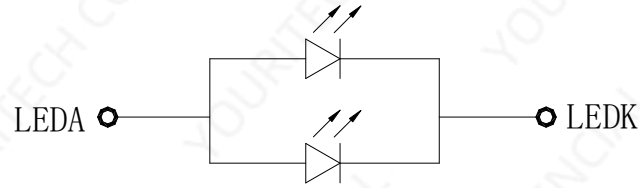
The back-light system is an edge-lighting type with 2 white LEDs. The characteristics of the back-light are shown in the following tables.

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		400	--	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	Description
1	LEDA	Power supply for backlight anode input terminal.
2	LEDK	Power supply for backlight cathode input terminal.
3	NC	NC
4	NC	NC
5	VDD2. 8V	MIPI Voltage (VDD to VSSAM): 2.6V ~ 3.3V
6	GND	Power Ground
7	RESET	Reset signal input terminal. Active at 'L'.
8	GND	Power Ground
9	NC	NC
10	GND	Power Ground
11	NC	NC
12	GND	Power Ground
13	NC	NC
14	GND	Power Ground
15	I0VCC1. 8V	I/O Voltage (VDDI to DGND): 1.65V ~ 3.3V
16	GND	Power Ground
17	TDPO	MIPI DSI differential data pair
18	TDNO	MIPI DSI differential data pair
19	GND	Power Ground
20	TCP	MIPI DSI differential clock pair
21	TCN	MIPI DSI differential clock pair
22	GND	Power Ground
23	TE	Tearing effect signal is used to synchronize MCU to frame memory
24	NC	NC

6. Timing Characteristics

MIPI Interface Characteristics

High Speed Mode

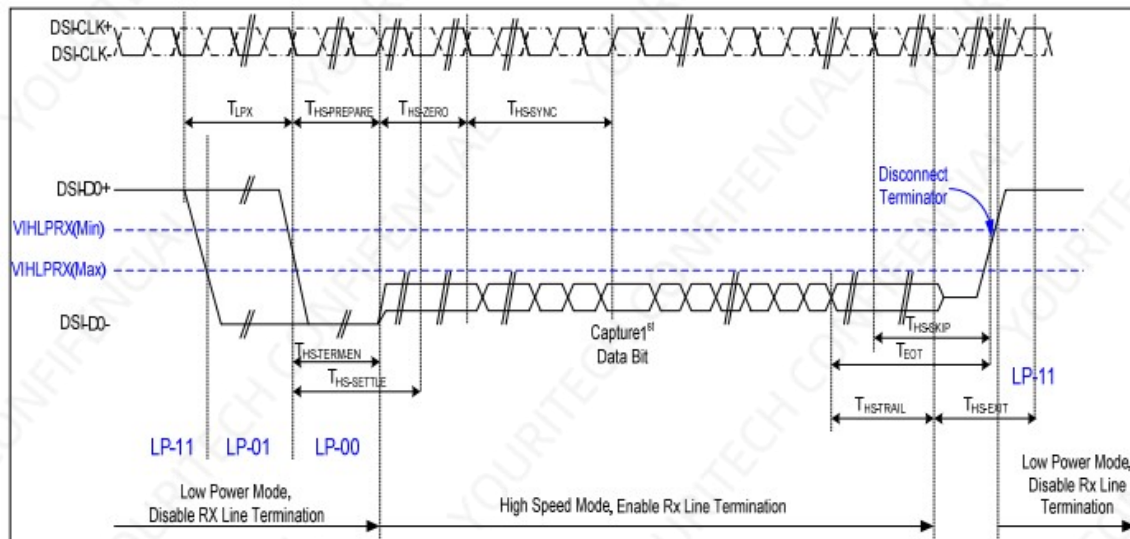
● Clock Channel Timing



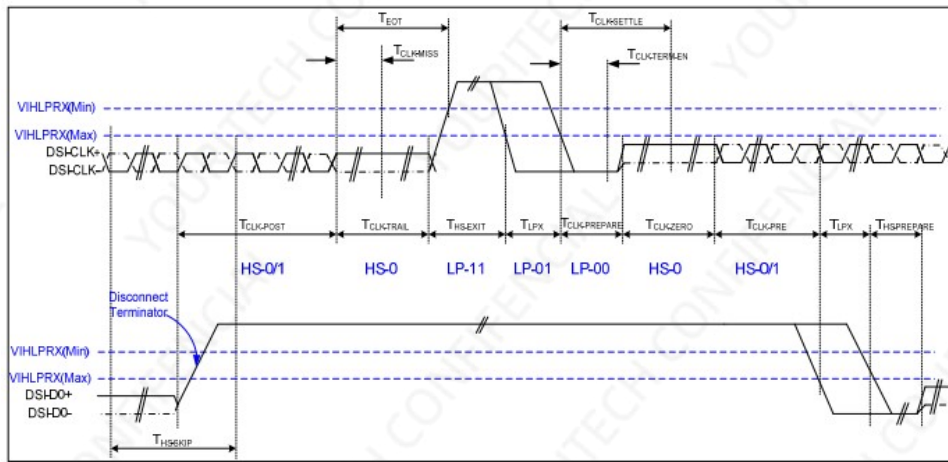
● Timing Characteristics

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	2xUIINSTA	Double UI instantaneous	4	25	ns	-
DSI-CLK+/-	UIINSTA UIINSTB	UI instantaneous halves	2	12.5	ns	UI = UIINSTA = UIINSTB
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	-
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	-

● Data Transmission

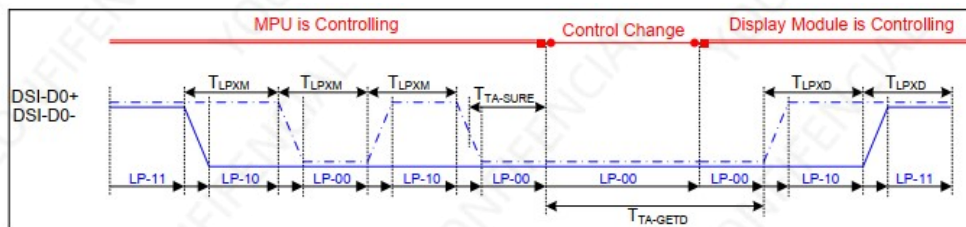


Data lanes-Low Power Mode to/from High Speed Mode Timing

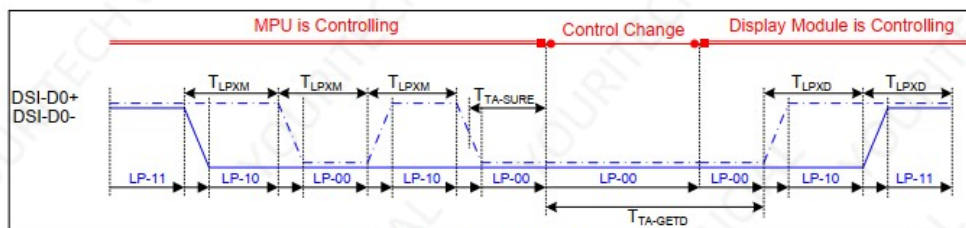


Clock lanes- High Speed Mode to/from Low Power Mode Timing

Bus Turnaround Procedure



Bus Turnaround (BTA) from display module to MPU Timing



Bus Turnaround (BTA) from MPU to display module Timing

VDDI=1.8V, VCI=2.8V, AGND=DGND=AGNDR=0V, Ta=25°C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	TLPXD	2xTLPXD	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	5xTLPXD		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	4xTLPXD		ns	Output

MIPI Interface BTA Mode Timing Characteristics

7. Optical Characteristics

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ3	CR>10	80	85		°	Note 1
		Θ9		80	85		°	
	Vertical	Θ12		80	85		°	
		Θ6		80	85		°	
Contrast Ratio		CR	Θ= 0°	900	1100			Note 2
Transmittance		T(%)	Θ= 0°	4.0	4.6			Note 3
NTSC		%	Θ= 0°	65	69.1			
Reproduction Of color	Red	Rx	Θ= 0°	0.64	0.655	0.67		Note 4 *Only CF With OC With C light
		Ry		0.312	0.327	0.342		
	Green	Gx		0.269	0.284	0.299		
		Gy		0.579	0.594	0.609		
	Blue	Bx		0.123	0.138	0.153		
		By		0.096	0.111	0.126		
White		Wx	Θ= 0°	0.285	0.300	0.315		
		Wy		0.311	0.326	0.341		
Response Time		Tr+Tf	Θ= 0°		35	40	ms	Note 5

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (See FIG.2).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIG. 2) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with APF Pol.

4. The color chromaticity coordinates specified in Table1 shall be calculated from

The spectral data measured with all pixels first in red, green, blue and white.

Measurements shall be made at the center of the C/F.

Measurement condition is C - light source & Halogen Lamp

5. The electro-optical response time measurements shall be made as FIG.3 by switching the "data" input signal ON and OFF.

The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

Figure 1. Measurement Set Up

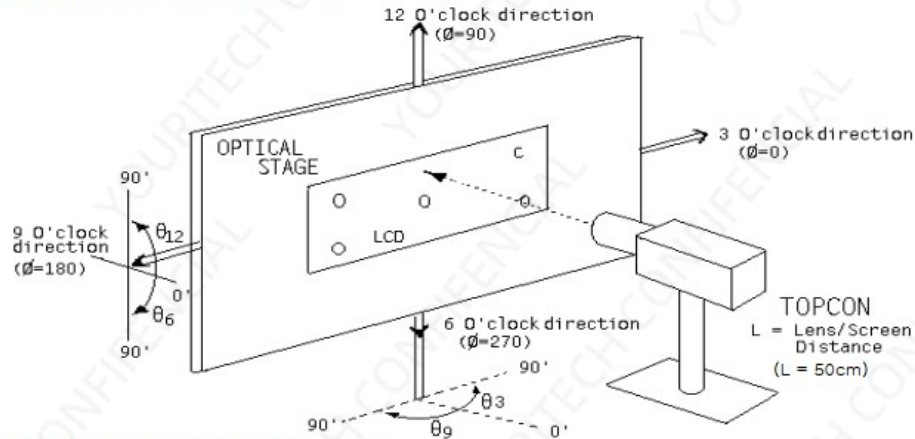
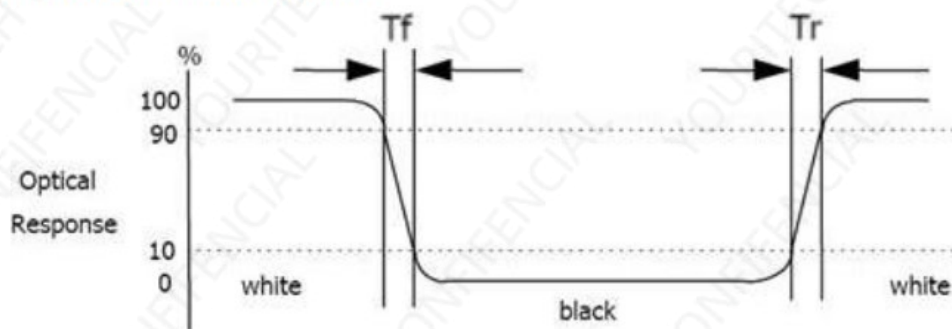


Figure 2. Response Time Testing



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 are un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Temperature Operating	+60°C / 96H	
4	Low Temperature 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) ~ 70°C (30min), 50 cycles	

9. Packing Method----TBD

- END -