深圳市海创通科技有限公司
Shenzhen HCT Technology Co.,Ltd

CERT. No. QAC0946535
(ISO9001)

CERT. No. HKG002005
(ISO14001)

Product Specification

Customer:

Model Name: H020LWQ 40E2503

Date:

Version:

■ **Preliminary Specification**

☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

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1. Record of Revision

Version	Revise Date	Content	Editor
1.0	2016/06/12	First Release.	Rich Liang

2 General Specifications

Feature		Spec
Characteristics	LCD Size	2 inch
	Display Format	480 (RGB) × 240
	Interface	RGB
	Color Depth	262K
	Technology type	a-Si
	Display Spec.	
	Display Mode	Normally White
	Driver IC	ILI9342C
	Surface Treatment	Haze 20%
	Viewing Direction	12 O’clock
	Gray Viewing Direction	6 O’clock
Mechanical	LCM (W x H x D) (mm)	46.1*40.96*2.53
	Active Area(mm)	40.8x 30.6
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	2 LEDs

Note 1: Viewing direction is following the data which measured by optics equipment.
Note 2: Requirements on Environmental Protection: RoHS
Note 3: LCM weight tolerance: +/- 5%

3 Input/Output Terminals

No.	Symbol	Description
1	GND	Ground
2	IOVCC	Power supply for logic operation 1.8V
3	VCC	System power supply 2.8V
4	DB0	Data bus
5	DB1	Data bus
6	DB2	Data bus
7	DB3	Data bus
8	DB4	Data bus
9	DB5	Data bus
10	DB6	Data bus
11	DB7	Data bus
12	GND	Ground
13	RESET	Reset Signal pin (“Low” is enable)
14	CS	Chip select
15	RS	Serial data select
16	WR	Write signal
17	RD	Read signal
18	TE	TE PIN
19	GND	Ground
20	LEDA	LED backlight anode
21	LEDK	LED backlight cathode
22	VGL	VGL power supply
23	VGH	VGH power supply
24~40	NC	

4 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{DD}	-0.3	5.0	V	
Input Signal Voltage	V_{in}	-0.3	VDD+0.3	V	
Logic Output Voltage	V_{OUT}	-0.3	VDD+0.3	V	
Operating Temperature	T_{OPR}	-10	60	℃	
Storage Temperature	T_{STG}	-20	70	℃	

5 Electrical Characteristics

5.1 Operating conditions:

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
Power Voltage	V_{cc}	2.6	2.8	3.4	V	
Driver supply voltag	VGH-VGL		0~30			

5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED current	I_F	-	40	50	mA	
Power Consumption					mW	
LED Voltage	V_F		3.2		V	Note 1
LED Life Time	W_{BL}	-	TBD	-	Hr	Note 2,3

Note 1 : There are 1 Groups LED

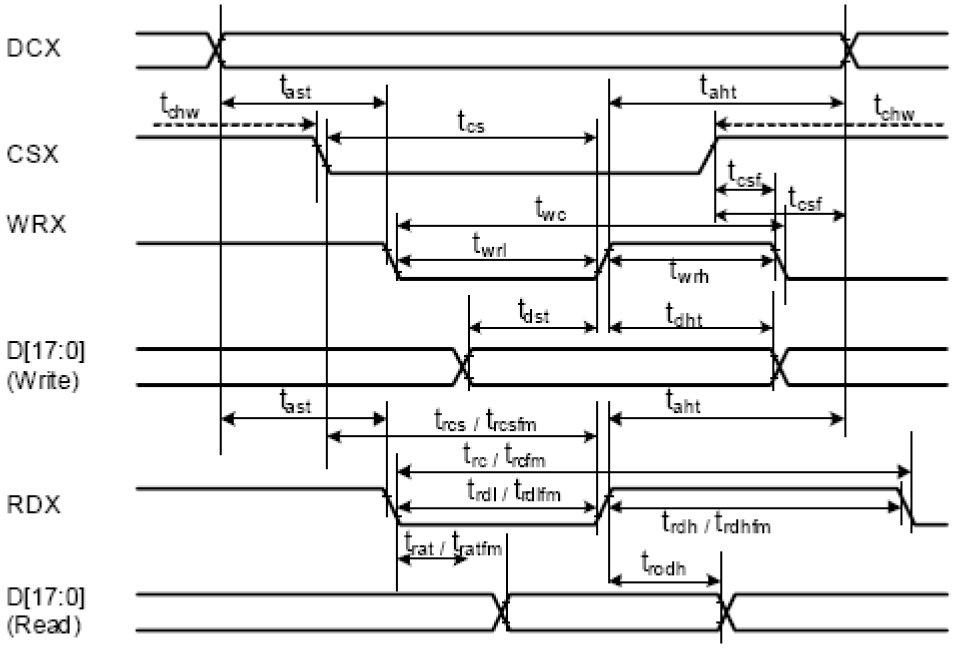
Note 2 : Ta = 25℃

Note 3 : Brightess to be decreased to 50% of the initial value

6 Interface Timing

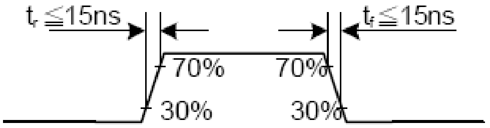
6.1 AC Electrical Characteristics

Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-system)

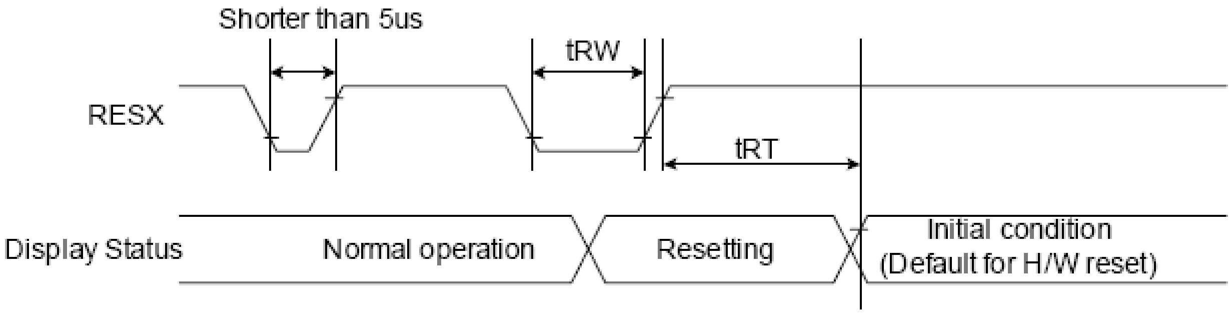

DCX
CSX
WRX
D[17:0]
(Write)
RDX
D[17:0]
(Read)
tchw
tast
tcs
taht
tchw
tcsf
tcsf
twc
twrl
twrh
tdst
tdht
tast
trcs / trcsfm
taht
trc / trcfm
trdl / trdlfm
trdh / trdhfm
trat / tratfm
trodh

Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{ast}	Address setup time	0	-	ns	
	t_{aht}	Address hold time (Write/Read)	10	-	ns	
CSX	t_{chw}	CSX "H" pulse width	0	-	ns	
	t_{cs}	Chip Select setup time (Write)	15	-	ns	
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	
	t_{csf}	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	t_{wc}	Write cycle	66		ns	
	t_{wrh}	Write Control pulse H duration	33	-	ns	
	t_{wrl}	Write Control pulse L duration	33	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from the frame memory
	t_{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
DB[17:0], DB[15:0], DB[8:0], DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dht}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{ratfm}	Read access time	-	50	ns	
	t_{rod}	Read output disable time	45	50	ns	

Note: Ta = -40 to 85 °C, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.6V, DGND=0V


$t_r \leqq 15ns$
$t_f \leqq 15ns$
70%
30%
70%
30%

6.2 Reset Timing


Shorter than 5us
tRW
RESX
tRT
Display Status
Normal operation
Resetting
Initial condition
(Default for H/W reset)

Signal	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

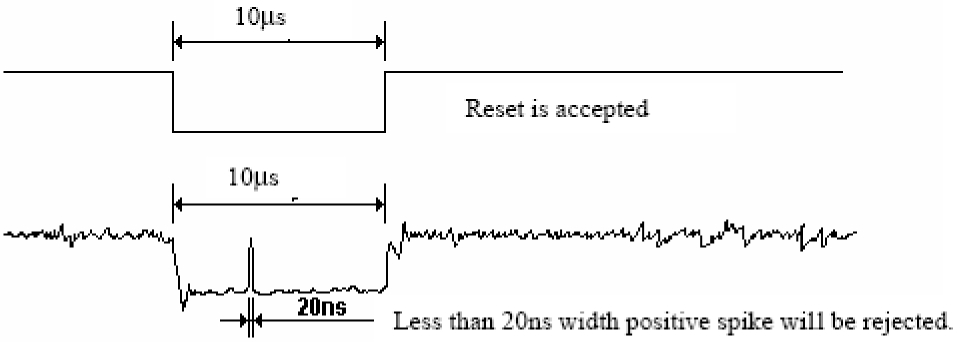
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 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 10us	Reset
Between 5us and 10us	Reset starts

Note 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.

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


10µs
Reset is accepted
10µs
20ns
Less than 20ns width positive spike will be rejected.

Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 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

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10		30	-	Degree.	Note2
		θ_B			45	-		
		θ_L			45	-		
		θ_R			45	-		
Contrast Ratio		CR	Θ =0	-	500	-	-	Note1, Note3
Response Time		T_{ON}	25°C	-	20	35	ms	Note1, Note4
		T_{OFF}		-	25	40		
Chromaticity	White	X_W	Backlight is on	0.282	0.312	0.342	-	Note1, Note5
		Y_W		0.319	0.349	0.379	-	
	Red	X_R		0.609	0.639	0.669	-	
		Y_R		0.314	0.344	0.374	-	
	Green	X_G		0.264	0.294	0.324	-	
		Y_G		0.557	0.587	0.617	-	
	Blue	X_B		0.102	0.132	0.162	-	
		Y_B		0.106	0.136	0.166	-	
Uniformity		U		80	-	-	%	Note1, Note6
NTSC					50		%	Note5
Luminance		L		200	250			Note1, Note7

Test Conditions:
1. IF= 20mA(one channel),the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

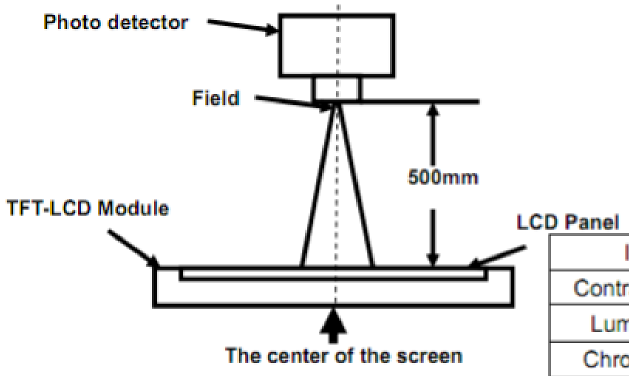


Photo detector
Field
500mm
TFT-LCD Module
LCD Panel
The center of the screen

Item	Photo detector	Field
Contrast Ratio	BM-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	SR-3A	2°

Note 2: Definition of viewing angle range and measurement system.
Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).

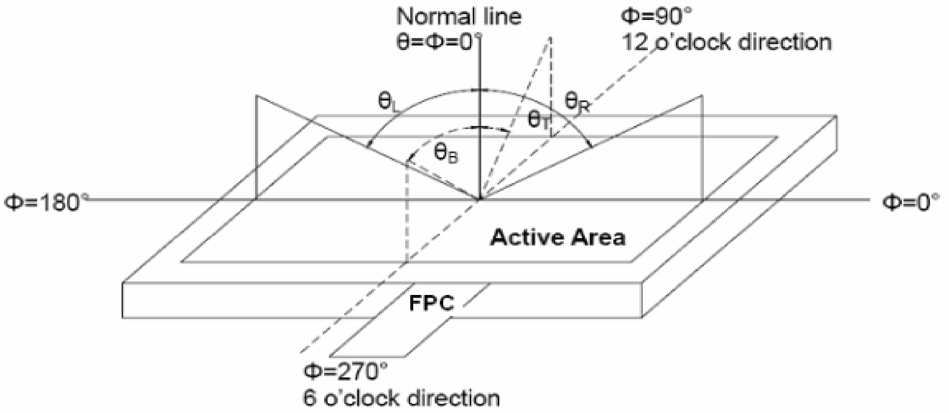

Normal line
θ=Φ=0°
Φ=90°
12 o'clock direction
θL
θR
θT
θB
Φ=180°
Φ=0°
Active Area
FPC
Φ=270°
6 o'clock direction

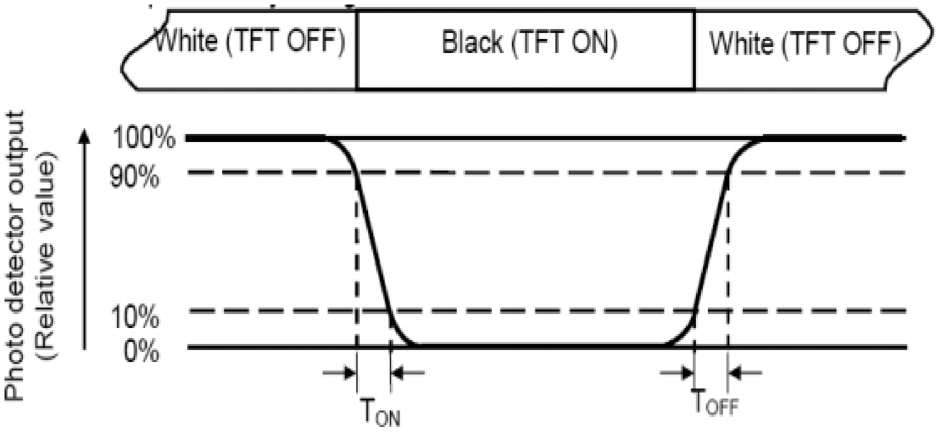
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval Between "White" state and "Black" state. Rise time (TON) is the time between Photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is The time between photo detector output intensity changed from 10% to 90%



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the Center of each measuring area

Luminance Uniformity (U) = Lmin/ Lmax X100%

L-------Active area length W----- Active area width

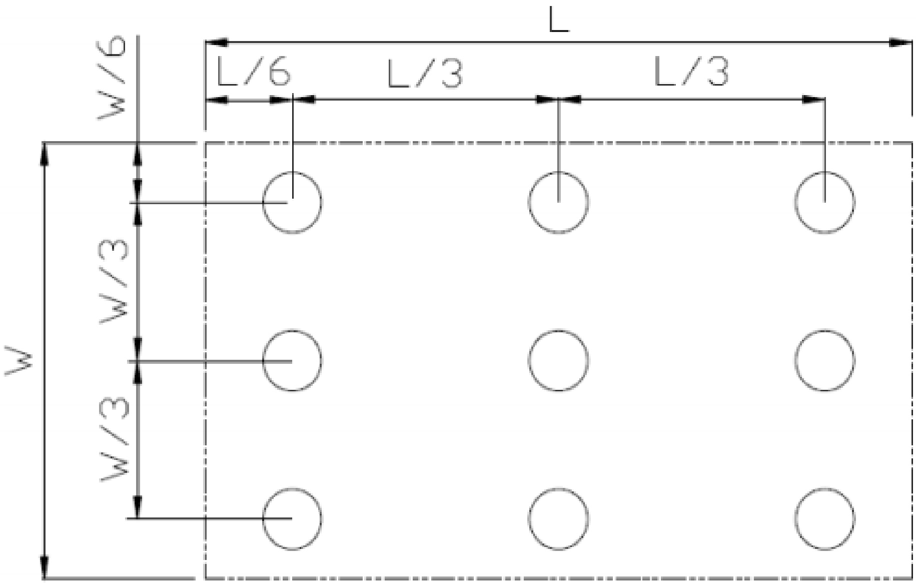


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

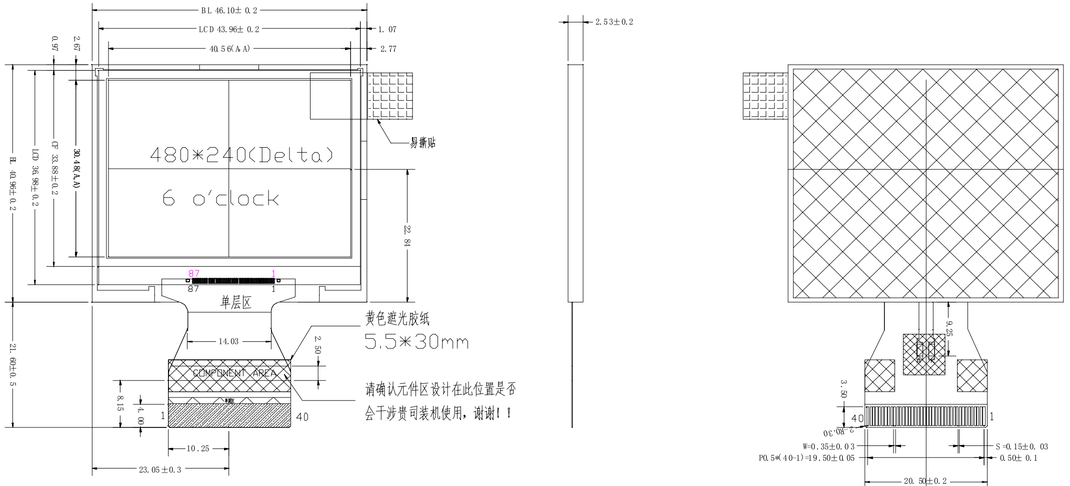
8 Environmental / Reliability Tests

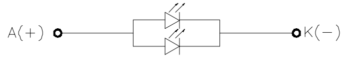
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= 60℃, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -10℃, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +70℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -20℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max, 160 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. T_S is the temperature of panel’s surface.
2. Ta is the ambient temperature of sample.

9 Mechanical Drawing

REV.	DATE	MODIFICATION
1.0	2016/04/29	First issue


BL 46.10± 0.2
LCD 43.96± 0.2
40.56(A.A)
1.07
2.77
0.97
2.67
BL 40.96± 0.2
LCD 36.98± 0.2
CF 33.88±0.2
30.48(A.A)
480*240(Delta)
6 o'clock
易撕贴
22.84
87
1
单层区
14.03
黄色遮光胶纸
5.5*30mm
2.50
COMPONENT AREA
请确认元件区设计在此位置是否会干涉贵司装机使用，谢谢！！
1
40
8.15
4.00
10.25
23.05±0.3
21.60±0.5
2.53±0.2
9.25
3.50
40
1
2-R0.30
W=0.35±0.03
S=0.15±0.03
P0.5*(40-1)=19.50±0.05
0.50± 0.1
20.50±0.2



背光电路图 (CIRCUIT DIAGRAM)

NO.	SYMBOL
1	VGL
2	VGH
3	C1N
4	C2N
5	C1P
6	C2P
7	DUMMY
8	DUMMY
9	DUMMY
10	VDD3
11	VDD25
12	GND
13	DUMMY
14	VCAC
15	C3P
16	C3N
17	DUMMY
18	DUMMY
19	LED-
20	DUMMY
21	DUMMY
22	LED+
23	GND
24	VCC
25	VSYNC
26	HSYNC
27	DCLK
28	GND
29	GND
30	DB0
31	DB1
32	DB2
33	DB3
34	DB4
35	DB5
36	SDA
37	SCL
38	CS
39	NC
40	REST

NOTES:
1.DISPLAY TYPE:
Main LCD:2.0" TFT 6 O'CLOCK DIRECTION
2.OPERATING TEMP: −20℃−−70℃
3.STORAGE TEMP: −30℃−−80℃
4.MAIN LCD DRIVER:OTA5182A or Equivalent
5.BACKLIGHT: 3CHIP−WHITE LED,Parallel connection
6.产品满足ROHS要求
7.GENERAL TOLERANCE:±0.2

INTERFACE	RGB Interface FPC Connector	深圳市海创通科技有限公司 Shenzhen HCT Technology Co.,Ltd			
		MODEL NAME TFT Display Module	PART NO. H020LW40E2503		
VIEWING DIRECTION	12 O'clock	DWN Rich Liang	REV. 1.0	SHEET OF 1/1	
		CHKD Rich Liang	TOLERANCE UNLESS SPECIFIED ±0.3		
Gray Scale DIRECTION	6 O'clock	PROJECTION 3RD ANGLE	UNIT mm	SCALE 1:1	

10.Packing

TBD

11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol
— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following: Water ； Ketene ； Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.