

PRODUCTION SPECIFICATION OF LCD MODULE MODULE NO.: BI015QVGCT

Customer Name:			
Customer Part Number:			
Approved By:		Date:	

Prepared By	Checked By	Approved By

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Revision History

Rev	Issued Date	Description	Page	Editor
1.0	Sep 05,2017	First release	All	

1 General Specifications

Feature		Specifications
Display Spec.	LCD type	1.54 inch
	Resolution (H*V)	320(RGB) x320
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Transmissive / Normally Black
	Surface Treatment	Glare
	Viewing Direction	ALL
Mechanical Characteristics	OutlineDimensions (W x H x T) (mm)	31.52*33.72*2.8
	Active Area(mm)	27.74*27.74
	With /Without Touch screen	With CTP
	Match Connector	0.5pitch, 24pin
	Backlight Type	White LED
	Weight (g)	TBD
Electrical Characteristics	Interface	MIPI
	Number of color	16.7M
	Driver IC	ST7796S

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

2 Pin Assignment

NO.	PIN NAME	I/O	Description
1	IOVCC	P	Power Supply 1.8V/2.8V Voltage
2	GND	P	Ground
3	VCC	P	Power Supply 2.8V Voltage
4	GND	P	Ground
5	LEDA	I	LED Anode
6	LEDK	I	LED Cathode
7	GND	P	Ground
8	LPTE	I	Tearing effect output
9	RESET	I	LCM Reset input signal
10	GND	P	Ground
11	GND	P	Ground
12	TCN	I/O	DSI-CLK- clock signals
13	TCP	I/O	DSI-CLK+ clock signals
14	GND	I	Ground
15	TD0N	I/O	DSI-D0- clock signals
16	TD0P	I/O	DSI-D0+clock signals
17	GND	P	Ground
18	GND	P	Ground
19	CTP_RST	I	CTP Reset
20S	CTP_INT	I	CTP Pin
21	GND	P	Ground
22	CTP_SDA	-	CTP Pin
23	CTP_SCL	-	CTP Pin
24	GND	P	Ground

Note1: I/O definition: I-----Input O---Output P----Power/Ground

3 Absolute Maximum Ratings

GND=0V, Ta= 25°C

Item	Symbol	Value	Unit
Power supply voltage for logic	V _{DD}	0.3~4.6	V
Input voltage	V _{in}	V _{DD} +0.3	V
Operating temperature	T _{opr}	-20 to 70	°C
Storage temperature	T _{stg}	-30 to 80	°C

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V _{DD}	2.6	2.8	3.3	V	-
Supply current	I _{DD}	-	20	-	mA	V _{DD} =2.8V, Ta=25°C
Input voltage	V _{IH}	0.8V _{DD}	-	V _{DD}	V	-
	V _{IL}	0	-	0.2V _{DD}	V	
Input leakage current	I _{IL}	-1.0	-	1.0	μA	V _{IN} =V _{DD} or V _{SS}

Note: Voltage greater than above may damage the module.

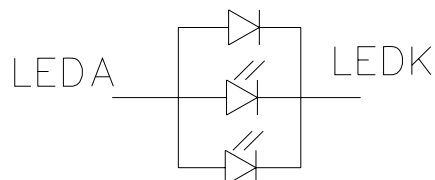
All voltages are specified relative to VSS=0V.

4.2 Driving Backlight

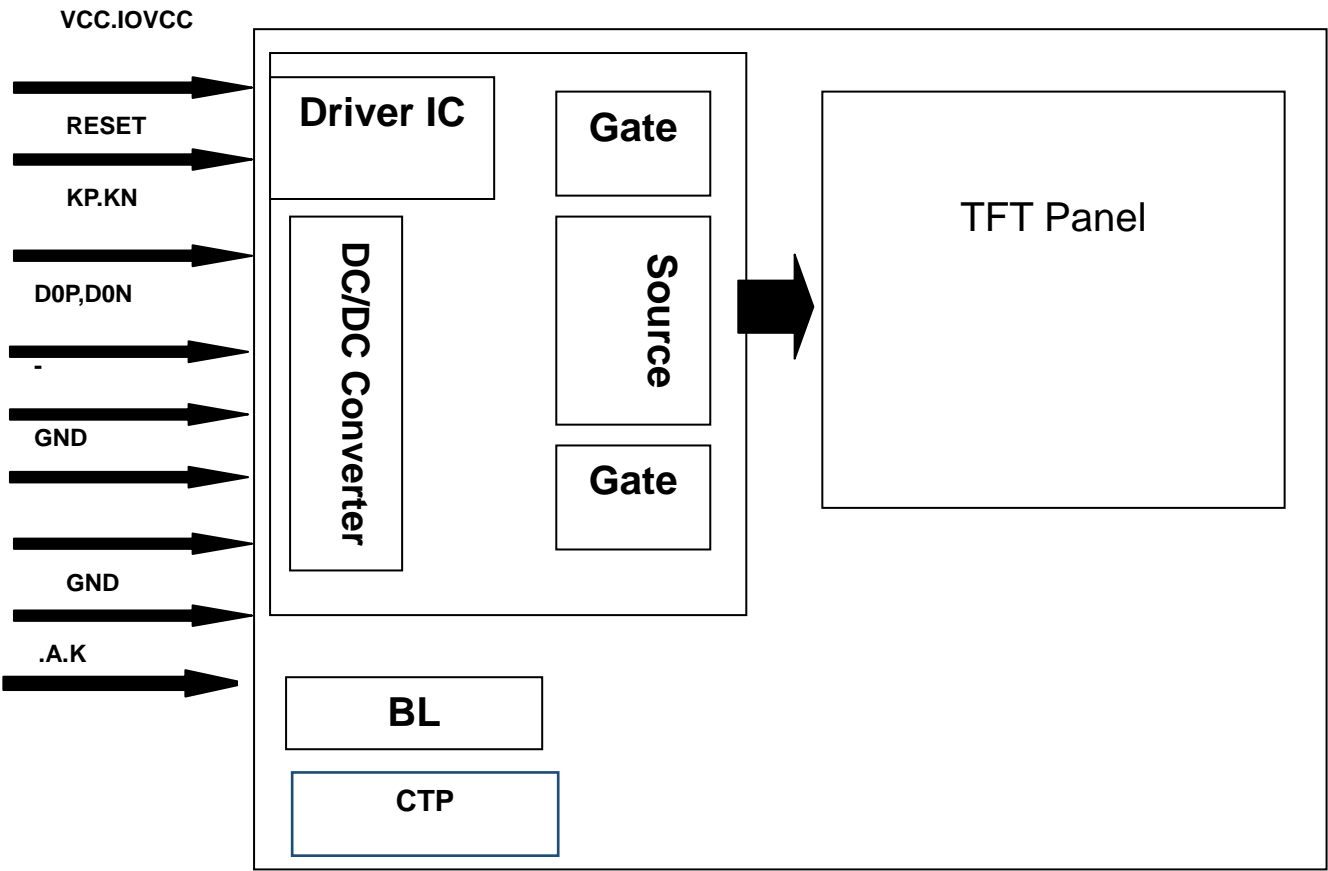
Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I _F	--	60	75	mA	
Forward Voltage	V _F	-	3.2	-	V	
Connection mode	P	--	3Parallel	--		
LED number	/		3		pcs	

Note1: Optical performance should be evaluated at Ta=25°C only .If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



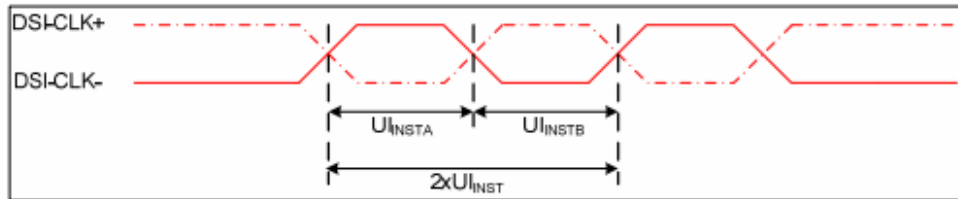
4.3 Block Diagram



5 INTERFACE TIMING

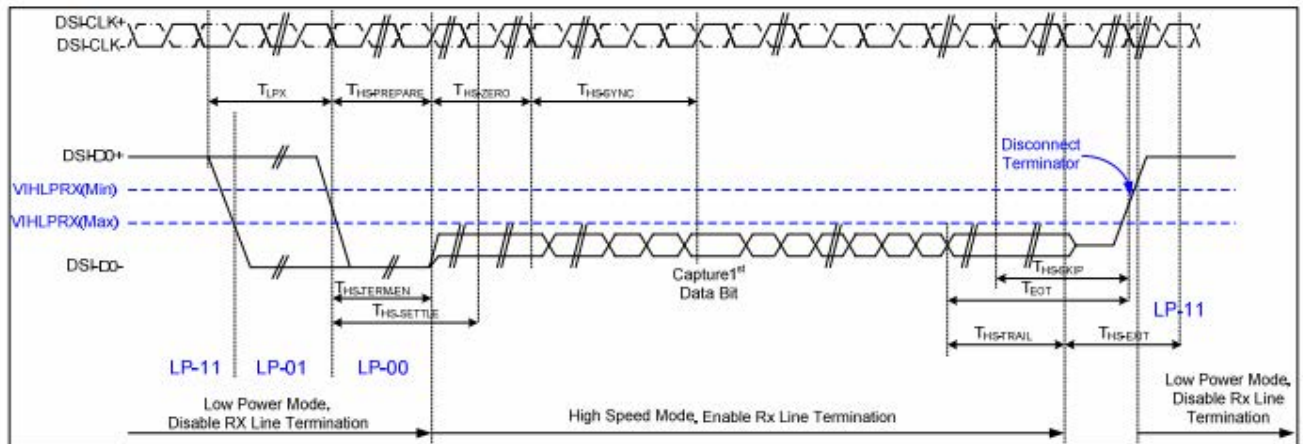
5.1 System Bus Read/Write Characteristics.

High Speed Mode – Clock Channel Timing



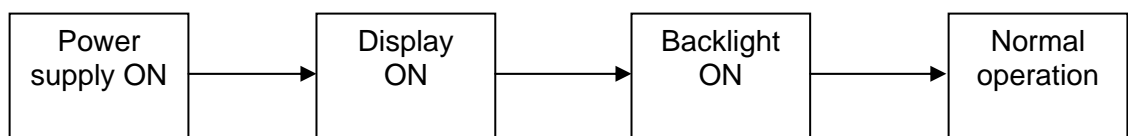
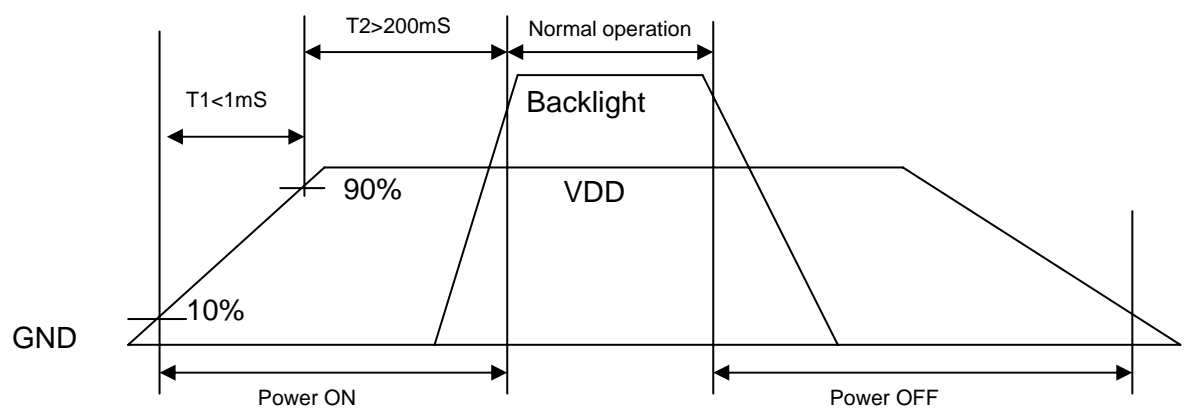
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-DATA_P/N	2xUI INST	Double UI instantaneous	4	25	ns	
DSI-DATA_P/N	UI INSTA ,UI INSTB	UI instantaneous Half	2	12.5	ns	

High-Speed Data Transmission

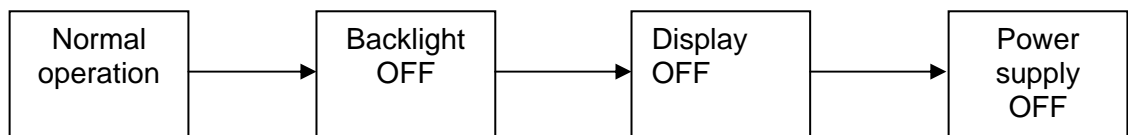


Parameter	Symbol	MIN	TYP	MAX	Unit
Time to drive LP-00 to prepare for HS transmission	$T_{HS-PREPARE}$	$40+4UI$		$85+6UI$	ns
Time from start of $t_{HS-TRAIL}$ or $t_{CLK-TRAIL}$ period to start of LP-11 state	T_{EOT}			$105+12UI$	ns
Time to enable data receiver line termination measured from when D_n crosses $VILMAX$	$T_{HS-TERM-EN}$			$35+4UI$	ns
Time to drive flipped differential state after last payload data bit of a HS transmission	$T_{HS-TRAIL}$	$60+4UI$			ns
Time-out at RX to ignore transition period of EoT	$T_{HS-SKIP}$	40		$55+4UI$	ns
Time to drive LP-11 after HS burst	$T_{HS-EXIT}$	100			ns
Length of any Low-Power state period	T_{LPX}	50			ns
Sync sequence period	$T_{HS-SYNC}$		8UI		ns
Minimum lead HS-0 drive period before the Sync sequence	$T_{HS-ZERO}$	$105+6UI$			ns

5.2 Power ON/OFF Timing



Power ON sequence



Power OFF sequence

6 Optical Characteristics

Ta=25℃

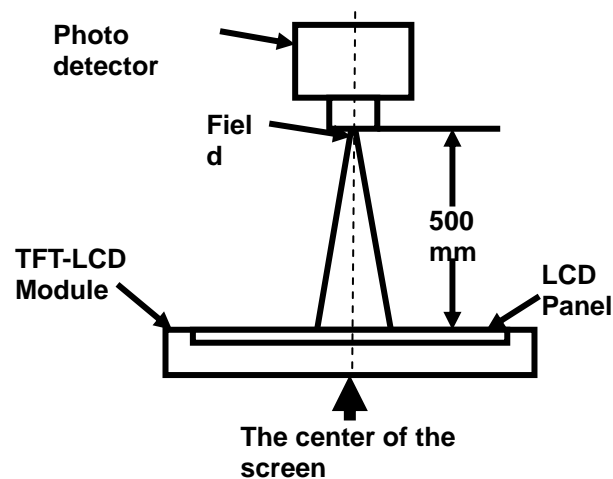
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \geq 10$	-	80	-	Degree	Note 2
	θB		-	80	-		
	θL		-	80	-		
	θR		-	80	-		
Contrast Ratio	CR	$\theta=0^\circ$	300	400	-	-	Note1 Note3
Response Time	T_{ON}	25℃	-	25	35	ms	Note1 Note4
	T_{OFF}						
Uniformity	U	-	70	80	-	%	Note1 Note6
NTSC	-	-	-	50	-	%	Note 5
Luminance	L		300	350	-	cd/m ²	Note1 Note7

Test Conditions:

1. $V_F=3.2V$, $I_F=60mA$, 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.



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

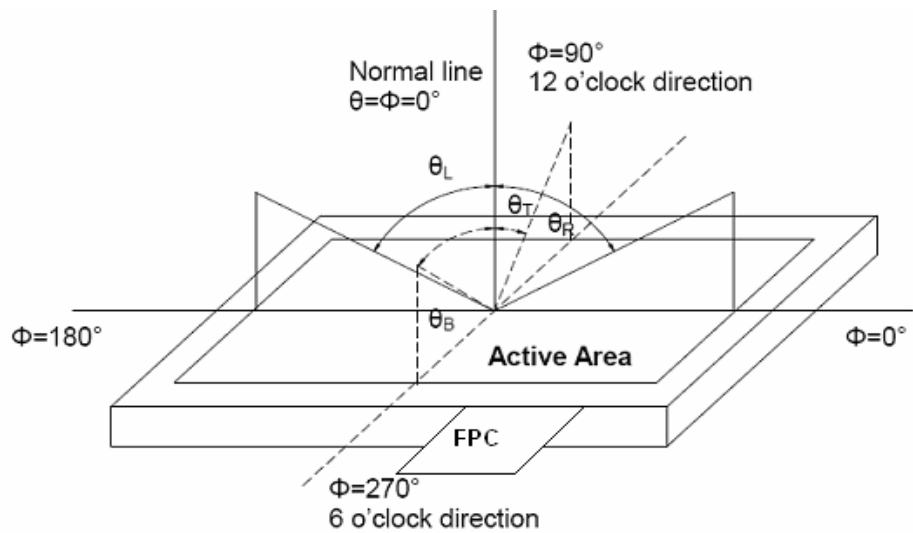


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

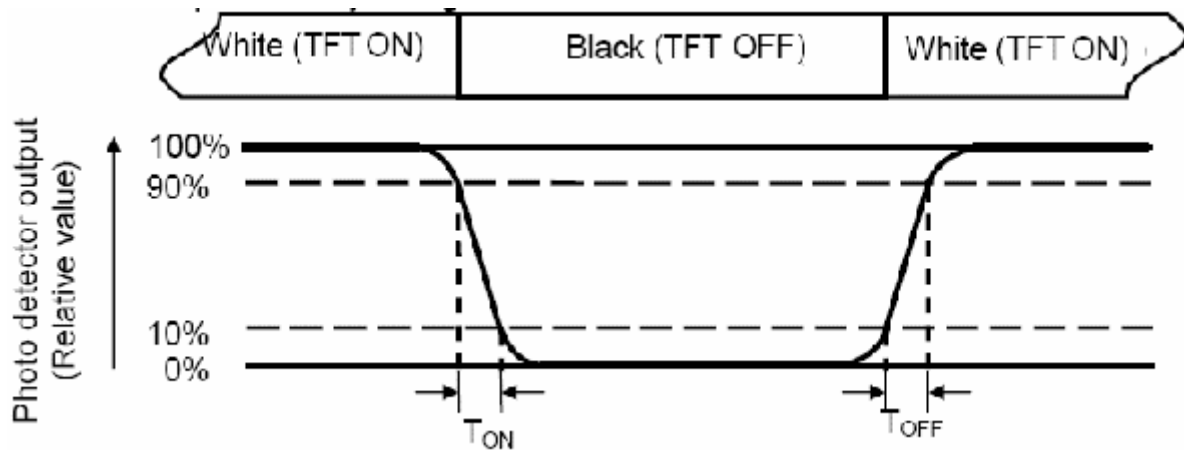
"White state": The state is that the LCD should be driven by V_{white} .

"Black state": The state is that the LCD should be driven 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.

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

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

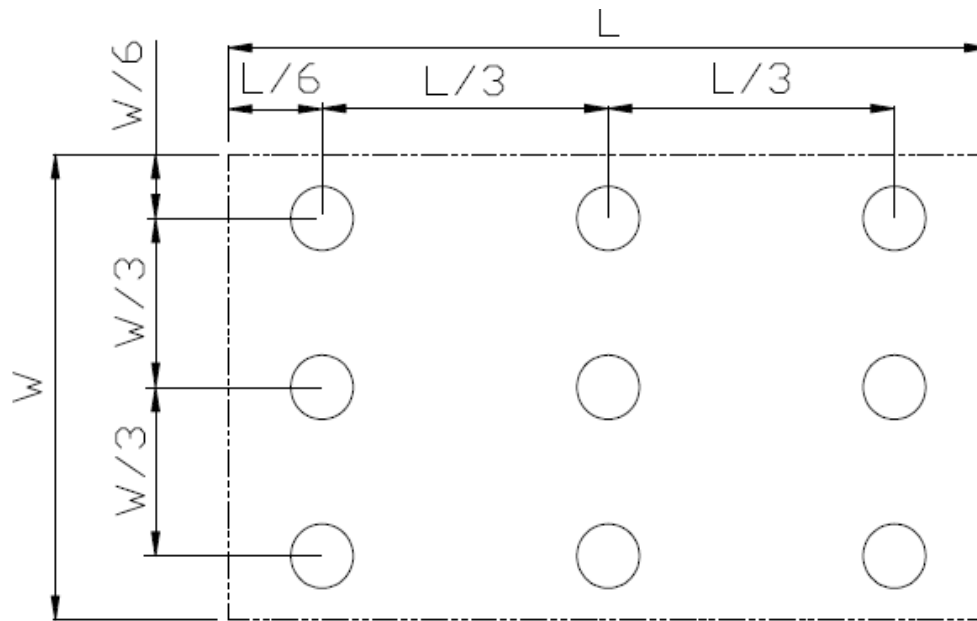


Fig. 2 Definition of uniformity

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

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	120	No abnormalities in functions and appearance
High temp. Operating	70°C	120	
Low temp. Storage	-30°C	120	
Low temp. Operating	-20°C	120	
Humidity	40°C/ 90%RH	120	
Thermal Shock(Non-operation)	-20°C ← 25°C →70°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	

8 Mechanical Drawing

1	2	3	4	5	6	7	8
DESIGN: (设计)		CHECKED: (检查)		APPROVED: (批准)		SPECIFICATION	
Date: (日期)	2017.12.23	Page: (页数)	1/1	图纸视角: 			
				01			
				Main: FPC			
				PIN NAME:			
				1 IDVCC18V			
				2 GND			
				3 VCC28V			
				4 GND			
				5 LEDA			
				6 LEIK			
				7 GND			
				8 LPIE			
				9 LCM_RST			
				10 GND			
				11 GND			
				12 TCN			
				13 TCP			
				14 GND			
				15 TDM			
				16 TDOP			
				17 GND			
				18 GND			
				19 CTP_RST			
				20 CTP_INT			
				21 GND			
				22 CTP_SDA			
				23 CTP_SCL			
				24 GND			

Notes:

- Unit:mm.
- △Modification rev.number.
- All radii without dimension R0.3mm.
- All draft angles to be 1.5°
- Unspecified Tolerances is : ± 0.20mm.
- Driver IC: ST796S TP: CST016
- LCD Driver Voltage : 2.8 ± 0.3V
- Color : White
- Operating Temperature : -20° ~ +70° C
- Storage Temperature : -30° ~ +80° C
- Requirements on Environmental Protection: ROHS

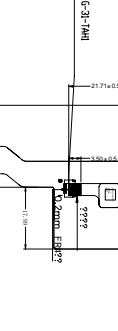
Customer Name: 客户名称

Approval Date: 承认日期

Approved By: 承认

Please Confirm This Drawing On/Before 请 签 回 此 图

LED CIRCUIT DIAGRAM



LEDA LEDK

TP 11.0℃X4.

1	TP0K 40
2	BRIST
3	ENV
4	SW
5	SE
6	DN

1. Unit:mm.

2. △Modification rev.number.

3. All radii without dimension R0.3mm.

4. All draft angles to be 1.5°

5. Unspecified Tolerances is : ± 0.20mm.

6. Driver IC: ST796S TP: CST016

7. LCD Driver Voltage : 2.8 ± 0.3V

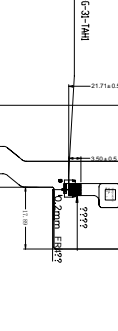
8. Color : White

9. Operating Temperature : -20° ~ +70° C

10. Storage Temperature : -30° ~ +80° C

11. Requirements on Environmental Protection: ROHS

LED CIRCUIT DIAGRAM



LEDA LEDK

TP 11.0℃X4.

1	TP0K 40
2	BRIST
3	ENV
4	SW
5	SE
6	DN

9 Precautions For Use of LCD Modules

9.1 Handling Precautions

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

9.1.1.2 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.

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

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

9.1.1.5 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
- Ketone
- Aromatic solvents

9.1.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

9.1.1.12 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.

9.1.1.13 Storage precautions

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

9.1.1.15 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:

9.1.1.16 Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

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

9.2 Transportation Precautions

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