

Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD MODULE

Module No: LTK156FTBCT27-V0

☒ Preliminary Specification

☐ Approval Specification

Designed by	Checked by	Approved by
jona	tom	lan

Final Approval by Customer

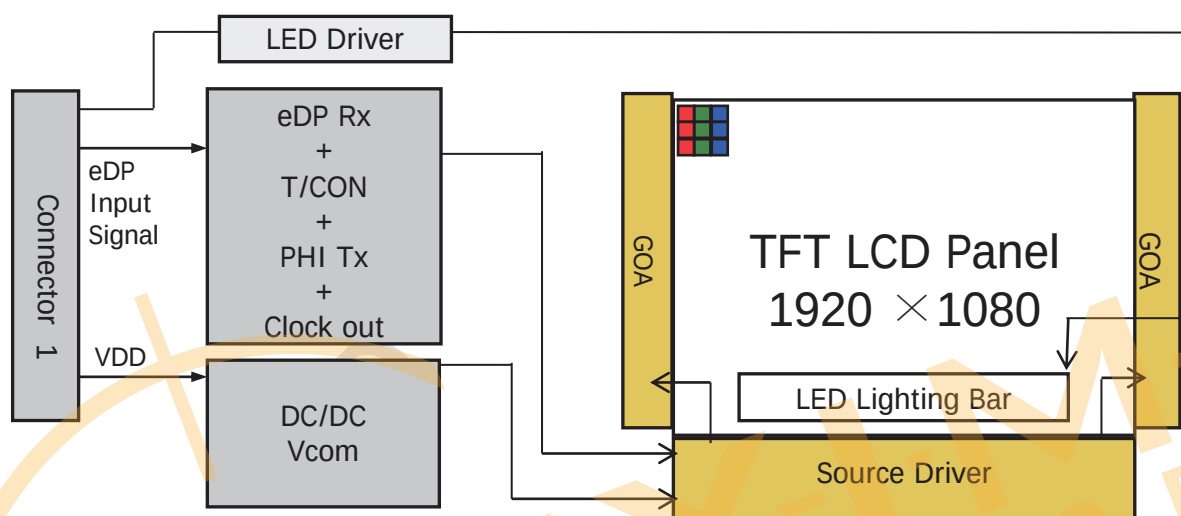
Approved by	Comment
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※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

1.1 Introduction

LTK156FTBCT27-V0 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 15.6 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type. Therefore, this module is suitable for Notebook PC. The LED Driver for back-light driving is built in this model.

All input signals are eDP1.2 interface compatible.



1.2 Features

- 2 lane eDP Interface with 2.7Gbps
- Thin and light weight
- 8-bit color depth, display 16.7M colors
- Green Product (RoHS & Halogen free product)
- Low driving voltage and low power consumption
- On board EDID chip

2.General Description

NO	Item	Specification	Unit
1	LCD Size	TFT"15.6	inch
2	Panel Type	IPS	mm
3	Display Resolution	1920 x RGB x 1080	pixel
4	Display Mode	Normally Black	-
5	Number of Colors	16.7M	-
6	Viewing Direction	ALL	-
7	Pixel arrangement	RGB Vertical stripe	-
8	Color Gamut	72% NTSC	-
9	CTP+LCM Module size	386.80(W)×236.07(H)×9.40(T)	mm
10	Active Area	344.16(W)×193.59(H)	mm
11	Pixel Pitch	0.17925 (H) × 0.17925 (V)	mm
12	LCM Driver	-	
13	Light Source	White LED	
14	LCM Interface	2 lane eDP	bit

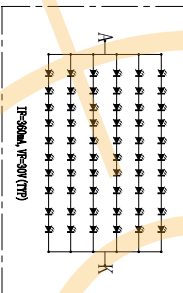
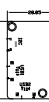
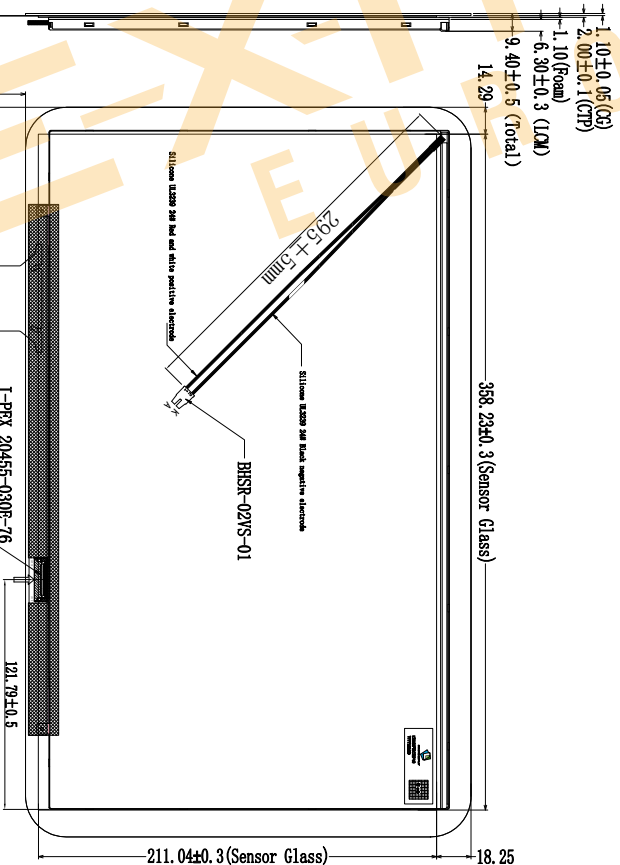
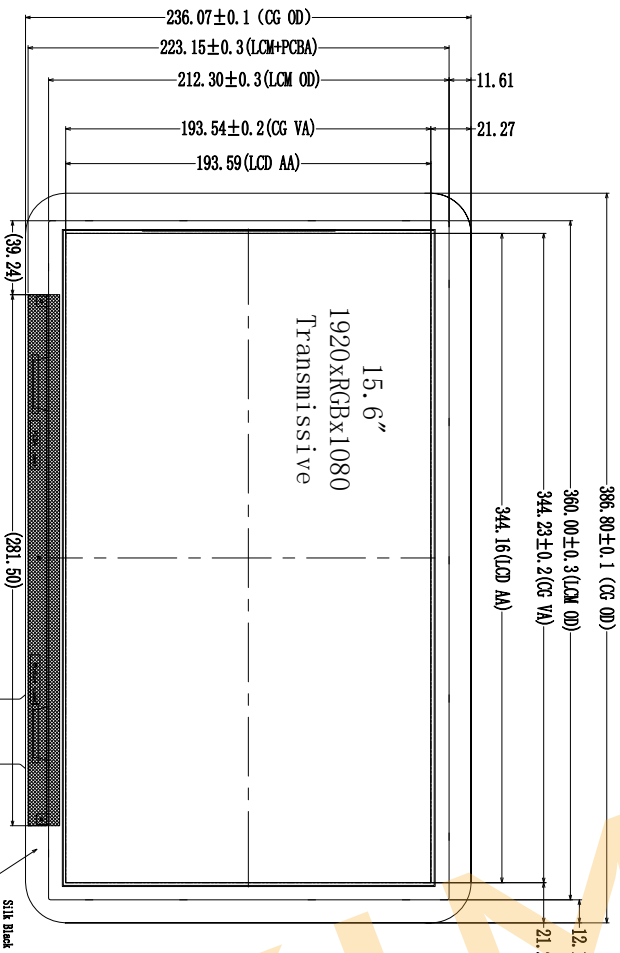
Note : Please refer to the mechanical drawing

3. Mechanical Drawing

Front View

Side View

Back View



(LIC)

(HSR)

PIN DESCRIPTION	
1	NC
2	H. GND
3	LAME1. N
4	LAME1. P
5	H. GND
6	LAME0. N
7	LAME0. P
8	H. GND
9	ADJ. CH. P
10	ADJ. CH. N
11	H. GND
12	LCD. VCC
13	LCD. VCC
14	NC
15	H. GND
16	H. GND
17	HPD
18	BL. GND
19	BL. GND
20	BL. GND
21	BL. GND
22	BL. ENABLE
23	BL. PWM
24	NC
25	NC
26	BL. POWER
27	BL. POWER
28	BL. POWER
29	BL. POWER
30	NC

PIN	definition
1	VDD
2	SEN
3	SEL
4	SMA
5	INT
6	GND

PIN	definition
1	VDD/ST
2	D-
3	D+
4	GND

- Technical parameters:
1. TP structure: G+G;
 2. TP type: CDB; IC selection: ILITEK2511
 3. Working voltage: 3.3V-5V
 4. Surface hardness: above 8H
 5. Working environment: -10°C~+60°C, ≤ 85%RH
 6. Storage environment: -10°C~+65°C, ≤ 85%RH
 7. Dimensional tolerances not specified shall be ± 0.2mm
 8. The product complies with RoHS standards

- Notes:
1. Display : 15.6", TFT
 2. Resolution: 1920xRGBx1080
 3. LCD Viewing Direction: all
 5. Display Mode: Normally Black
 6. LCM+CTP Brightness: 600cd/㎡ (TYP)
 7. unmark Tolerance: ±0.2
 8. OPERATING TEMP: -20° C~+70° C
 9. STORAGE TEMP: -30° C~+80° C
 10. Requirements on Environmental Protection: ROHS

REV	DESCRIPTION	DATE	NAME
3			
2			
1			
0			
REV			



Shenzhen Leadtek Electronics Co., Ltd

SCALE: 1/1	UNIT: mm	PAGE: 1/1	APPROVE	CHECK	DRAWN
Part No:	LTK156FTBCT27	VER: V0	Revin	JOMA	IAN
Customer No:					

4.0 ELECTRICAL SPECIFICATIONS

4.1 Electrical Specifications

 $T_a=25\pm 2^{\circ}\text{C}$

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V_{RF}	-	-	100	mV	At $V_{DD} = 3.3\text{V}$
Power Supply Current	I_{DD}	-	212	303	mA	Note 1
Differential Input Voltage	V_{ID}	200	-	600	mV	
Power Consumption	P_D	-	0.7	1.0	W	Note 1

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25°C.

- a) Typ : Mosaic Pattern
b) Max : R/G/B Pattern



2. Calculated value for reference ($V_{LED} \times I_{LED}$)

5.0 ELECTRICAL SPECIFICATIONS

5.1 Electrical Specifications

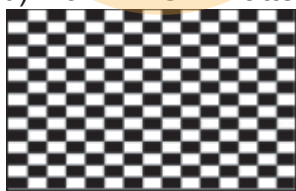
< Table . Electrical specifications >

Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V _{RF}	-	-	100	mV	At V _{DD} = 3.3V
Power Supply Current	I _{DD}	-	273	-	mA	Note 1
Differential Input Voltage	V	200	-	600	mV	
Power Consumption	P	-	0.9	1.7	W	Note 1
	P _{BL}	-	-	3.0	W	Note 2
	P _{total}	-	3.9	4.7	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25°C.

- a) Typ : Mosaic Pattern
b) Max : R/G/B Pattern



2. Calculated value for reference (V_{LED} × I_{LED})

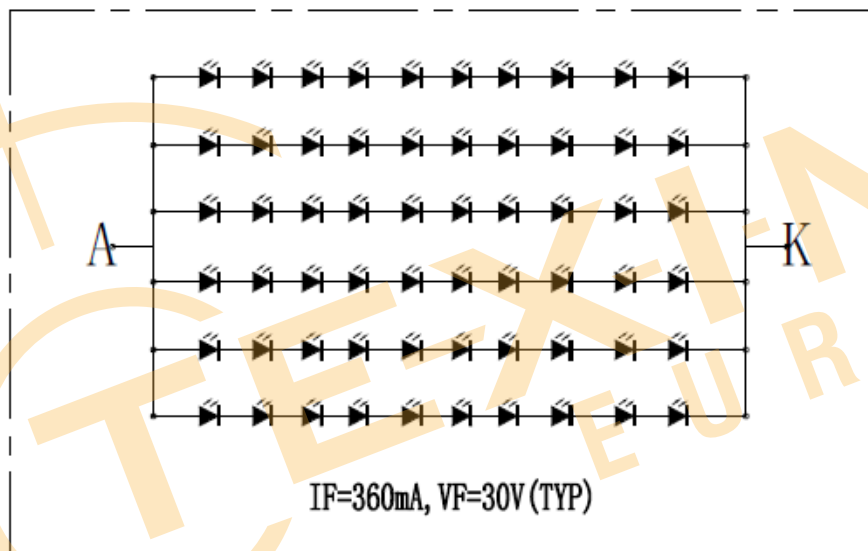
5.2 Back-light Unit:

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
LED Current	IF	—	360	—	mA	—	—
LED Voltage	VF	—	30	33	V	I=360mA	—
Life Time		—	20000	—	Hr.	I ≤ 360mA	—
CTP+LCM Brightness	Luminance	—	600	--	cd/m2	I=360mA	
Color	White						

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) Ta=25±2℃

(3) Test condition: LED Current 360mA



6.0 OPTICAL SPECIFICATION

6.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta=270$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 o'clock.

6.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	100	1200	-	-	
Transmittance		Tr		-	6.3	-	%	With APF
Luminance of White(LCM+CTP)	6 Points	Y_w	$\Theta = 0^\circ$ $I_{LED} = 60mA$	-	-	600	nit	With BOE BLU
White Chromaticity		x_w	$\Theta = 0^\circ$	0.254	0.285	0.315	-	
		y_w		0.284	0.315	0.345	-	
Reproduction of color	Red	x_R	$\Theta = 0^\circ$	-0.03	0.648	+0.03	-	
		y_R			0.345		-	
	Green	x_G			0.317		-	
		y_G			0.625		-	
	Blue	x_B			0.153		-	
		y_B			0.054		-	
Gamut		-	-	68	72	-	%	
Response Time (Rising + Falling)		T_{RT}	$Ta= 25^\circ C$ $\Theta = 0^\circ$	-	30	35	Ms	Note 6
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2	%	

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.

3. Center Luminance of white is defined as luminance values of 5 point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 5(or 13) points} / \text{Maximum Luminance of 5(or 13) points}$.
(see FIGURE 2 and FIGURE 3).

5. 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.

6. The electro-optical response time measurements shall be made as FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark.
(See FIGURE 5).

6.3 Optical measurements

Figure 1. Measurement Set Up

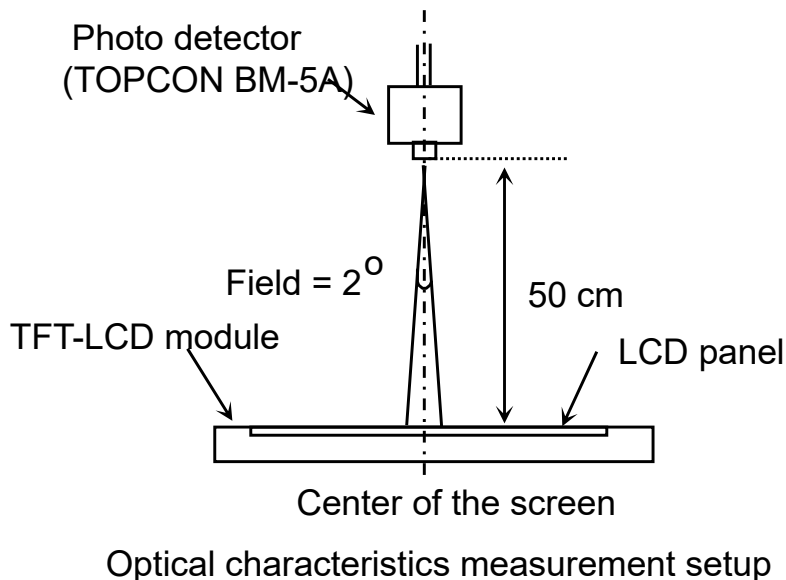
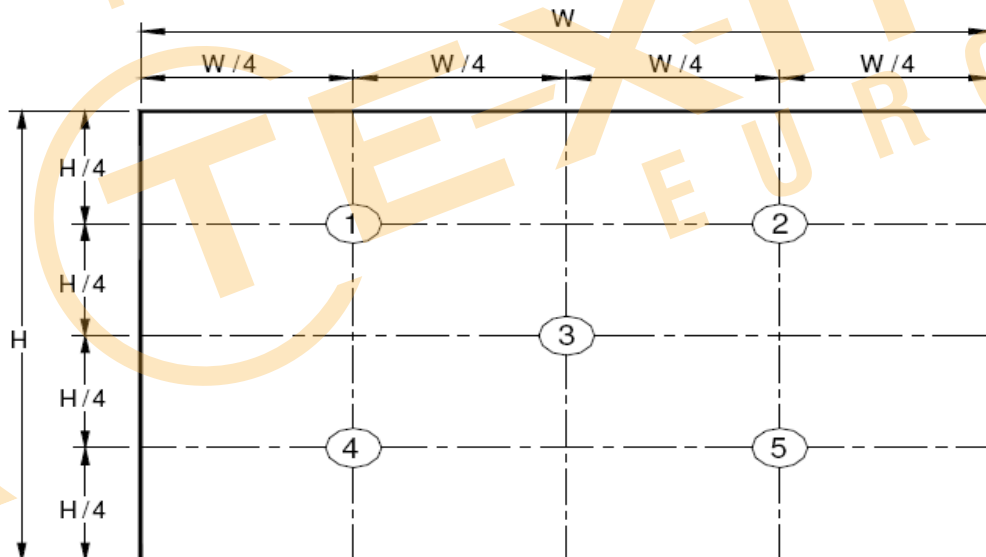
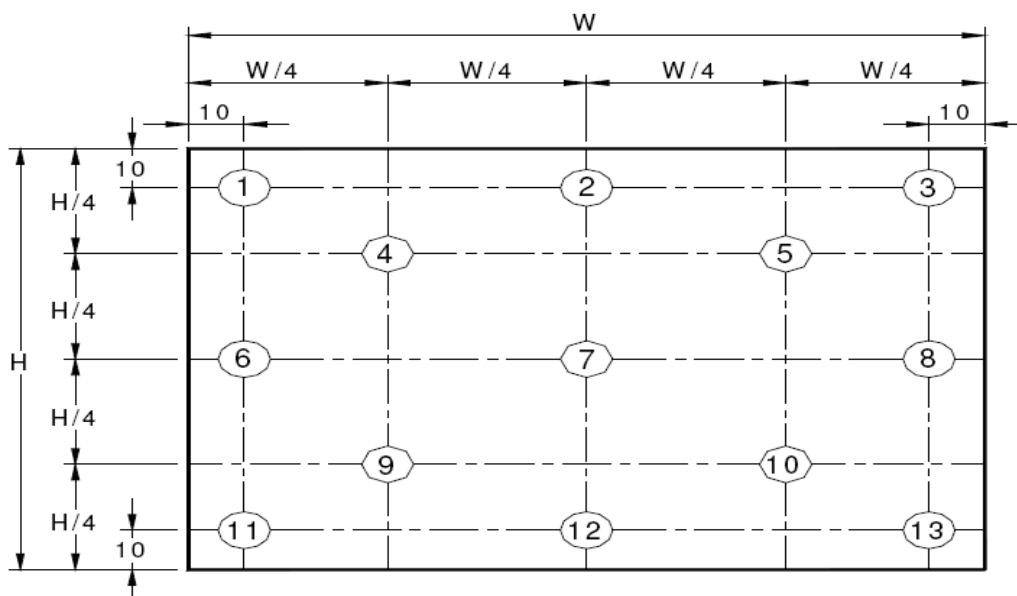


Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



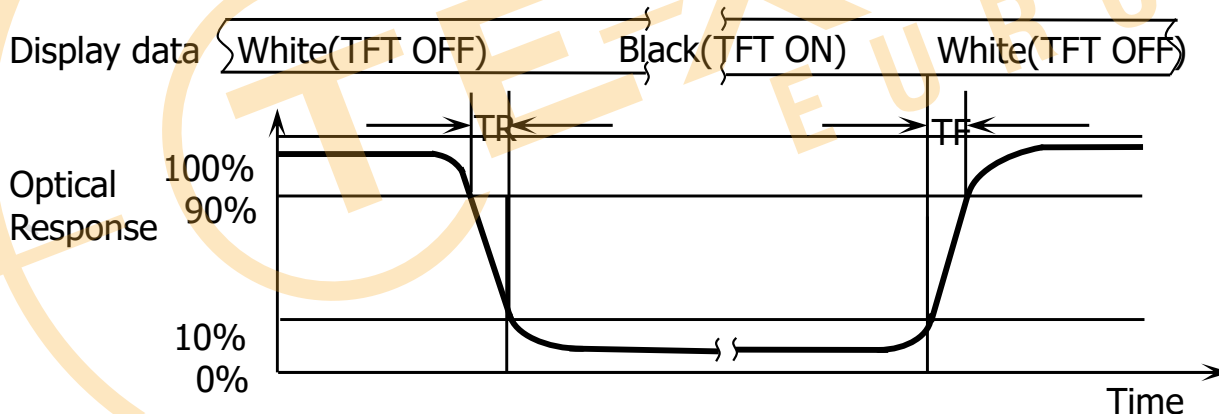
Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



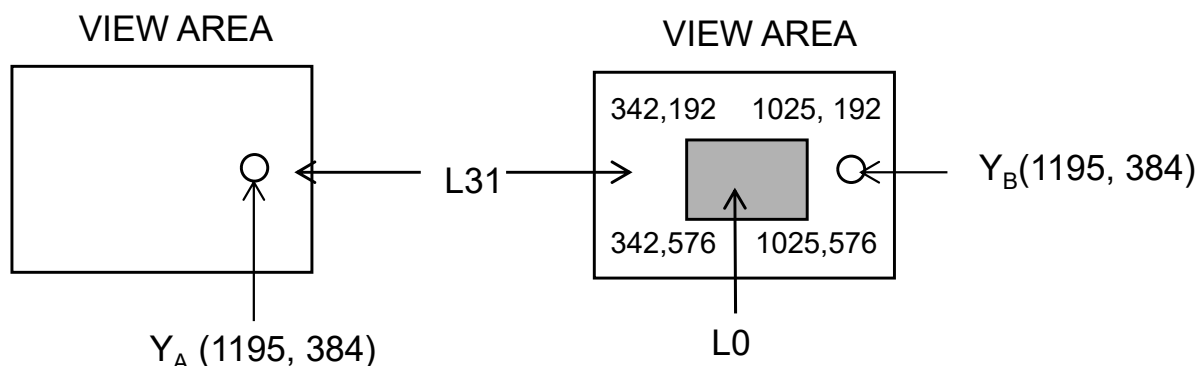
The White luminance uniformity on LCD surface is then expressed as : $\Delta Y5 = \text{Minimum Luminance of five points} / \text{Maximum Luminance of five points}$ (see FIGURE 2) , $\Delta Y13 = \text{Minimum Luminance of 13 points} / \text{Maximum Luminance of 13 points}$ (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_d and 90% to 10% is T_r .

Figure 5. Cross Modulation Test Description



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m²)

Y_B = Subsequent luminance of measured area (cd/m²)

The location measured will be exactly the same in both patterns

Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark (Refer to FIGURE 5).

7.0 INTERFACE CONNECTION.

7.1 Electrical Interface Connection

The electronics interface connector is STM MSAK24025P30 or Compatible.
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	NC	No Connection
2	H_GND	Ground
3	LANE1_N	eDP RX channel 1 negative
4	LANE1_P	eDP RX channel 1 positive
5	H_GND	Ground
6	LANE0_N	eDP RX channel 0 negative
7	LANE0_P	eDP RX channel 0 positive
8	H_GND	Ground
9	AUX_CH_P	eDP AUX CH positive
10	AUX_CH_N	eDP AUX CH negative
11	H_GND	Ground
12	LCD_VCC	Power Supply, 3.3V (typ.)
13	LCD_VCC	Power Supply, 3.3V (typ.)
14	NC	No Connection
15	H_GND	Ground
16	H_GND	Ground
17	HPD	Hot plug detect output
18	BL_GND	LED Ground
19	BL_GND	LED Ground
20	BL_GND	LED Ground
21	BL_GND	LED Ground
22	BL_ENABLE	LED enable pin(+3.3V Input) ; If not use , NC
23	BL_PWM	System PWM Signal Input ; If not use , NC
24	NC	No Connection
25	NC	No Connection
26	BL_POWER	LED Power Supply 5V-21V ; If not use , NC
27	BL_POWER	LED Power Supply 5V-21V ; If not use , NC
28	BL_POWER	LED Power Supply 5V-21V ; If not use , NC
29	BL_POWER	LED Power Supply 5V-21V ; If not use , NC
30	NC	No Connection

7.2. eDP Interface

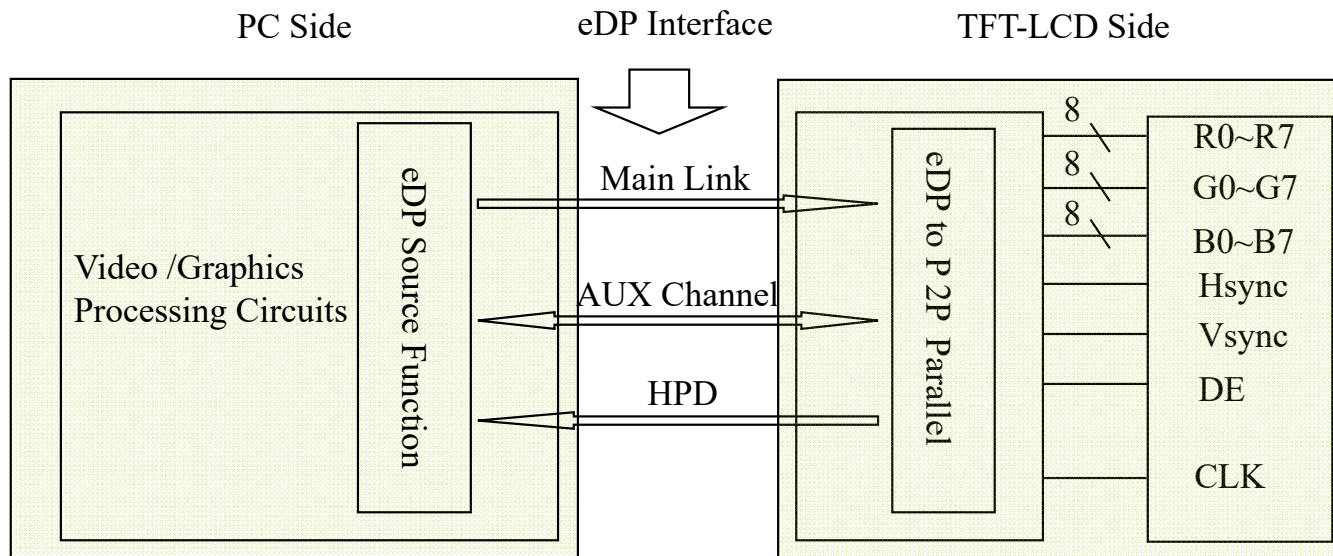


Figure 12. eDP Interface Architecture

7.3.eDP Input signal

Lane 0	Lane 1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

8.0 SIGNAL TIMING SPECIFICATION

8.1 The QV156FHB-N80 is operated by the DE only.

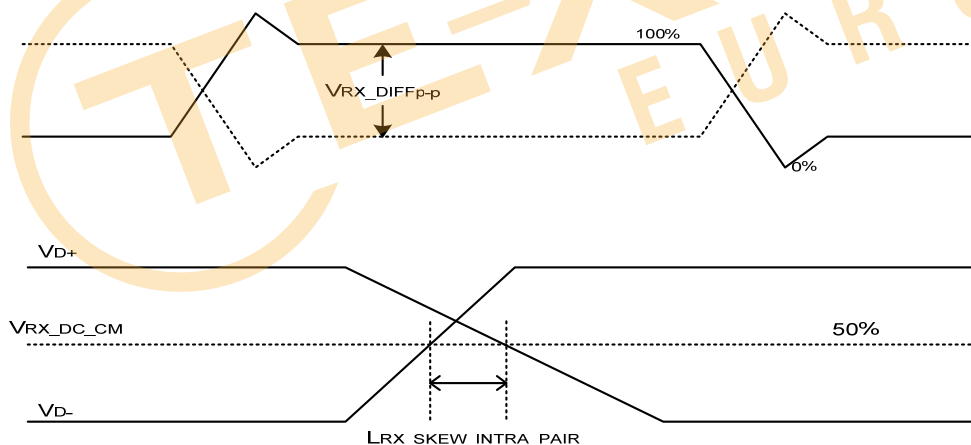
Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	136.65	147.84	155	MHz
	High Time	Tch	-	4/7	-	Tc
	Low Time	Tcl	-	3/7	-	Tc
Frame Period		Tv	1095	1120	1130	lines
			-	60	-	Hz
			-	16.7	-	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	2080	2200	2248	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

8.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 5.

<Table 5. eDP Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock	ssc		0.5		%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	120	0	1200	mV	
Rx input DC common mode voltage	VRX_DC_CM	-	GND	-	V	
Differential termination resistance	RRX-DIFF	80	100	120	Ω	
Single-ended termination resistance	RRX-SE	45	50	60	Ω	
Rx short circuit current limit	IRX_SHORT	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_INTRA_PAIR	-	-	60	ps	

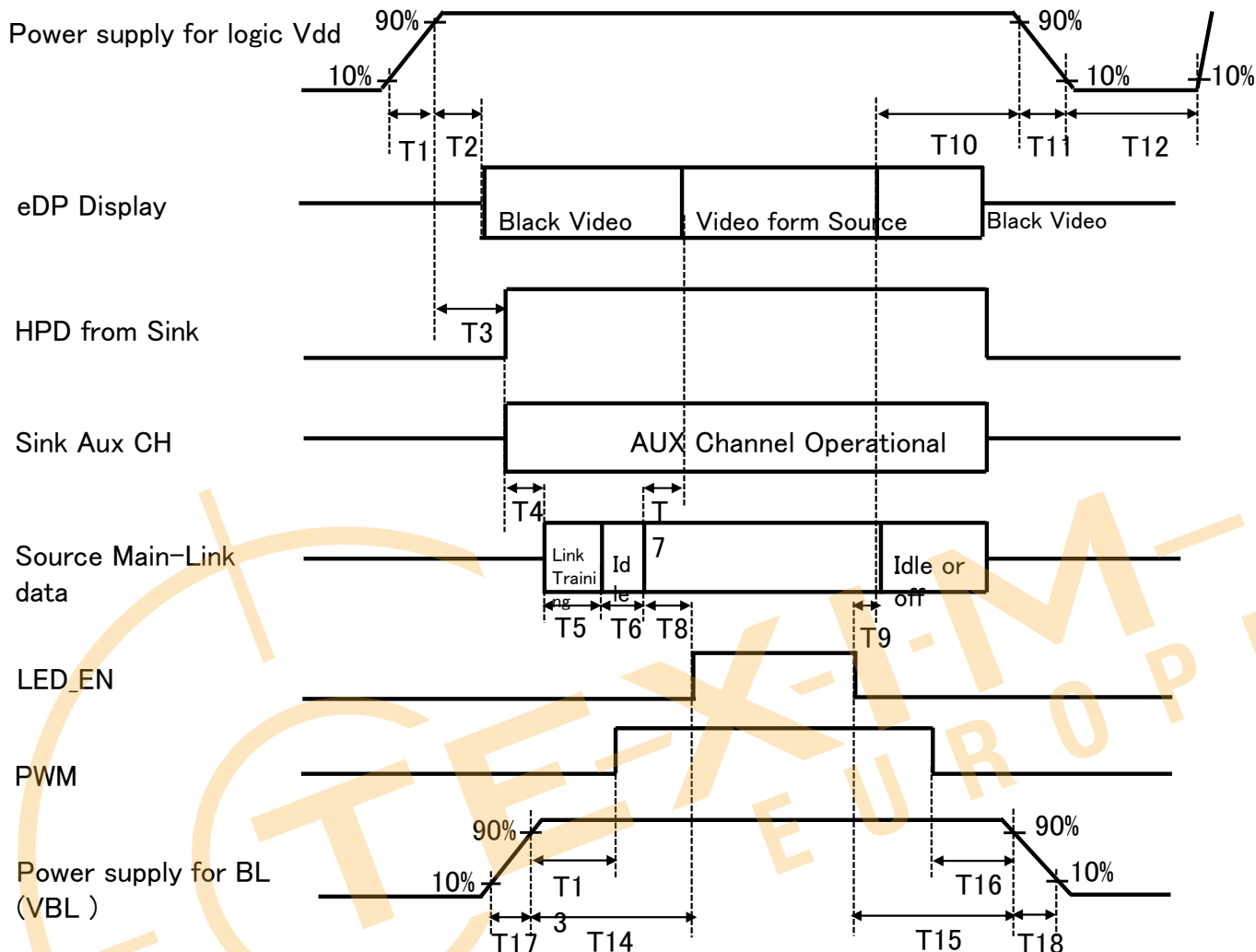


9.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

	Colors & Gray scale	Data signal																							
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Light Blue	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray scale of White& Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
	▽	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

10.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD FOB, the power on/off sequence shall be as shown in below



- $0.5\text{ms} \leq T1 \leq 10\text{ms}$
- $0\text{ms} \leq T2 \leq 200\text{ms}$
- $0\text{ms} \leq T3 \leq 200\text{ms}$
- $0\text{ms} \leq T13$
- $0\text{ms} \leq T14$
- $0\text{ms} \leq T17$
- $T3+T4+T5+T6+T8 > T2(\text{max})=200\text{ms}$
- $0\text{ms} \leq T7 \leq 50\text{ms}$
- $0\text{ms} \leq T10 \leq 500\text{ms}$
- $0\text{ms} \leq T11 \leq 10\text{ms}$
- $150\text{ms} \leq T12$
- $0\text{ms} \leq T15$
- $0\text{ms} \leq T16$
- $0\text{ms} \leq T18$

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Backlight sequence is reference.

11.0 Connector Description

Physical interface is described as for the connector on LCD.

These connectors are capable of accommodating the following signals and will be following components.

111 TFT LCD

Connector Name /Description	For Signal Connector
Manufacturer	UJU
Type/ Part Number	IS050-L30B-C10
Mating housing/ Part Number	I-PEX 20454-030

TEXIM-EUROPE

12.0 EDID Table

00	Header	00	0	0	EDID Header
01		FF	255	255	
02		FF	255	255	
03		FF	255	255	
04		FF	255	255	
05		FF	255	255	
06		FF	255	255	
07		00	0	0	
08	ID Manufacturer Name	09	9	BOE	ID = BOE
09		E5	229		
0A	ID Product Code	7A	122	2426	ID = 2426
0B		09	9		
0C	32-bit serial No.	00	0	0	
0D		00	0	0	
0E		00	0	0	
0F		00	0	0	
10	Week of manufacture	1B	27	27	
11	Year of Manufacture	1E	30	2020	Manufactured in 2020
12	EDID Structure Ver.	01	1	1	EDID Ver 1.0
13	EDID revision #	04	4	4	EDID Rev. 0.4
14	Video input definition	A5	165	-	Video Signal Interface
15	Max H image size	1F	31	31	31cm (Approx)
16	Max V image size	11	17	17	17cm (Approx)
17	Display Gamma	78	120	2.2	Gamma curve = 2.2
18	Feature support	02	2	-	Feature Support
19	Red/Green low bits	FF	255	-	Red / Green Low Bits
1A	Blue/White low bits	35	53	-	Blue / White Low Bits
1B	Red x high bits	A7	167	0.655	Red (x) = 10100111 (0.655)
1C	Red y high bits	56	86	0.339	Red (y) = 01010110 (0.339)
1D	Green x high bits	50	80	0.315	Green (x) = 01010000 (0.315)
1E	Green y high bits	9F	159	0.624	Green (y) = 10011111 (0.624)
1F	Blue x high bits	27	39	0.152	Blue (x) = 00100111 (0.152)
20	Blue y high bits	0E	14	0.058	Blue (y) = 00001110 (0.058)
21	White x high bits	50	80	0.313	White (x) = 01010000 (0.313)
22	White y high bits	54	84	0.329	White (y) = 01010100 (0.329)
23	Established timing 1	00	0	-	--
24	Established timing 2	00	0	-	
25	Established timing 3	00	0	-	

13.0 EDID Table

26	Standard timing #1	01	1		Not Used
27		01	1		
28	Standard timing #2	01	1		Not Used
29		01	1		
2A	Standard timing #3	01	1		Not Used
2B		01	1		
2C	Standard timing #4	01	1		Not Used
2D		01	1		
2E	Standard timing #5	01	1		Not Used
2F		01	1		
30	Standard timing #6	01	1		Not Used
31		01	1		
32	Standard timing #7	01	1		Not Used
33		01	1		
34	Standard timing #8	01	1		Not Used
35		01	1		
36	Detailed timing/monitor descriptor #1	C0	192	147.8	147.84MHz Main clock
37		39	57		
38		80	128	1920	Hor Active = 1920
39		18	24	280	Hor Blanking = 280
3A		71	113	-	4 bits of Hor. Active + 4 bits of Hor. Blanking
3B		38	56	1080	Ver Active = 1080
3C		28	40	40	Ver Blanking = 40
3D		40	64	-	4 bits of Ver. Active + 4 bits of Ver. Blanking
3E		30	48	48	Hor Sync Offset = 48
3F		20	32	32	H Sync Pulse Width = 32
40		36	54	3	V sync Offset = 3 line
41		00	0	6	V Sync Pulse width : 6 line
42		35	53	309	Horizontal Image Size = 309 mm (Low 8 bits)
43		AE	174	174	Vertical Image Size = 174 mm (Low 8 bits)
44		10	16	-	4 bits of Hor Image Size + 4 bits of Ver Image Size
45		00	0	0	Hor Border (pixels)
46		00	0	0	Vertical Border (Lines)
47		1A	26	-	Detailed timing Definition

14.0 EDID Table

48	Detailed timing/monitor descriptor #2	00	0	0.0	-
49		00	0		-
4A		00	0	0	-
4B		00	0	0	-
4C		00	0	-	-
4D		00	0	0	-
4E		00	0	0	-
4F		00	0	-	-
50		00	0	0	-
51		00	0	0	-
52		00	0	0	-
53		00	0	0	-
54		00	0	0	-
55		00	0	0	-
56		00	0	-	-
57		00	0	0	-
58		00	0	0	-
59		00	0	-	-
5A	Detailed timing/monitor descriptor #3	00	0	Indicates descriptor #3 is a display Descriptor	
5B		00	0		
5C		00	0	Reserved	
5D		FE	254	Tag: ASCII String	
5E		00	0	Reserved	
5F		42	66	B	Manufacture name : BOECQ
60		4F	79	O	
61		45	69	E	
62		20	32		
63		43	67	C	
64		51	81	Q	
65		0A	10		
66		20	32		
67		20	32		
68		20	32		
69		20	32		
6A		20	32		
6B		20	32		

15.0 EDID Table

6C	Detailed timing/monitor descriptor #4	00	0		Indicates descriptor #4 is a display Descriptor
6D		00	0		
6E		00	0		Reserved
6F		FE	254		Tag: ASCII String
70		00	0		Reserved
71		4E	78	Q	Model name : QV156FHM-N81
72		56	86	V	
73		31	49	1	
74		34	52	5	
75		30	48	6	
76		46	70	F	
77		48	72	H	
78		4D	77	B	
79		2D	45	-	
7A		4E	78	N	
7B		36	54	8	
7C		35	53	1	
7D		0A	10		
7E	Extension flag	00	0	1	Extension flag
7F	Checksum	FA	250	-	Checksum

Notes:

- 1.EDID custom information not required

16. Reliability test items

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+80°C / 48H	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 / 48H	
3	High Temp. Operating	+70°C / 48H	
4	Low Temp. Operating	-20°C / 48H	
5	High Temperature / Humidity storage	50°C x 90%RH / 48H	
6	Thermal and cold shock	Static state, -20°C (30min) ~60°C (30min), 50 cycles	
7	ESD test	±2KV, Human Body Mode, 150pF/330Ω; ±4KV, Air Mode, 150pF/330Ω;	

Note: All tests above are practiced at module type.

There is no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.

17.0 General Precaution

17.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

17.2 Assembly Precaution

- 1、 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.
- 2、 Please design display housing in accordance with the following guide lines.
- 3、 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
- 4、 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
- 5、 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)
- 6、 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
- 7、 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
- 8、 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change. 11.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

17.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. Leadtek does not warrant the module, if customers disassemble or modify the module.

17.4 Breakage of LCD Panel

- 1、 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 2、 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 3、 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 4、 Handle carefully with chips of glass that may cause injury, when the glass is broken.

17.5 Absolute Maximum Ratings and Power Protection Circuit

- 1、 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 2、 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 3、 It's recommended employing protection circuit for power supply.

11.6 Operation

- 1 、 Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 2、 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 3 、 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
- 4 、 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

17.6 Static Electricity

- 1 、 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 2、 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.
- 3 、 Persons who handle the module should be grounded through adequate methods.

17.7 Disposal

When disposing LCD module, obey the local environmental regulations.

17.8 OTHERS

- 1 、 A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight land strong UV rays.
- 2、 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- 3、 For the packaging box, please pay attention to the followings:
- 4、 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
- 5、 Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.
- 6、 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- 7、 Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

18.0 Packing form-TBD



深圳市丽台电子有限公司

Shenzhen Leadtek Electronics Co.,Ltd

Incoming Inspection Standards

来料检验标准

Model No. / 产品型号: Applies More than 15.6 Inches Touch Display Screen

Updated Date / 生效日期: 2022-05-20

Version / 版本: A0

Customer confirmation : _____

Record of Revision / 修订履历

Version / 版本	Revision Record / 修订内容	Reviser / 修订人	Revision Date / 修订日期
V0	首发 / Starting	Green	2022.05.20

1.Scope of application /适用范围.

This document shall be applied to more than 10.0 inches touch display screen.

本文件适用于5.5~10.0 寸触摸显示屏.

2.Inspection conditions and environment /检验条件与环境.

2.1 Inspection Conditions /检验条件:

(1) Inspection Distance /检测距离: 35cm ±5cm.

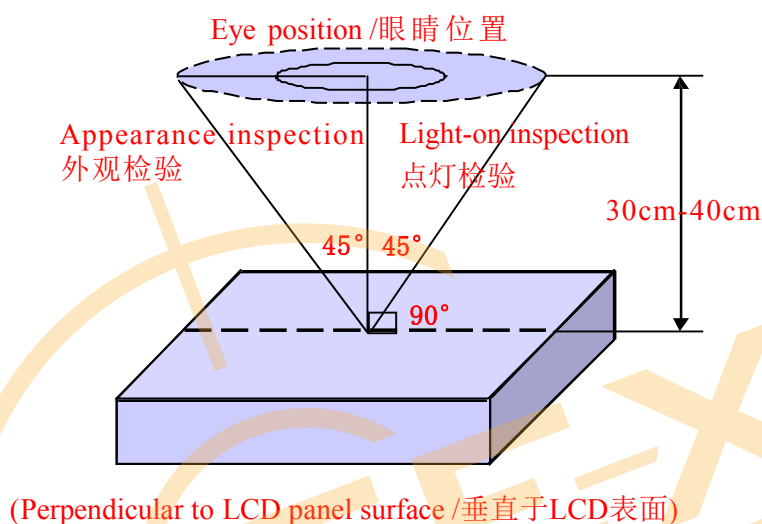
(2) Check time /检验时间:

Displays performance test /功能测试: 3~5S /Image, Cosmetic Inspection /外观检验:12~15S.

(3) Check the viewing angle /检验视角:

Light-on Inspection Angle /点灯检验角度: ±45°.

Cosmetic Inspection Angle /外观检验角度: ±45°.



2.2 Inspection environment /检验环境:

Ambient Temperature 温度		25°C±5°C
Ambient Humidity 湿度		55±5%RH
Ambient Illumination 亮度	Cosmetic Inspection 外观检验	800-1000 Lux
	Functional Inspection 点灯检验	200~300Lux

2.3 Sampling Conditions /抽样条件:

(1) Quantity to be inspected /批量: Quantity of shipment lot per model /单次运送单一型号数量.

(2) Sampling method /抽样方法:

Sampling Plan /抽样计划		GB/T 2828.1- 2003
		Normal Inspection , Single Sampling 正常检验、单次抽样
		General inspection level: II 一般检验水平: 二级
AQL	Major Defect /主要缺陷	0.65
	Minor Defect /次要缺陷	1.0

(3) The classification of Major(MA) and Minor(MI) defects is shown as “3.1 Classification of defects” .
主缺(MA)及次缺(MI)定义于”3.1缺陷分类”.

3.Terms And Definitions /术语和定义

3.1 Classification of defects / 缺陷分类 :

(1) Major defects /主要缺陷:

A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the product for its intended purpose .

可导致产品功能失效或减少产品可用性的缺陷.

(2) Minor defects /次要缺陷:

It will not cause the product to fail and reduce the defects in the effective use and operation of the product.

不会导致产品功能失效和减少产品的有效使用与操作的缺陷.

3.2 Point defects /点状缺陷:

The size of the point defect is defined by the diameter D, and the average diameter of the defect is

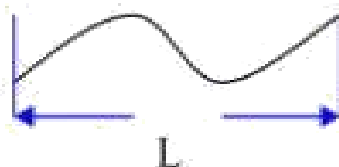
$$D=1/2 (W+L) .$$

点状缺陷的大小是由直径 D 定义的, 缺陷的平均直径 $D=1/2(W+L)$.

3.3 Linear defects /线状缺陷:

When defect size $L \geq 2W$, the defect count as liner type defect. Size of linear defect is defined by length (L) and the maximum width (W).

当缺陷尺寸 $L \geq 2W$ 时, 被视为线状缺陷, 线状缺陷是由长度 (L) 和最大宽度 (W) 定义的.



3.4 LCD sub-pixel dot /LCD子像素点

(1) Definition /定义 : The point defect area is greater than 50% of the LCD sub-pixel area, and is visible through ND5% filter masking .

子像素点缺陷面积大于 50% LCD子像素面积, 且透过 ND5%遮盖是可见的.

(2) The drawing of 1/2 area sub-pixel definition / 1/2 面积的子像素定义绘图:

The 1/2 area sub-pixel can be defined as below one or more of specific shapes

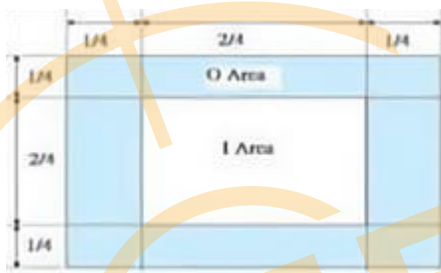
1/2 面积的子像素可以定义为如下一个或多个特定形状图:



3.5 Small bright dot /细碎亮点 :

Point defects smaller than "LCD sub-pixels" /小于“LCD子像素点”的点缺陷.

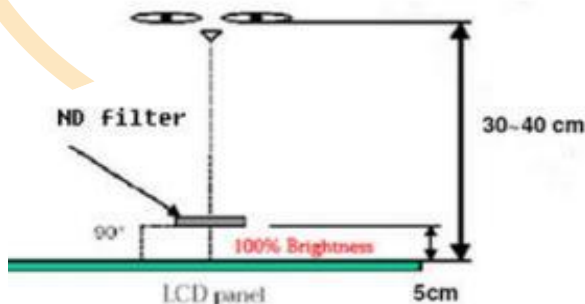
(Ratio of Zone I to Zone O / I 区与 O 区比例: 1: 2: 1)



3.6 ND filter inspection method /ND卡的检验方法:

Hold the ND filter about 5cm above the display area, with your eyes 30-40cm away from the panel, and observe for 2~3 seconds.

在显示区域上方大约 5cm 处握住 ND 卡, 眼睛距离面板 30-40cm, 观察2~3 秒.



3.7 Any FPC surface problems that do not leak copper on the surface and do not cause functional failure are acceptable.

任何 FPC 表面问题, 表面未露铜和不造成功能失效是可以接受.

3.8 Extraneous substances that can be wiped out , like Finger point,Particles are not considered as a defect .

可以被擦拭干净的表面物质不视为缺陷 (如手指印, 尘粒) .

3.9 Defects that can be covered by the material and are not visible in appearance are not considered defects.

能被物料覆盖，外观不可见的缺陷不视为缺陷。

3.10 Panel damage /面板损伤:

Glass damage outside the AA display area that does not affect the effective wiring is acceptable.

AA 显示区域以外的玻璃损伤，不影响有效线路是可以接受的。

3.11 Issues not specified or defined in this acceptance standard shall be handled through friendly negotiation between the two parties.

本允收标准中未规定或定义的问题，双方友好协商处理。

4. Inspection standards /检验标准

4.1 Structural Dimensions /结构尺寸规格

Serial Number 序号	Measurement items /测量项目		Specification /规格	Remark /备注
	名称 /Name	Unit /单位	Tolerance /公差	
1	Outside dimension: Length 尺寸: 长	mm /毫米	0.15mm~0.30mm	Please refer to the product specification for detailed dimensions and tolerances 详细的尺寸规格和公差请参考产品规格书
2	Outside dimension: Width 尺寸: 宽	mm /毫米	0.15mm~0.30mm	
3	Outside dimension: Thickness 尺寸: 高	mm /毫米	0.30mm~0.50mm	

4.2 Appearance Inspection Specification /外观检验规格

(D : diameter, W : width, L : length, N : quantity, DS : spacing)

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
Glass 玻璃	Wire(on Array) 线路	Can't be damaged 不能损伤	MA	
	Chipping/corner breaking 崩边/破角	Can't affect the effective lines and functions 不能影响有效线路和功能	MA	
	Edge 边缘	There must be no extensional cracks 不可有延伸性裂纹	MA	
Silicone 硅胶	Silicone coating 硅胶涂布	The height must not exceed the LCD CF surface 高度不能超过LCD CF面		MI
	Glue overflow 溢胶	Can't cover FPC, POL, etc 不能覆盖到FPC、POL等		MI

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
PCBA FPC Connector 连接器	Appearance 外观	Scratches or injuries are not allowed to cause copper exposure 划伤或损伤不允许表面出现露铜		MI
	Component 元器件	Can't be damaged and lack 不能损伤和缺少	MA	
	Goldfinger oxidation 金手指氧化	Not allowed 不允许		MI
	Connection status 连接状况	The connection must be accurate and stable 必须准确稳定连接	MA	
	Break 破裂	Not allowed 不允许	MA	
	Soldering, false soldering/tinning/tin beads 假焊/连锡/锡珠	Not allowed 不允许	MA	
POL 偏光片	Scratches 划伤	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许)		MI
	Dent 凹凸印	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Bubbles 气泡	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Point defects 点状不良	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Edge bubbles 边缘气泡	1. Within 1/2BM of the display area, it is not allowed 显示区往外 1/2BM 区域内, 不允许 2. The display area is 1/2 outside the BM area, and it is not controlled 显示区往外 1/2BM 区域以外, 不管控		MI
	Dirty/watermarked 脏污/水印	No dirt/water lines/finger marks are allowed, and must be wiped clean 不允许有脏污/水印/手指印, 须擦拭干净方可		MI
	Warping 起翘	Not allowed 不允许		MI
	Attaching offset 贴偏	It is necessary to completely cover the display area outward, within the 1/2BM area, or without leaking POL edges after TP is attached 需完整覆盖显示区往外、1/2BM 区以内或贴合 TP 后不会出现漏偏光片边缘		MI
	Mixture 混料	Mixing different types of POL or not using POL as required by the BOM, not allowed 不允许混贴不同型号的 POL 或未按 BOM 要求使用 POL	MA	

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
TP&CG	Point defects 点状不良	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Scratches 划伤	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许) 4. There is a feeling scratch, Not allowable 有感划伤, 不允许		MI
	Edges and corners cracked 崩角/崩边	1. Product front / 产品正面: Edge and corner chipping is not allowed 崩角、崩边不允许 2. Product back / 产品背面: $X \leq 0.5$, $Y \leq 0.5$, $Z \leq 1/2T$; $N \leq 5$; $DS \geq 10\text{mm}$		MI
	Silk screen 丝印	The silk screen is clear, complete and correct 丝印清晰、完整、内容正确		MI
	Dirty 脏污	Non-wipeable dirt, not allowed 不可擦拭的脏污, 不允许		MI
	Broken 破损	Not allowable 不允许	MA	
	Ink color aberration 油墨色差	$\Delta E > 1$, Not allowable (不允许)		MI
	Cover pinholes 针孔	1. $D \leq 0.20\text{mm}$, $N \leq 5$, $DS \geq 10\text{mm}$, allowable 2. $D > 0.20\text{mm}$, intensive pinholes (密集型针孔), Not allowable (不允许)		MI
	IR holes IR孔	Dirt, deviation, color difference, etc. are not allowed 不允许脏污、偏位、色差等		MI
BL 背光	Backlight separation 背光分离	Not allowable 不允许		MI
	Deformation of rubber iron and rubber frame 胶铁、胶框变形	Use the plug gauge 0.3mm on the flat surface and can snap in and judge NG 在平面上使用塞规0.3mm卡翘曲位置, 能卡进判定NG		MI
	The iron frame is oxidized and not tightened 铁框氧化、卡不紧	Not allowable 不允许		MI
	Backlight sticky solder beads, glue, etc 背面粘锡珠、残胶等	Not allowable 不允许		MI
	Inkjet coding, Barcode, QR code 喷码/条码/二维码	The Inkjet coding is clear and complete, the barcode and QR code can be scanned normally, and the content and format match 喷码清晰完整、条码和二维码可正常扫描, 内容和格式相符		MI
	Accessories (protective film, double-sided tape, insulating adhesive, etc.) 辅料 (保护膜、双面胶、绝缘胶等)	Defects such as missing pastes, sticking deviations, defects, and fractures are not allowed 不允许有漏贴、贴偏、残缺、断裂等缺陷		MI

4.3 Electrical test specifications /电性检查规格

(D : diameter, W : width, L : length, N : quantity, DS : spacing)

Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
Glass bright spots/dark spots 玻璃亮点/暗点	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
Mura	Use ND5% filter masking, visual invisibility is OK, 200~300Lux 使用ND5%遮盖, 目视不可见即为OK, 200~300Lux		MI
Small bright dot 细碎亮点	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
Light leakage 漏光	1. Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK 2. If necessary, sign off on the sample 必要时, 签限定样		MI
Backlight black/white dots 背光黑点/白点	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
Linear foreign bodies 线状异物 (异物毛丝等)	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许)		MI
Black/White Print 黑印/白印	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
The display is uneven 显示不均匀	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
The brightness is uneven 亮度不均匀	Brightness uniformity $< 85.0\%$, Not allowable 亮度均匀性 $< 85.0\%$, 不允许		MI
Displacement of the membrane 膜材移位	Not allowable 不允许		MI
Interference pattern/Newtonian pattern 干涉纹/牛顿纹	Not allowable 不允许		MI
Display abnormal 显示异常	Not allowable 不允许	MA	
No display 无显示	Not allowable 不允许	MA	
Line/Missing Drawing 线条/缺画	Not allowable 不允许	MA	
Splash screen 闪屏	Not allowable 不允许	MA	
LCD grid LCD网格	Not allowable 不允许	MA	
Afterimage 残影	Not allowable 不允许	MA	
Wrong viewing angle 视角错误	Not allowable 不允许	MA	
No touch 无触摸	Not allowable 不允许	MA	
Touch the jump point 触摸跳点	Not allowable 不允许	MA	
Not sensitive 触摸不灵敏	Not allowable 不允许	MA	

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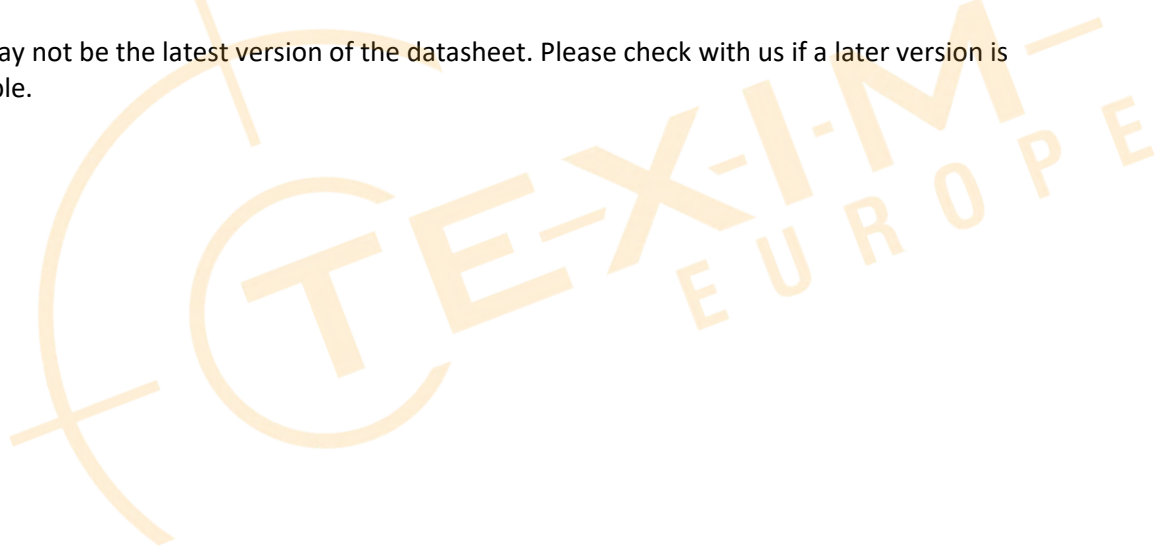
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Please contact us if you have any questions about the contents of the datasheet.

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