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MODEL NO : ET010QG01-G**MODEL VERSION:** 01**SPEC VERSION :** 1.0**ISSUED DATE:** 2018-12-08☒ **Preliminary Specification**☐ **Final Product Specification****Customer :** _____

Approved by	Notes

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Record of Revision

[illegible]

1 General Specifications

Feature		Spec
Display Spec.	Size	0.95 inch
	Resolution	180xRGBx120
	Technology Type	LTPS
	Pixel Configuration	RGB Vertical Stripe
	Pixel pitch(mm)	0.1113 (W) ×0.1113 (H)
	Display Mode	AMOLED
	Viewing Direction	Free angle
Mechanical Characteristics	LCM (W x H x D) (mm)	22.23 x 18.32 x 0.75
	Active Area(mm)	20.03 x 13.36
	With /Without TSP	ONCELL
	Driver IC	RM67160
	Weight (g)	TBD
Electrical Characteristics	Interface	SPI
	Color Depth	262K

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

1	GND1	Power	The power ground
2	X00	IO	Touch Panel trace
3	Y00	IO	Touch Panel trace
4	X01	IO	Touch Panel trace
5	X02	IO	Touch Panel trace
6	Y02	IO	Touch Panel trace
7	X03	IO	Touch Panel trace
8	GND2	Power	The power ground
9	KEY_R	-	Connect to KEY
10	KEY_L	-	Connect to KEY
11	VDDIO	Power	Driver IC digital I/O supply
12	VCI	Power	Driver IC analog supply
13	TE	O	Tear effect output
14	SWIRE	O	Swire protocol setting pin of Power IC
15	GND3	Power	The power ground
16	ID_L	O	Panel ID pin
17	SDI	I	Serial input signal in SPI I/F. The data is input on the rising edge of the SCL signal.
18	CSX	I	Chip select input pin ("Low" enable)
19	SDO	O	Serial output signal in SPI I/F. The data is output on the rising/falling edge of the SCL signal.
20	D/CX	I	Display data / command selection in 80-series MPU I/F and 4-wire SPI I/F. D/CX = "0" : Command D/CX = "1" : Display data or Parameter
21	GND4	Power	The power ground
22	XRES	I	This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.
23	SCL	I	A synchronous clock signal in SPI I/F.
24	GND5	Power	The power ground
25	NC2	-	No Connection
26	MTP	Power	Power supply for OTP. Leave the pin to open when not in use.
27	ELVSS2	Power	AMOLED power Negative
28	ELVDD	Power	AMOLED power Positive
29	ELVSS3	Power	AMOLED power Negative
30	ELVDD	Power	AMOLED power Positive

3 Absolute Maximum Ratings

Parameter	Symbol	Spec			Unit	Note
		Min.	Typ.	Max.		
Analog/boost power voltage	VCI	-0.3	-	5.5	V	-
I/O voltage	VDDIO	-0.3	-	5.5	V	-
Operating temperature	Top	-20	-	70	°C	-
Storage temperature	Tstg	-40	-	80	°C	-

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	4.55	4.6	4.65	V	-
AMOLED power Negative	ELVSS	-2.45	-2.4	-2.35	V	Ref
Digital Power supply	VDDIO	1.65	1.8	1.95	V	Ref
Analog Power supply	VCI	2.7	2.8	2.9	V	Ref

1) Normal Mode

Power Supply: IOVCC=1.8V VCI=2.8V

Frame Frequency: $F_{frame}=60\text{HZ}$ @ 25degC, Brightness 350 nits, Command Mode,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 350nits	IELVDD /ELVSS	-	8	8.8	mA	Ref
	IVCI	-	6.0	7.2	mA	Ref
	IVDDIO	-	5.8	6.0	mA	Ref
50% Pixel On 175nits	IELVDD /ELVSS	-	2.5	2.75	mA	Ref
	IVCI	-	6.6	8.0	mA	Ref
	IVDDIO	-	5.8	6.0	mA	Ref

2) Idle Mode

Power Supply: IOVCC=1.8V VCI=2.8V

Frame Frequency: $F_{frame}=15\text{HZ}$ @ 25degC, Brightness 30 nits,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
10% Pixel On 30 nits	IELVDD /ELVSS	-	-	-	mA	Supplied by Driver IC
	IVCI	-	4.5	5.4	mA	Ref
	IVDDIO	-	1.5	1.8	mA	Ref

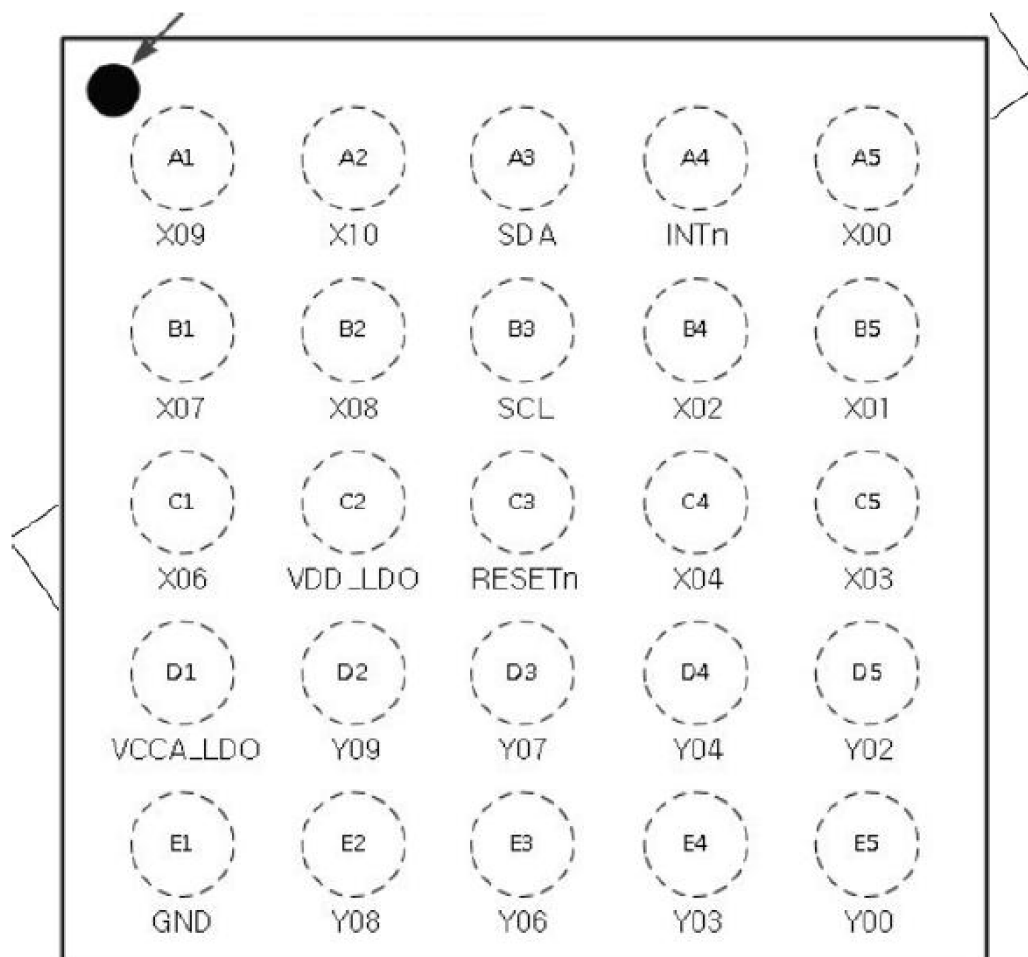
3) Deep Standby Mode

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	2	uA	-
	IVDDIO	-	-	1	uA	-

5 Timing Chart

5.1 TP IC Recommended Operating Conditions

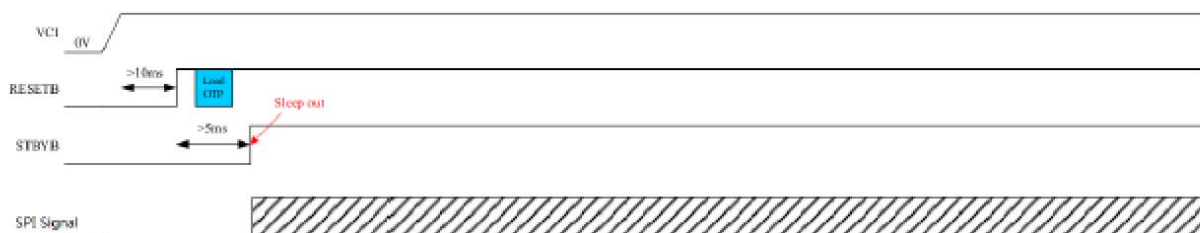
Symbol	Description	Min	TYP	MAX	UNIT
VCCA	Analog power supply voltage	2.7	3.3	3.6	V
V _{IN} (I2C)	Input voltage range	0	-	3.6	V
V _{OUT} (I2C)	Output voltage range	0	-	VBUS	V
V _{IN} (INT)	Input voltage range	0	-	3.6	V
V _{OUT} (INT)	Output voltage range	0	-	VBUS	V
V _{OUT} (TX)	Output voltage range	0	-	3.3	V
V _{OUT} (RX)	Input voltage range	0	-	3.3	V



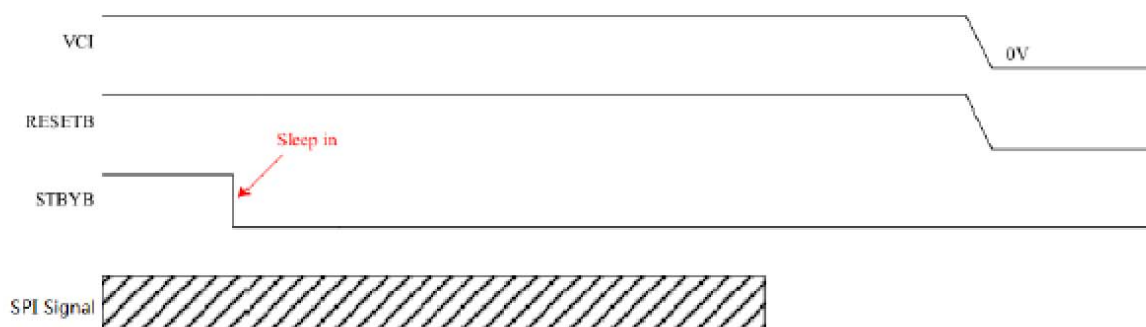
25 Ball WLCSP (TOP VIEW) assignments

5.2 Recommended Operating Sequence

5.4.1 Power on sequence



5.4.2



5.4.3 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.

When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

The closed interval of Low can be shown as the following.

(Test condition: VDDIO=1.65V~3.6V, VSS=0V, TA=-20°C~+70°C)

Parameter	Symbol	Conditions	Spec			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	μs

Table: Reset timing

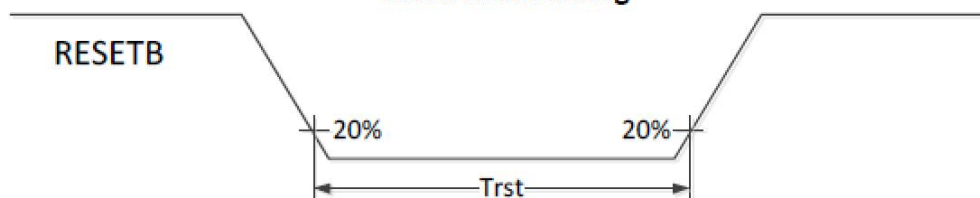


Figure: Reset timing

6 Optical Characteristics

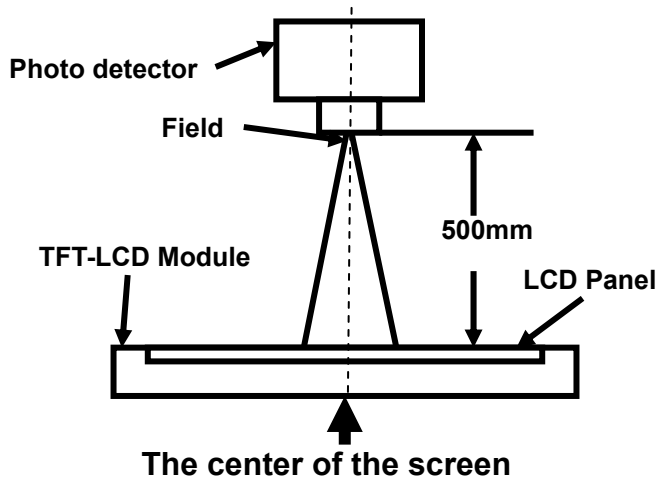
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	-	80	-	Degree	Note2,3
		θB		-	80	-		
		θL		-	80	-		
		θR		-	80	-		
Contrast Ratio		CR	θ=0°	10000	-			Note 3
Response Time		T _{ON}	25℃	-	2	4	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.25	0.30	0.35		Note 1,5
		y		0.28	0.33	0.38		
	Red	x						Note 1,5
		y						
	Green	x						Note 1,5
		y						
	Blue	x						Note 1,5
		y						
Uniformity		U		80	85	--	%	Note 6
NTSC Ratio		NTSC	CIE1931	90	105		%	
Luminance		L		310	350	-	cd/m ²	Note 7

Test Conditions:

1. $I_F = 15$ mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

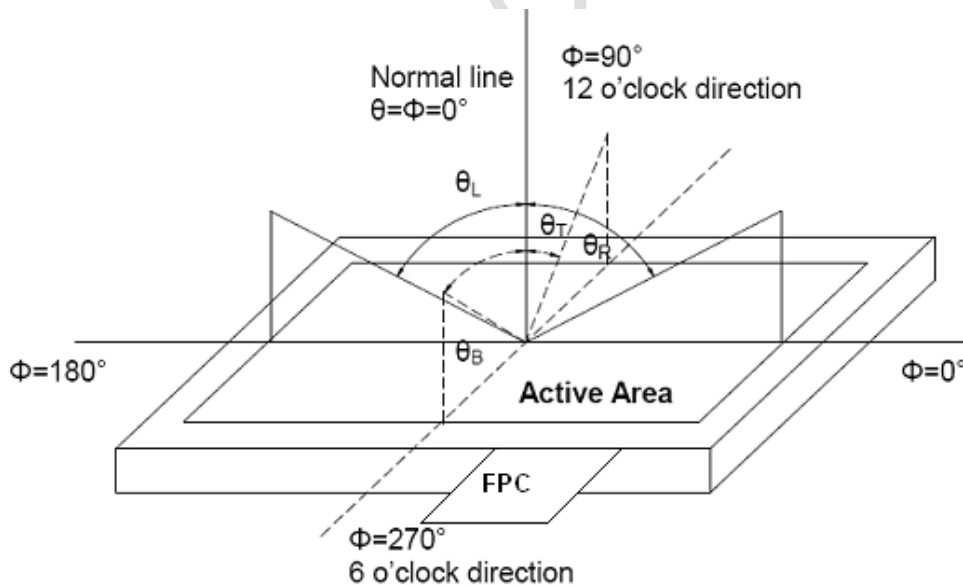
Note 1: Definition of optical measurement system.

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.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD.



Note 3: Definition of contrast ratio

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

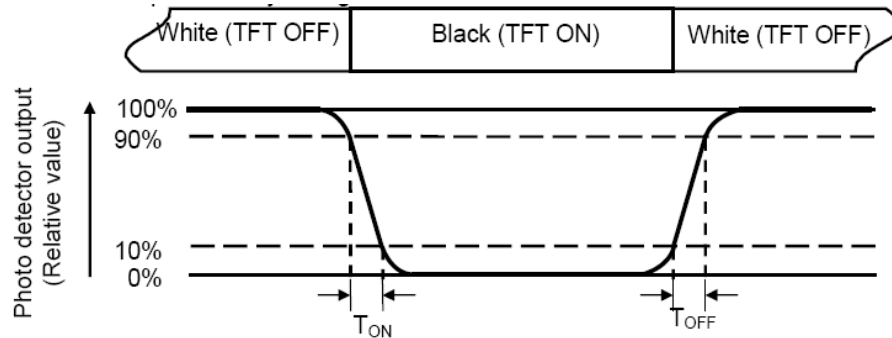
"White state ": The state is that the LCD should drive by V_{white} .

"Black state": The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

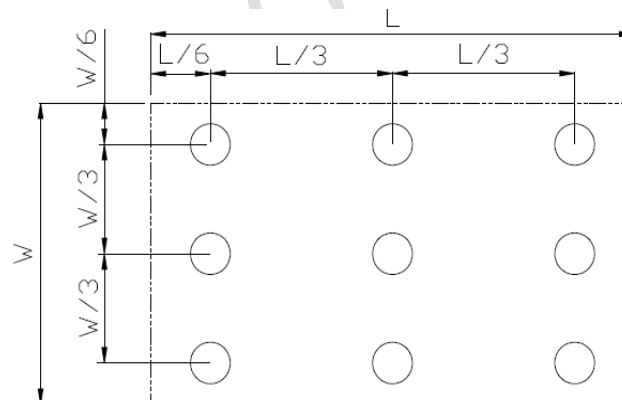
Color coordinates measured at center point of LCD.

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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



$L_{\max}$: The measured Maximum luminance of all measurement position.

$L_{\min}$: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	70℃, 96Hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃, 96 Hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	80℃, 96Hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-40℃, 96 Hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	60℃, 90%RH, 96 Hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃/0.5h~+80℃/0.5h for a total 24 cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	±2KV, Human Body Mode, 150pF/330Ω; ±8KV, Air Mode, 150pF/330Ω;	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	10 => 55 =>10 => 55 => 10 Hz, within 1 minute;Amplitude:1.5mm. 15 minutes for each Direction (X,Y,Z)	IEC60068-2-6:1982 GB/T2423.10—1995
10	Package Drop Test	Packed, 66CM free fall 6 sides, 1 corner, 3edges	IEC60068-2-32:1990 GB/T2423.8—1995

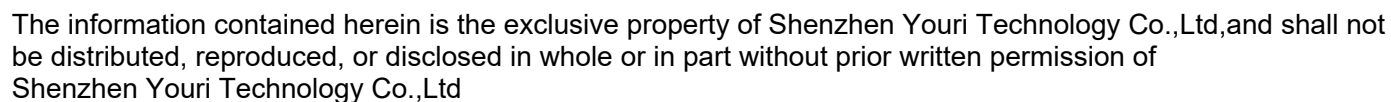
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8. Outline Dimension



9 Packing Drawing

TBD

10 Precautions for Use of LCD Modules

a) Handling Precautions

- i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- ii. 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.
- iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- v. 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
 - Ketone
 - Aromatic solvents
- vi. Do not attempt to disassemble the LCD Module.
 - vii. If the logic circuit power is off, do not apply the input signals.
 - viii. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

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

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

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

10.1.8.4 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.

b) Storage precautions

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

- ii. 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%

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

c) Transportation Precautions

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