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MODEL NO : ET032QV02-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2020-11-30

□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 240xRGBx320.
As to basic specification of the driver IC, refer to the IC (Sitronix:ST7789V2) specification and data book.
All material & processing of the LCD module should be Lead Free.

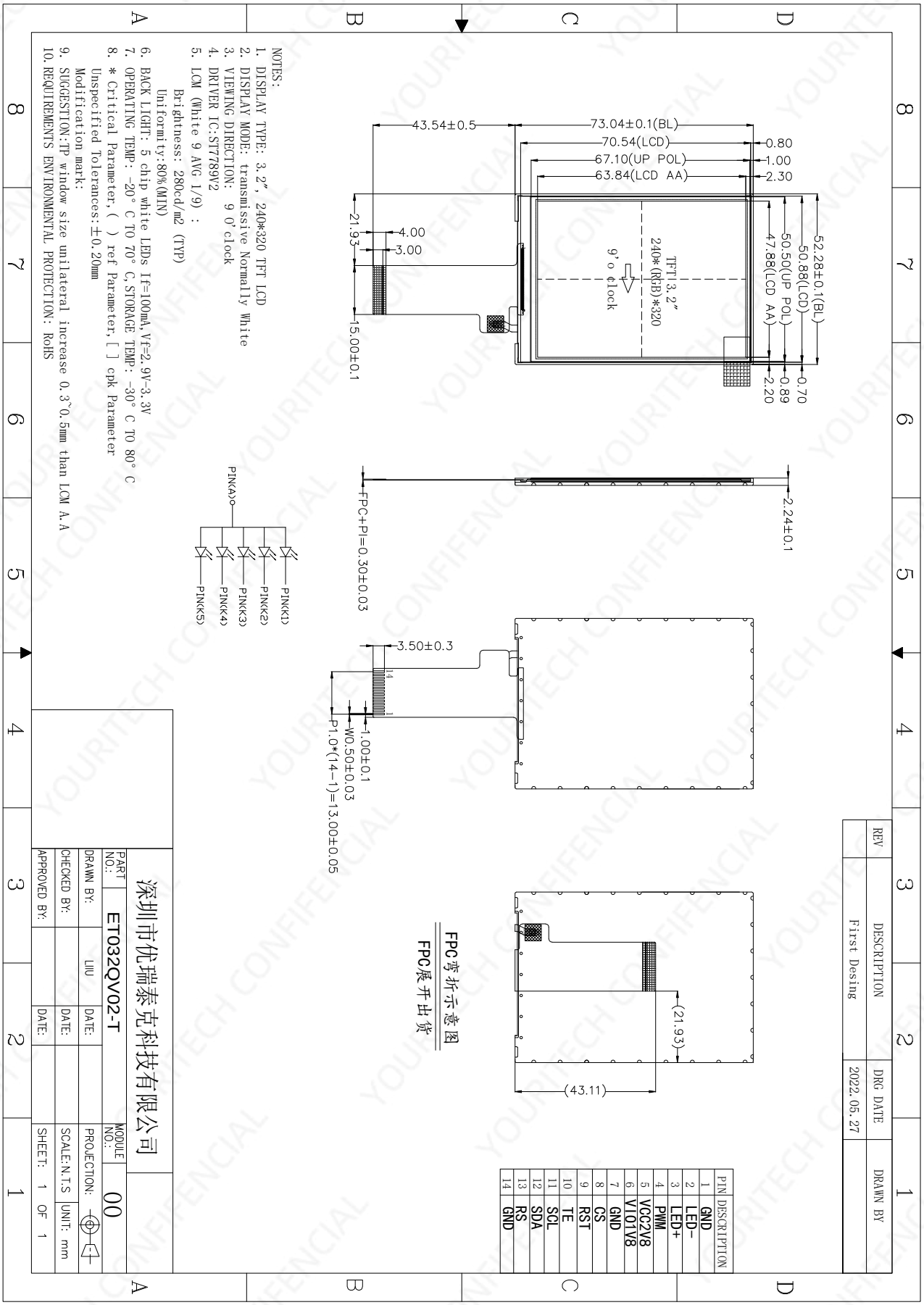
1.2 TFT features:

Structure: TFT PANNEL+IC +FPC+BL;
9 O'clock Type LCD
240dot-segment and 320 dot-common outputs;
65/262K Color can be selected by software;
White LED back light;
4lane SPI interface

1.3 Applications:

2. LCM General specification

ITEM	Sandard value	Unit
LCD Type	Normally White	--
Drive element	TFT active matrix	--
Number of pixels	240*3RGB(H)X320(V)	Dots
Pixel arrangement	RGB Vertical stripe	--
Pixel Pitch (W*H)	0.1995(W) × 0.1995(H)	mm
Active area	47.88(W) × 63.84(H)	mm
Viewing direction	9 O'CLOCK	-
TFT Driver IC	ST7789V2	
TFT interface	4lane SPI interface	-
Module Size(W*H*T)	52.28 (W) ×73.04(H) ×2.24(T)	mm
Approx. Weight	TBD	g
Touch structure		
Touch Driver IC		-
Touch Interface		



NOTES:
1. DISPLAY TYPE: 3.2", 240*320 TFT LCD
2. DISPLAY MODE: transmissive Normally White
3. VIEWING DIRECTION: 9 O'clock
4. DRIVER IC:ST7789V2
5. LCM (White 9 AVG 1/9) ;
   Brightness: 280cd/m2 (TYP)
   Uniformity:80%(MIN)
6. BACK LIGHT: 5 chip white LEDs If=100mA, Vf=2.9V-3.3V
7. OPERATING TEMP: -20° C TO 70° C, STORAGE TEMP: -30° C TO 80° C
8. * Critical Parameter, ( ) ref Parameter, [ ] cpk Parameter
   Unspecified Tolerances:±0.20mm
   Modification mark:
9. SUGGESTION:TP window size unilateral increase 0.3~0.5mm than LCM A.A
10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS

PIN	DESCRIPTION
1	GND
2	LED-
3	LED+
4	PWM
5	VCC2V8
6	VIO1V8
7	GND
8	CS
9	RST
10	TE
11	SCL
12	SDA
13	RS
14	GND

REV	DESCRIPTION	DRG DATE	DRAWN BY
	First Desing	2022.05.27	

深圳市优瑞泰克科技有限公司

PART NO.:	ET032QV02-T	MODULE NO.:	00
DRAWN BY:	LIU	DATE:	PROJECTION:
CHECKED BY:		DATE:	SCALE:N.T.S UNIT: mm
APPROVED BY:		DATE:	SHEET: 1 OF 1

3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T_{OPR}	-20	+70	°C
LCM Storage Temperature	T_{STG}	-30	+80	°C
Humidity	RH	--	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for I/O	VDDIO	1.65	1.8	3.3	V
Supply Voltage for(DC/DC)	VDD	2.5	2.8	3.3	V
Supply Voltage for(DC/DC)	AVDD	--	--	--	V
Supply Voltage for(DC/DC)	AVEE	--	--	--	V

4.2 Back-Light Unit Characeristics

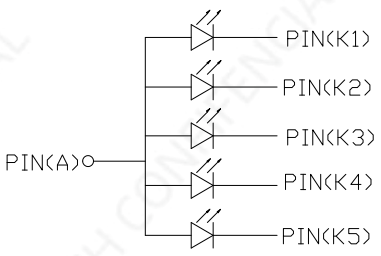
The back-light system is an edge-lighting type with 5 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V_F	2.9	--	3.3	V	--
Forward current	I_F	--	100	--	mA	--
Luminance(With LCD)	Lv	--	280	--	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	Functional	Notes
1	GND	Power Ground	
2	LEDK	Power supply for backlight cathode input terminal.	
3	LEDA	Power supply for backlight anode input terminal.	
4	PWM	PWM (Pulse Width Modulation) Signal Of LED Driving.	
5	VCC 2.8V	Power supply 2.5V ~ 3.3V	
6	IOVCC 1.8V	Power Supply For I/O.	
7	GND	Power Ground	
8	CS	Chip select signal input pin	
9	RESET	Reset signal input terminal. Active at 'L'.	
10	TE	Frame head pulse for tearing effect.	
11	SCL	Serial clock signal pin.	
12	SDA	Serial data input/output pin.	
13	RS	Display data/command selection pin in parallel interface	
14	GND	Power Ground	

6. Timing Characteristics

Power ON/OFF Sequence

VDDI and VDD can be applied in any order.

VDD and VDDI can be power down in any order.

During power off, if LCD is in the Sleep Out mode, VDD and VDDI must be powered down minimum 120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, VDDI or VDD can be powered down minimum 0msec after RESX has been released.

CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

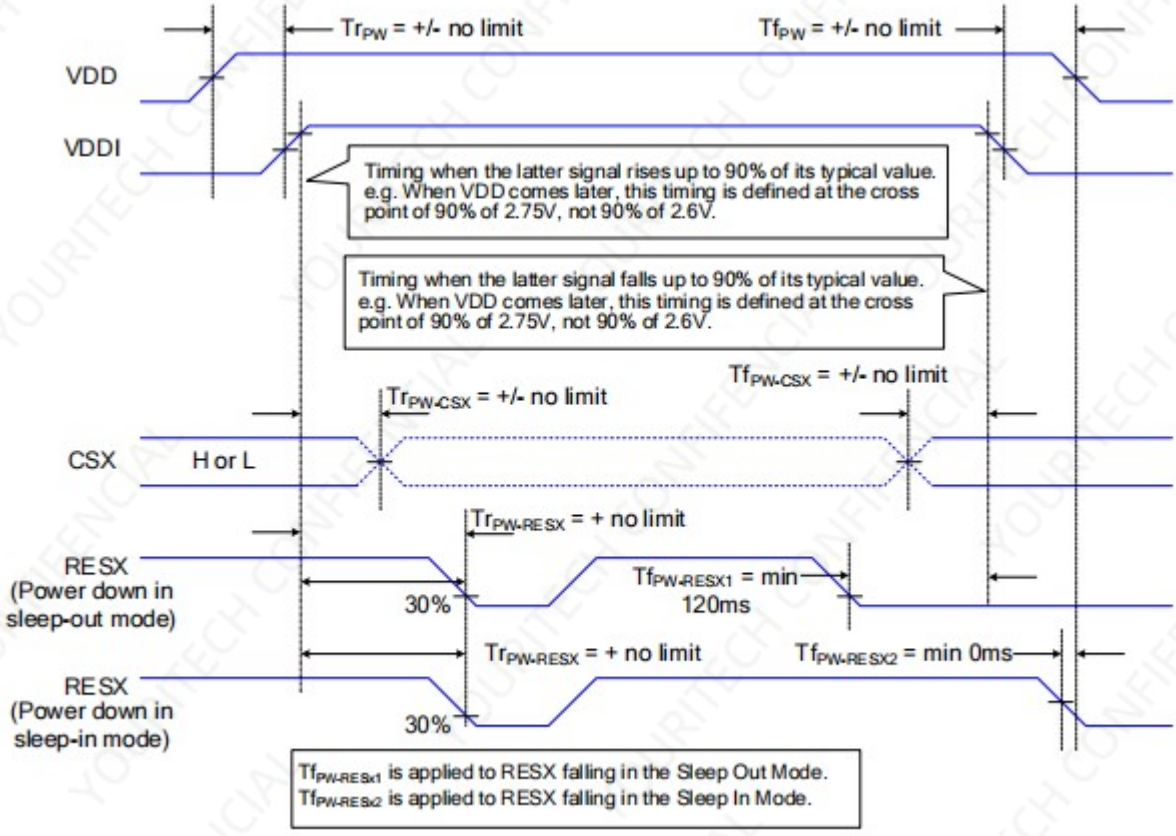
Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.

Note 4: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

The power on/off sequence is illustrated below



Serial Interface Characteristics (4-line serial):

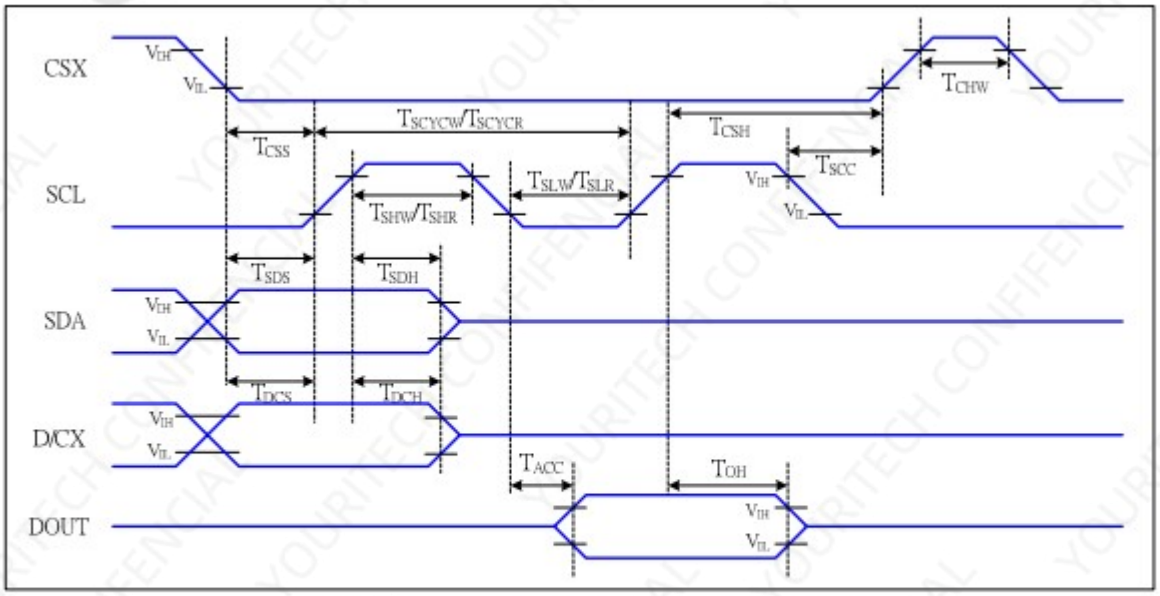


Figure 5 4-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	16		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SDH}	Data hold time	7		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Table 6 4-line serial Interface Characteristics

Reset Timing

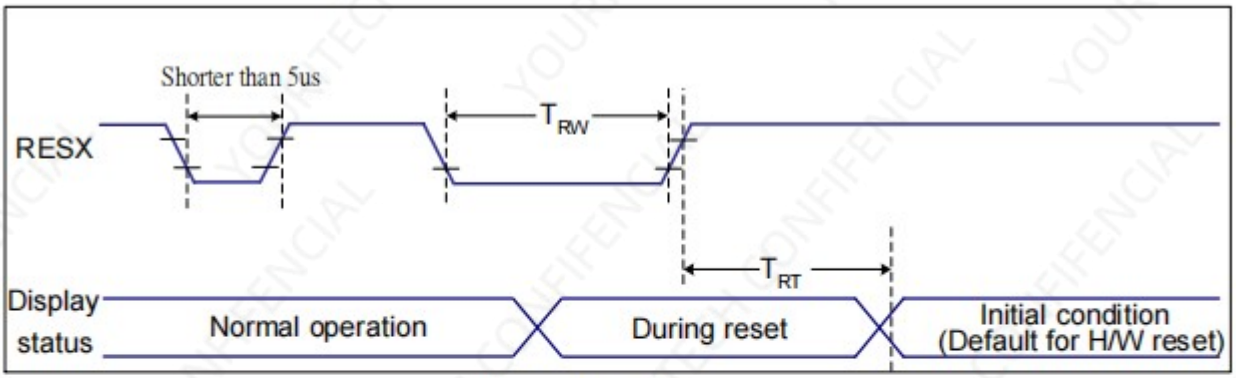


Figure 7 Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

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 (tRT) 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:

7.Optical Characteristics

Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold Voltage		Vsat		2.0	2.2	2.4	V	Fig.1
		Vth		1.1	1.3	1.5	V	
Viewing Angle	Horizontal	Θ3	CR>10	45	60		°	Note 1
		Θ9		45	60		°	
	Vertical	Θ12		45	60		°	
		Θ6		45	60		°	
Contrast Ratio		CR	Θ= 0°	300	350			Note 2
Transmittance		T(%)	Θ= 0°	6.40	6.70			Note 3
NTSC		%	Θ= 0°	45%	50%			
Reproduction Of color	Red	Rx	Θ= 0°	0.611	0.626	0.641		Note 4 *Color filter Glass with ITO
		Ry		0.295	0.310	0.325		
	Green	Gx		0.281	0.296	0.311		
		Gy		0.503	0.518	0.533		
	Blue	Bx		0.127	0.142	0.157		
		By		0.126	0.141	0.156		
White		Wx	Θ= 0°	0.280	0.295	0.310		
		Wy		0.312	0.327	0.342		
Response Time		Tr+Tf	Θ= 0°		30	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 Θ= 0° 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.

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

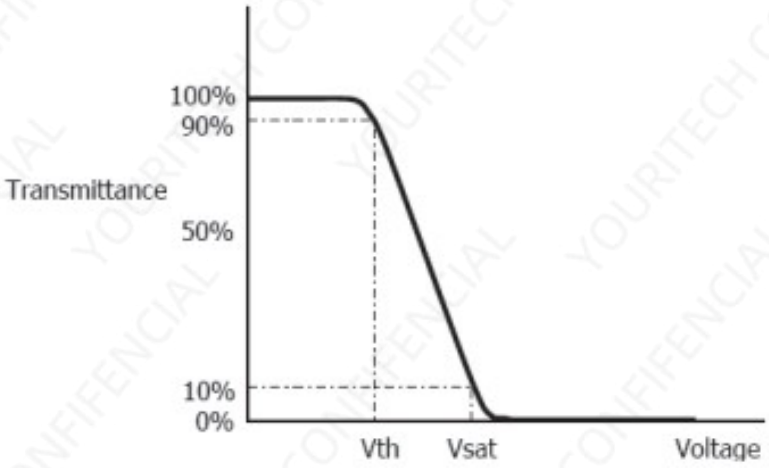
3. Transmittance is the value with Polarizer.

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

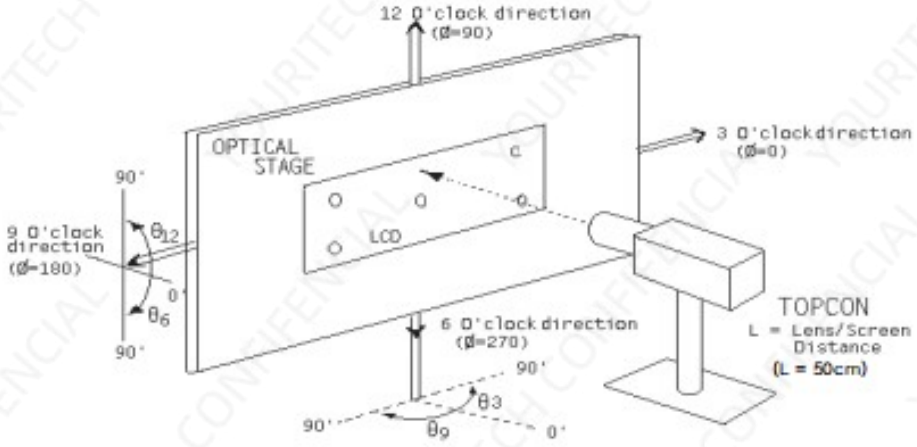
5. The electro-optical response time measurements shall be made as FIG.3 by switching the "data" input signal ON and OFF.

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

Figure 1. The definition of Vth & Vsat



Fi



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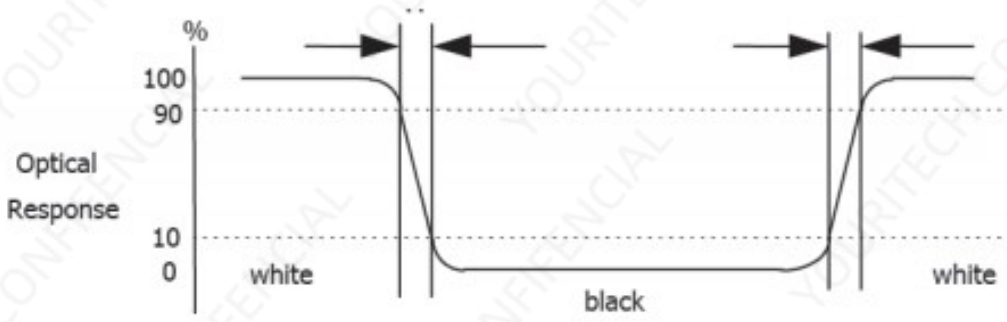

8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+80°C / 96H	1. Functional test isOK. Missing Segment,short, unclear segment non-display,display abnormally and liquid crystal leakare un-allowed. 2. No low temperature bubbles,end seal loose andfall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Tempe. Operating	+70°C / 96H	
4	Low Tempe. Operating	-20°C / 96H	
5	High Temperature /Humidity storage	50°C x 90%RH /96H	
6	Thermal and cold shock	Static state， -20℃（30min） ~60℃（30min），50 cycles	

9. Packing Method----TBD

- END -