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MODEL NO : ET078HD02-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2022-06-14

☐ 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

This LCD module should be designed for mobile phone use.

LCD specification: Dots 400xRGBx1280.

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

ALL O'CLOCK Type LCD

400 dot-segment and 1280 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

LVDS interface

1.3 Applications:

Motorcycle dashboard

Electric Animation Dashboard

Medical display

Engineering vehicle display

Outdoor highlight equipment

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally Black	--
Drive element	TFT active matrix	--
Number of pixels	400*3RGB(H)X1280(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (W*H)	0.1485(W)x 0.1485(H)	mm
Active area	59.40(H) × 190.08 (V)	mm
Viewing direction	ALL O'CLOCK	
TFT Driver IC	TBD	-
TFT interface	LVDS Interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	67.14(W) x205.12(H) x4.50(T)	mm
Touch structure	--	
Touch Driver IC	--	-
Touch Interface	--	



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	10	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
TFT OperationFrame rate	Hz	--	60	--	Hz	
Supply Voltage for(IO/IO)	IOVCC	--	--	--	V	
Supply Voltage for(DC/DC)	VDD	2.5	3.3	3.6	V	

4.2 Back-Light Unit Characeristics

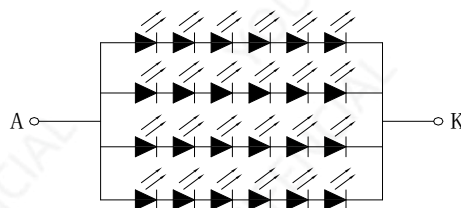
The back-light system is an edge-lighting type with 24 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	16.8	--	20.4	V	-
Forward current	I _F	--	160	--	mA	-
Luminance(With LCD)	L _v	--	900	--	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=40mA/LED. The LED life time could be decreased if operating I_L is larger than 45mA/LED.

Backlight circuit diagram shown in below:



5. Module Function Description

LCM PIN Description:

Pin No.	Symbol	Description
1	VCOM/NC	NC
2	VDD 3.3V	Power Voltage for digital circuit.
3	VDD 3.3V	Power Voltage for digital circuit.
4	NC	NC
5	RESET	RESET PIN
6	STBYB/NC	NC
7	GND	Ground
8	RXIN0-	Negative LVDS Differential Data Input
9	RXIN0+	Positive LVDS Differential Data Input
10	GND	Ground
11	RXIN1-	Negative LVDS Differential Data Input
12	RXIN1+	Positive LVDS Differential Data Input
13	GND	Ground
14	RXIN2-	Negative LVDS Differential Data Input
15	RXIN2+	Positive LVDS Differential Data Input
16	GND	Ground
17	RXCLKIN-	Negative LVDS Differential Clock Input
18	RXCLKIN+	Positive LVDS Differential Clock Input
19	GND	Ground
20	RXIN3-	Negative LVDS Differential Data Input
21	RXIN3+	Positive LVDS Differential Data Input
22	GND	Ground
23	CS(NC)	NC
24	SCL(NC)	NC
25	GND	Ground
26	SDA(NC)	NC
27	SDO(NC)	NC
28	SELB(NC)	NC
29	AVDD(NC)	NC
30	GND	Ground
31-32	LED-	LED Cathode
33	L/R(NC)	Horizontal inversion
34	U/D(NC)	Vertical inversion
35	VGL(NC)	Gate OFF Voltage
36	NC	NC
37	NC	NC
38	VGH(NC)	Gate ON Voltage
39-40	LED+	LED Anode

LVDS AC characteristic

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK	-	30	-	TBD	MHz
Input data skew margin	TRSKM	$ VID = 200\text{mV}$ $RxVCM = 1.2\text{V}$ $RxFCLK = 81\text{MHz}$	500	-	-	ps
Clock High Time	TLVCH	-	-	$4/(7 \cdot RxFCLK)$	-	ns
Clock Low Time	TLVCL	-	-	$3/(7 \cdot RxFCLK)$	-	ns
PLL wake-up-time	TenPLL	-	-	-	150	us

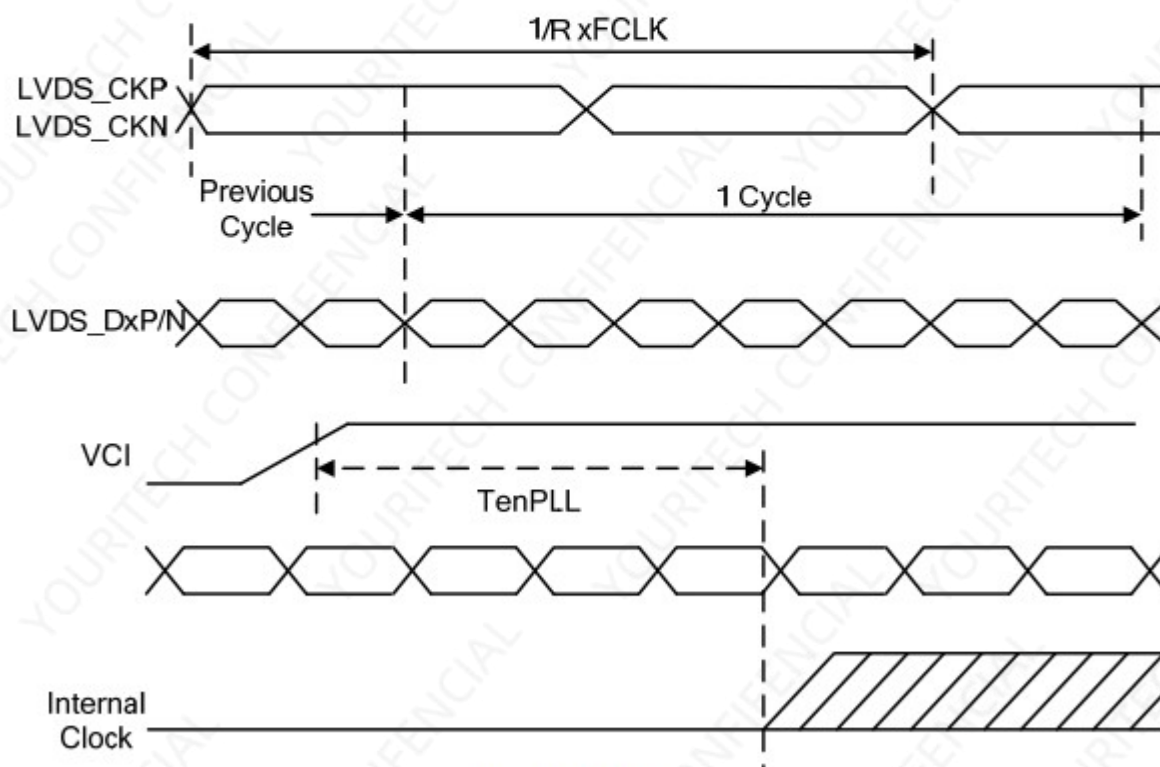
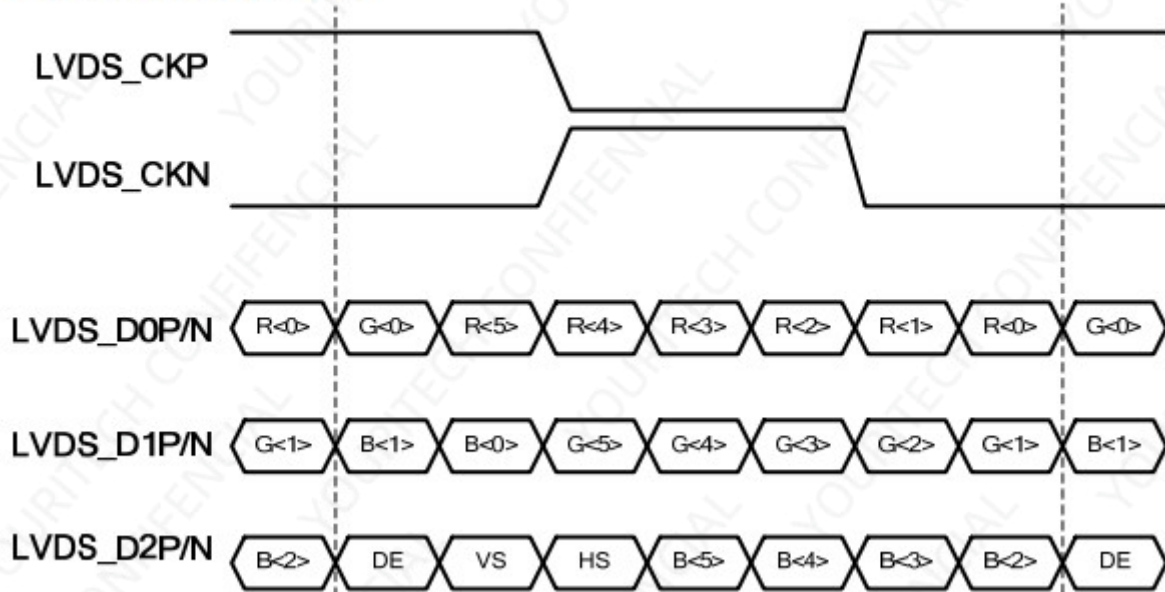


Figure LVDS figure

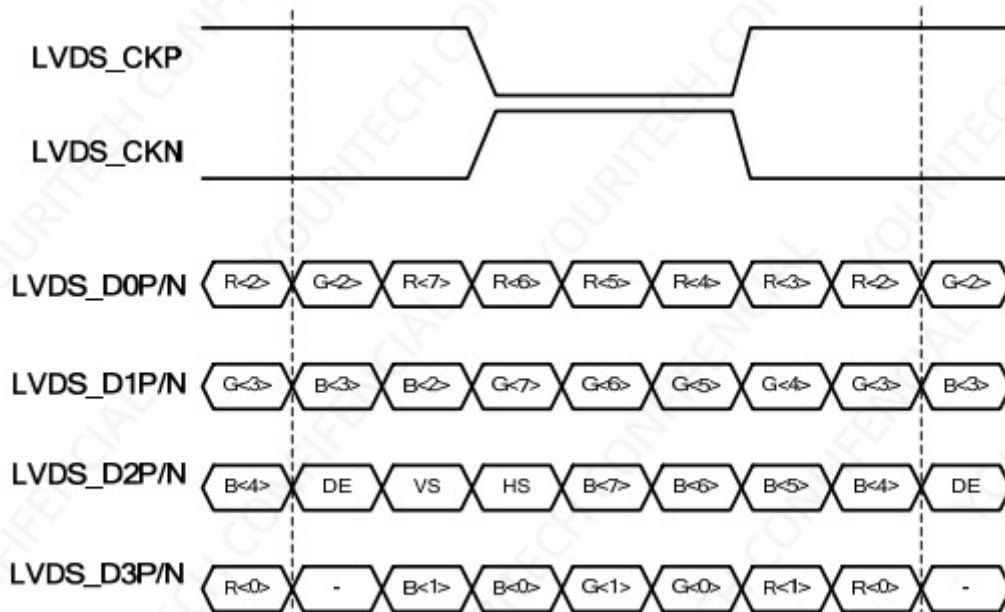
Parameter	Symbol	Min.	Typ.	Max.	Units	Condition
Modulation Frequency	SSCMF	23	-	93	KHz	
Modulation Rate	SSCMR	-	-	+3	%	

LVDS interface

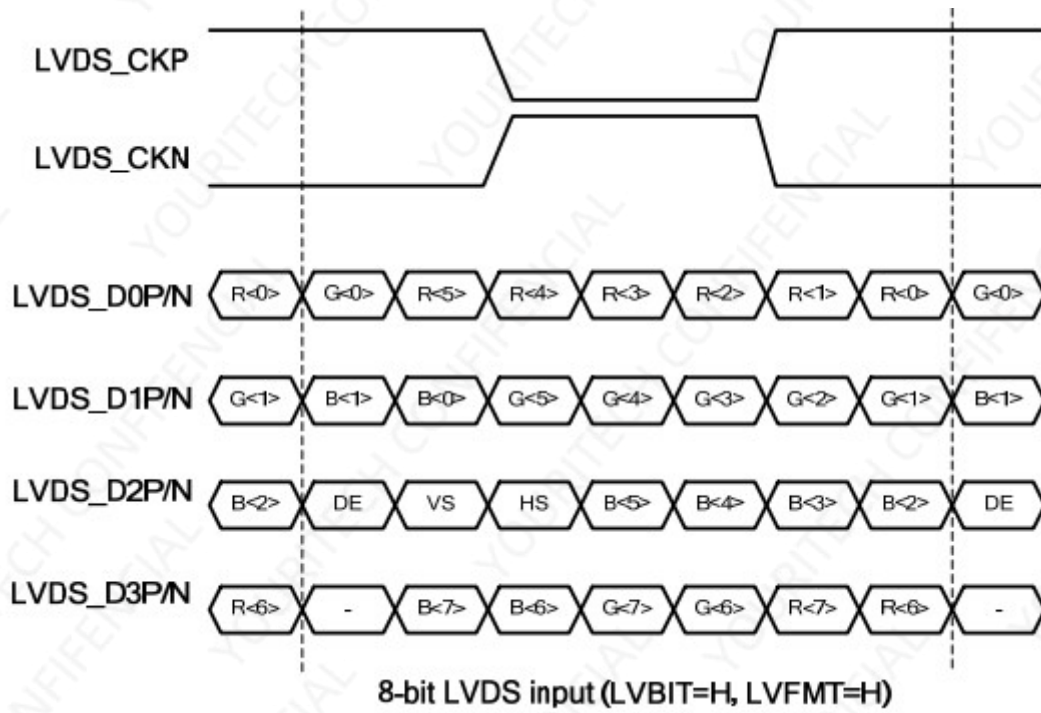
Data input format for LVDS



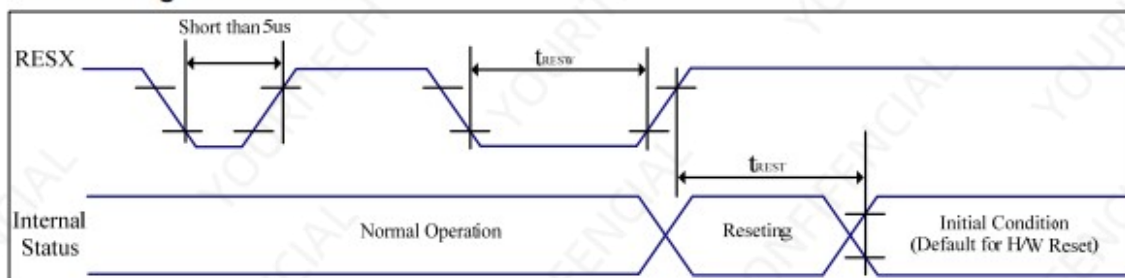
6-bit LVDS input (LVBIT=L, LVFMT=Don't care)



8-bit LVDS input (LVBIT=H, LVFMT=L)



Reset timing characteristics



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

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

Table: Reset input timing

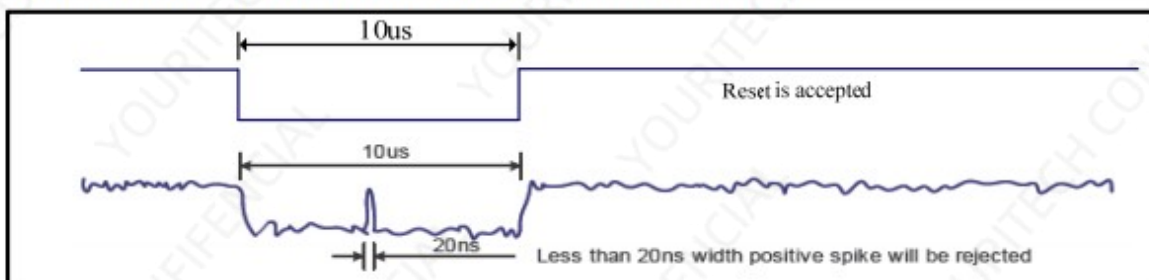
Note 1: Due to an electrostatic discharge on RESX line, spike does not cause irregular system reset according to the table below.

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.)

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.

7.Optical Characteristics

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	70	80	-	Deg.	Note 1
		Θ_9		70	80	-	Deg.	
	Vertical	Θ_{12}		70	80	-	Deg.	
		Θ_6		70	80	-	Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$	700	900	-	-	Note 2
Transmittance		Tr		3.7	4.3	-	%	Note 3
Color Gamut	NTSC	CIE1931	$\Theta = 0^\circ$	65	70	-	%	Note 4
Reproduction of color	White	Wx	$\Theta = 0^\circ$	Typ -0.03	0.300	Typ +0.03	-	
		Wy			0.329		-	
Response Time		Tr+Td	Ta= 25° C $\Theta = 0^\circ$	-	30	40	ms	Note 5

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 FIGURE 1).

2. Contrast measurements shall be made at viewing angle of $\Theta=0$ 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 FIGURE 1) 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 without APF and without CG.

4. The color chromaticity coordinates specified in Table 5. 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 panel and based on C Light.

5. The electro-optical response time measurements shall be made as FIGURE 2. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+80°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	+70°C / 96H	
4	Low Temp. Operating	-20°C / 96H	
5	High Temperature / Humidity storage	60°C x 90%RH / 96H	
6	Thermal and cold shock	Static state, -20°C (30min) ~70°C (30min), 50 cycles	

9. Packing Method

TBD

- END -