



(V) Preliminary Specification
() Final Specification

Module	5.7 Inch Color TFT-LCD
Model Name	G057QN01 V0

Customer	Date
_____	_____
Checked & Approved by	
_____	_____
Note: This Specification is subject to change without notice.	

Approved by	Date
_____	_____
Prepared by	
David Hsing	2007/10/04
General Display Business Division / AU Optonics corporation	

Contents

1. Operating Precautions	4
2. General Description.....	5
2.1 Display Characteristics	5
2.2 Optical Characteristics	6
3. Functional Block Diagram.....	8
4. Absolute Maximum Ratings	9
4.1 Absolute Ratings of TFT-LCD Module	9
4.2 Absolute Ratings of Environment	9
5. Electrical Characteristics	9
5.1 TFT-LCD Driving	9
5.2 Backlight Unit Driving	11
6. Signal Characteristic	11
6.1 Pixel Format Image	11
6.2 Scanning Direction	12
6.3 The Input Data Format	12
6.4 TFT- LCD Interface Signal Description.....	13
6.5 TFT- LCD Interface Timing	14
6.6 LED Backlight Unit Interface	15
6.7 Power ON/OFF Sequence	15
7. Connector & Pin Assignment.....	16
7.1 TFT- LCD Signal (CN1): LCD Connector	16
7.2 LED Backlight Unit (CN2): LED Connector	16
7.3 PIN 1 definition of CN1 and CN2	17
8. Reliability Test Criteria	17
9. Mechanical Characteristics.....	19
10. Label and Packaging	20
10.1 Shipping Label (on the rear side of TFT-LCD display)	20
10.2 Carton Package	20
11 Safety	20
11.1 Sharp Edge Requirements	20
11.2 Materials	20
11.3 Capacitors	20
11.4 National Test Lab Requirement	20



Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 Oct. 04, 2007	All	First edition preliminary specifications		

1. Operating Precautions

- 1) Display area (Polarizer) of TFT-LCD Module is easily to be damaged, please be cautious and not to scratch it.
- 2) Be sure to power off your machine before connecting or disconnecting your signal cable to TFT-LCD Module.
- 3) Wipe off water drop on display area immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
- 5) Display area (Glass) of TFT-LCD Module may be broken or cracked if bump Module against hard object.
- 6) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module.
- 7) Do not open nor modify the TFT-LCD module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if TFT-LCD module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT-LCD Module may be damaged.
- 10) When inserting or removing of your signal cable to TFT-LCD Module, be sure not to apply abnormal force (rotate, tilt...etc.) to the Connector of the TFT-LCD Module.
- 11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
- 12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 13) Severe temperature condition may result in different luminance and short LED backlight operating life time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

2. General Description

G057QN01 V0 is designed for industrial display applications with QVGA (320 x RGB x 240) resolution and 262k colors (RGB 6-bits). It is composed of a TFT-LCD panel, driver ICs, control and power supply circuits board and backlight unit. G057QN01 V0 offers CMOS interface for display signal input. LED driving board for backlight unit is not included.

2.1 Display Characteristics

The following items are G057QN01 V0 characteristics summary at 25 °C condition.

Items	Unit	Specifications
Screen Diagonal	inch	5.7
Active Area	mm	115.2(H) x 86.4(V)
Pixels H x V		320 x 3(RGB) x 240
Pixel Pitch	mm	0.36 x 0.36
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	Volt	3.3 typ.
Typical Power Consumption	Watt	1.84W (LCD:0.69W/LED: 1.5W) All black pattern
Weight	Grams	200g(typ.), 220g(max.)
Physical Size	mm	144.0(H)x 104.6(V) x 12.3(D) (typ.)
Electrical Interface		CMOS
Surface Treatment		Anti-Glare, Hardness 3H
Support Color		262K colors
Temperature Range Operating Storage (Non-Operating)	°C °C	-30 to +85 -30 to +85
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Remark
White Luminance	[cd/m ²]	I _F = 15mA / 1 LED line (center point)		400	-	Note 1
Uniformity	%	5 Points		-	1.3	Note 1, 2, 3
Contrast Ratio				600	-	Note 4
Response Time	[msec]	Rising	-	20	30	Note 5
	[msec]	Falling	-	15	20	
	[msec]	Raising + Falling	-	35	50	
Viewing Angle	[degree]	Horizontal (Right)	60	70	-	Note 6
	[degree]	CR = 10 (Left)	60	70	-	
	[degree]	Vertical (Upper)	50	60	-	
Color / Chromaticity Coordinates (CIE 1931)		CR = 10 (Lower)	50	60	-	
		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
		Red x	TBD	TBD	TBD	
		Red y	TBD	TBD	TBD	
		Green x	TBD	TBD	TBD	
		Green y	TBD	TBD	TBD	
		Blue x	TBD	TBD	TBD	
		Blue y	TBD	TBD	TBD	
Color Gamut	%		-	50	-	

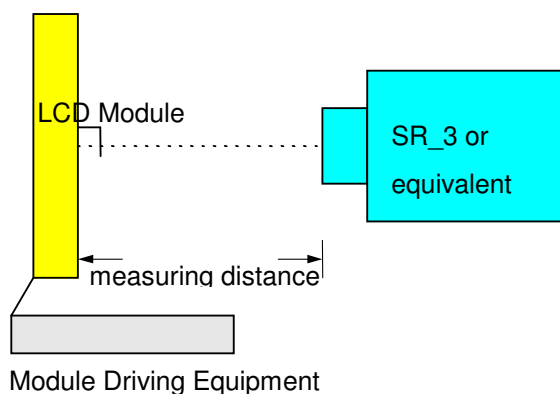
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

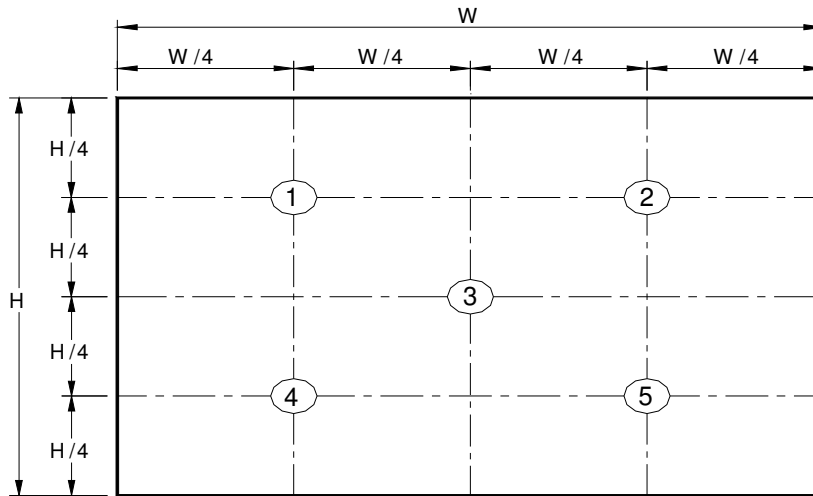
Aperture 1° with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 5 points position (Display active area : 115.2mm(W) x 86.4mm(H))



Note 3:

The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

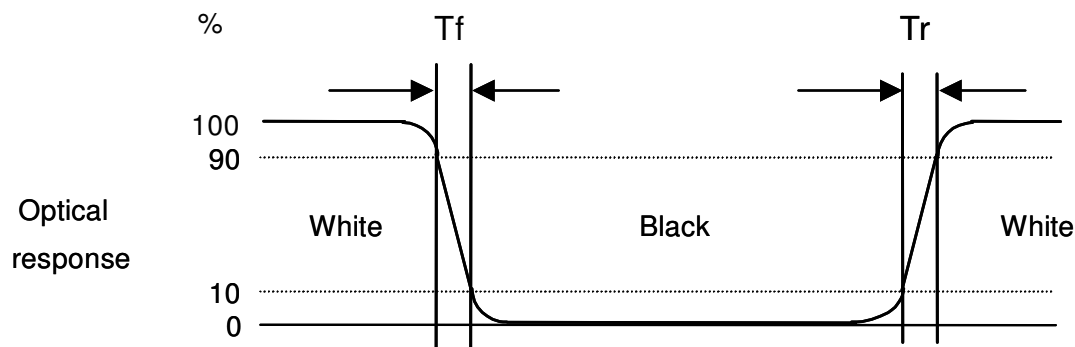
$$\delta_{w5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

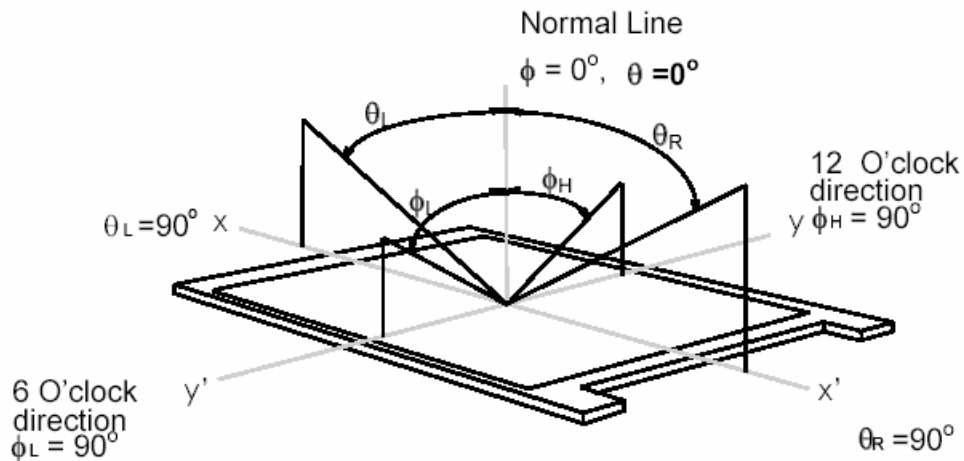
Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



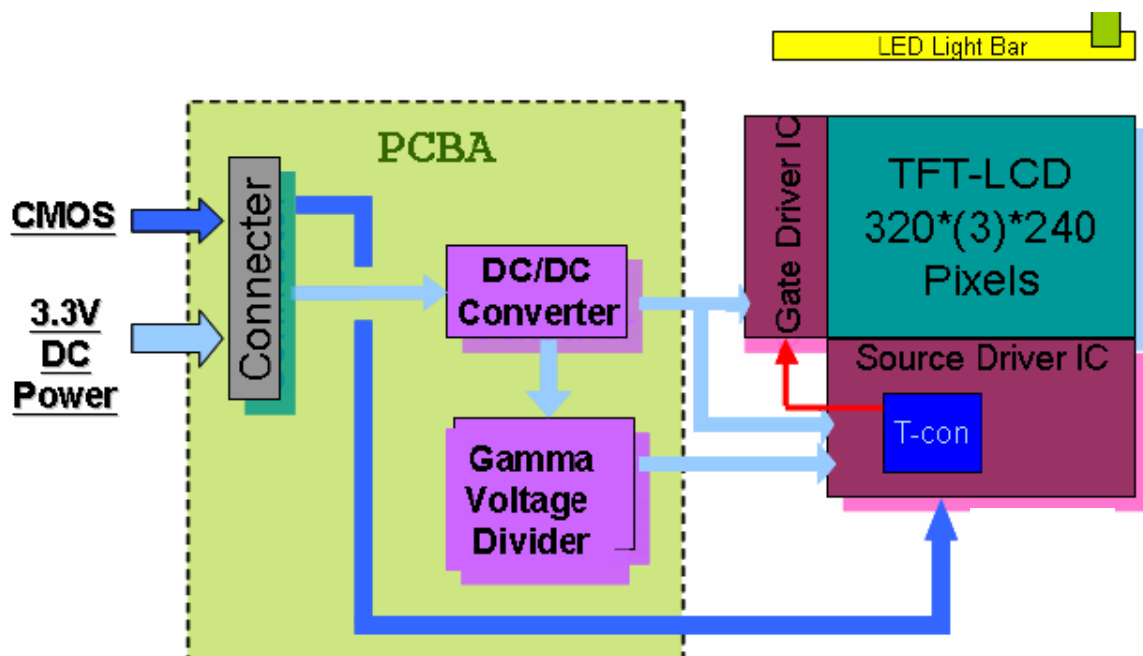
Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



3. Functional Block Diagram

The following diagram shows the functional block of the G057QN01 V0 color TFT/LCD module:



4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT-LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	V _{in}	-0.3	+3.6	Volt
LED backlight	I _{LED}	0	30	mA

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	°C
Operation Humidity	HOP	5	95	%RH
Storage Temperature	TST	-30	+85	°C
Storage Humidity	HST	5	95	%RH

Note: Maximum Wet-Bulb should be 39°C and no condensation.

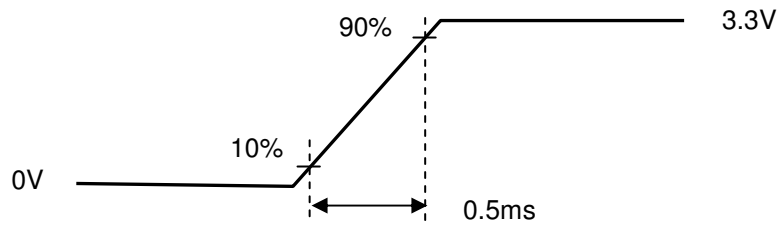
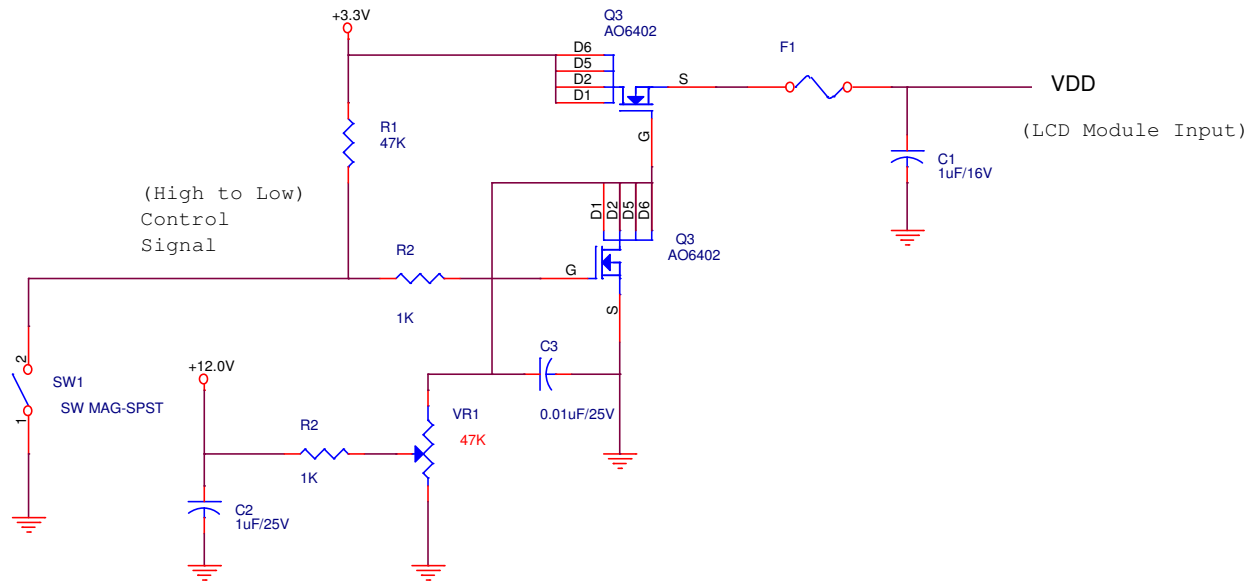
5. Electrical Characteristics

5.1 TFT-LCD Driving

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	Volt	
IDD	VDD Current	-	210	-	mA	All Black Pattern (VDD=3.3V, at 60Hz)
I _{rush}	LCD Inrush Current	-	-	1.5	A	Note 1
PDD	VDD Power	-	0.69	-	Watt	All Black Pattern (VDD=3.3V, at 60Hz)
VDD _{rp}	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	mV p-p	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:



VDD rising time

5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Logic Input Voltage for Display Signals	High	VIH	0.7VDD	-	VDD	V	
	Low	VIL	0	-	0.3VDD	V	
Input Voltage for RL/UD	High	VIH	0.7VDD	-	VDD	V	
	Low	VIL	0	-	0.3VDD	V	

5.2 Backlight Unit Driving

5.2.1 Parameter guideline for LED

Following characteristics are measured under a stable condition using an LED driving board at 25°C (Room Temperature):

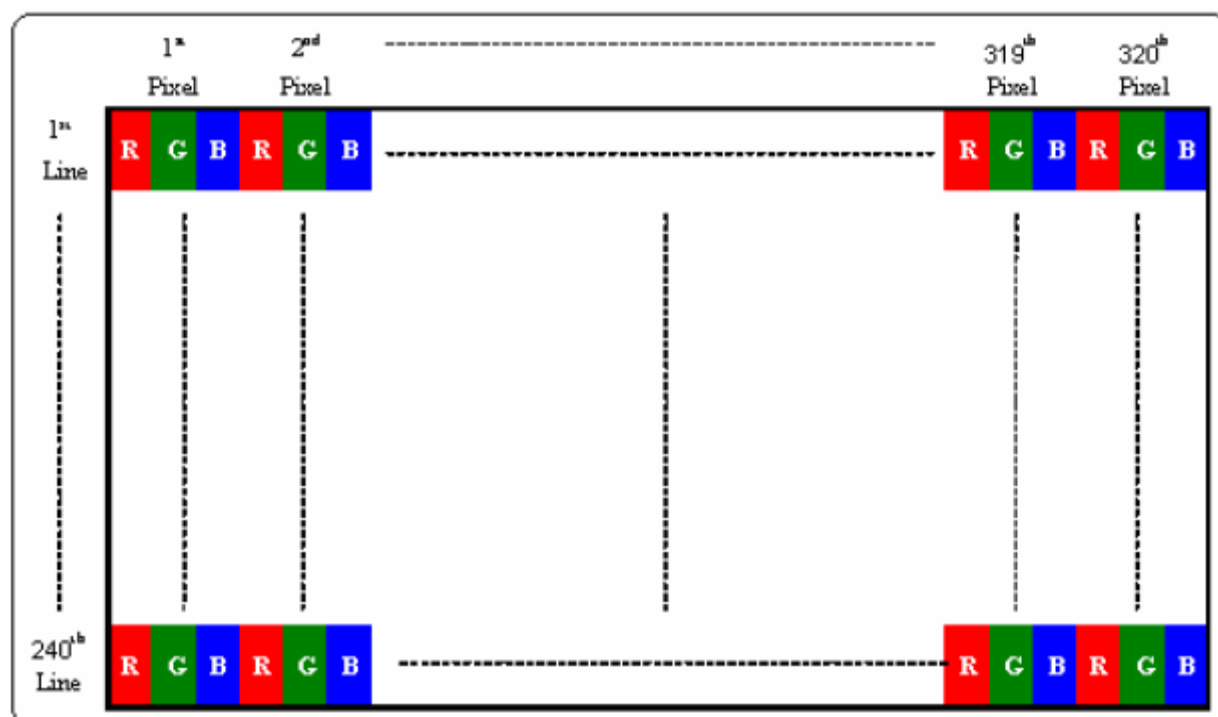
Symbol	Parameter	Min	Typ	Max	Unit	Remark
I_F	LED forward current		15		mA	Ta = -30 ~ 85 °C (each channel)
V_F	LED forward voltage		TBD		V	$I_F = 25\text{mA}$, Ta = -30°C
			TBD		V	$I_F = 25\text{mA}$, Ta = 25°C
			TBD		V	$I_F = 25\text{mA}$, Ta = 85°C
P_{LED}	LED Power	-	1.5	-	Watt	
LED Life		20000			Hrs	$I_F = 15\text{mA}$, Ta = 25°C

- G057QN01 V0 can be operated at operating temperature range, but optical performance should be evaluated at Ta = 25 °C only.
- When G057QN01 V0 module is operated at high ambient temperature condition (over 25 °C), LED forward current I_F should be less than 15 mA to avoid over LED junction temperature spec.
- If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



6.2 Scanning Direction

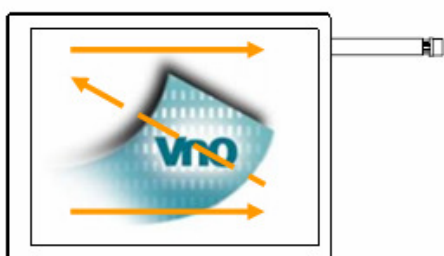
The following figures show the image seen from the front view. The arrow indicates the direction of scan.



RL=L; UD=H



RL=H; UD=H



RL=L; UD=L



RL=H; UD=L

6.3 The Input Data Format

This product displays 262,144 colors in terms of the 64 grey levels on RGB respectively. The following table demonstrates the display of input data

Display colors		Data signal (0: Low level, 1: High level)																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic colors	Black	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	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red gray scale	Black	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
	dark	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑																		
	↓																		
	bright	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Green gray scale	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	1	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	↑																		
	↓																		
	bright	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
Blue gray scale	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	1
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	↑																		
	↓																		
	bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

6.4 TFT- LCD Interface Signal Description

PIN No.	Symbol	Pin Description
1	GND	Ground
2	CLK	Dot clock
3	NC	No Connection
4	NC	No Connection
5	GND	Ground
6	R0	Red data (LSB)
7	R1	Red data
8	R2	Red data
9	R3	Red data
10	R4	Red data
11	R5	Red data (MSB)
12	GND	Ground
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data (MSB)
19	GND	Ground
20	B0	Blue data (LSB)
21	B1	Blue data
22	B2	Blue data
23	B3	Blue data
24	B4	Blue data
25	B5	Blue data (MSB)
26	GND	Ground
27	DE	Data Enable Signal
28	VDD	Power supply (3.3V Typ. ONLY)
29	VDD	Power supply (3.3V Typ. ONLY)
30	RL	Horizontal reverse scan (L: Normal, H: Right & Left reversal)
31	UD	Vertical reverse scan (H: Normal, L: Up & Down reversal)
32	NC	No Connection
33	GND	Ground

Note 1: Input signals shall be in low status when VDD is off.

Note 2: NC = No Connection

6.5 TFT- LCD Interface Timing

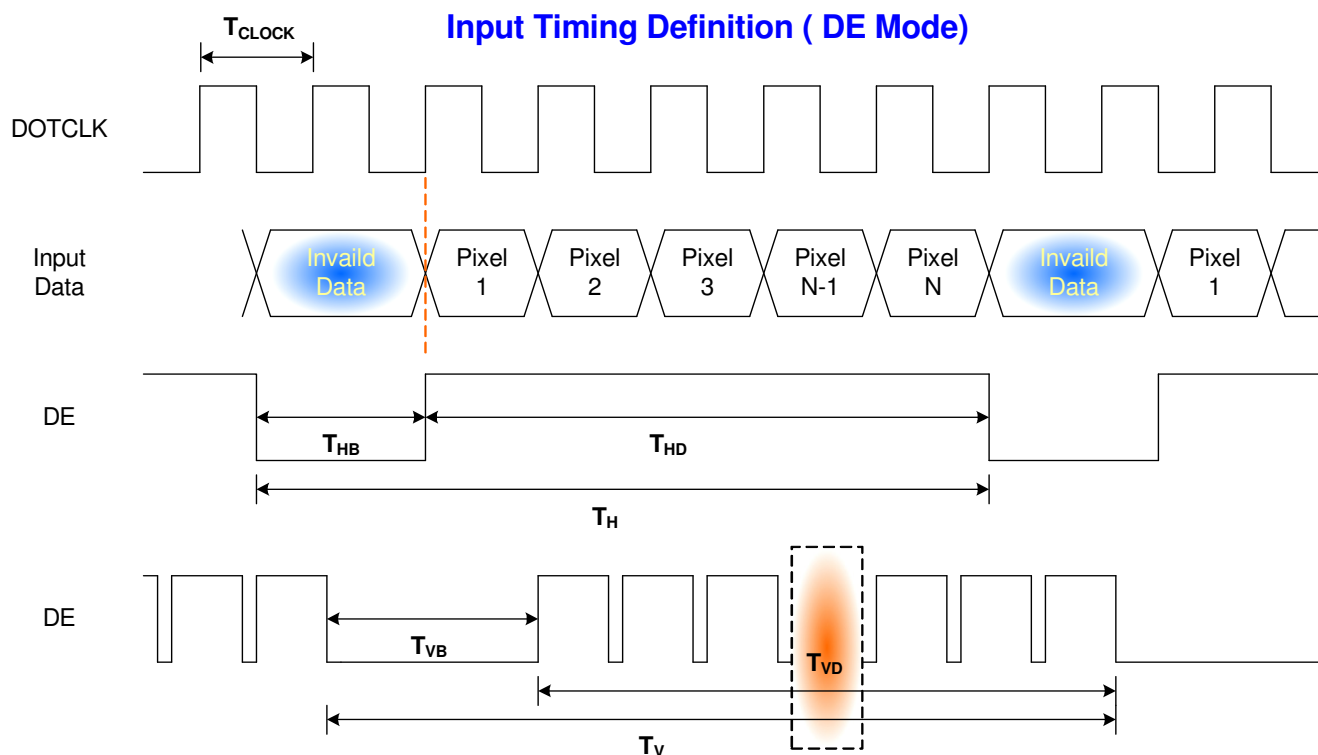
6.5.1 Timing Characteristics

DE mode only

Signal		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency (DOTCLK)		1/ T _{CLOCK}	6.2	6.4	12.1	MHz	Note1
Horizontal Section	Period	T _H	406	408	560	T _{CLOCK}	Note1
	Active	T _{HD}	320				
	Blanking	T _{HB}	86	88	240		
Vertical Section	Period	T _V	254	263	360	T _{LINE}	Note1
	Active	T _{VD}	240				
	Blanking	T _{VR}	14	23	120		

Note 1: Frame rate is 60 Hz.

6.5.2 Input Timing Diagram

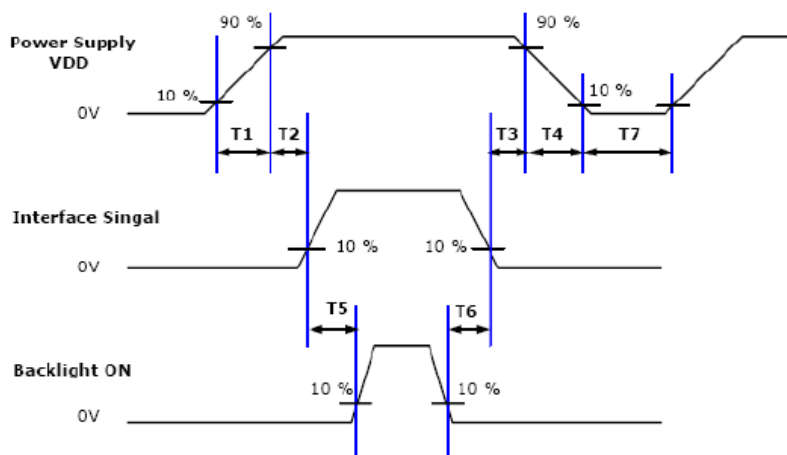


6.6 LED Backlight Unit Interface

Pin #	Symbol	Pin Description
1	AN1	Anode 1
2	AN2	Anode 2
3	AN3	Anode 3
4	CA1	Cathode 1
5	CA2	Cathode 2
6	CA3	Cathode 3

6.7 Power ON/OFF Sequence

VDD power and LED on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	0	-	10	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	500	-	-	ms

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7. Connector & Pin Assignment

7.1 TFT- LCD Signal (CN1): LCD Connector

Connector Name / Designation	Signal Connector
Manufacturer	Hirose or compatible
Connector Model Number	FH12-33S-0.5SH(55) or compatible

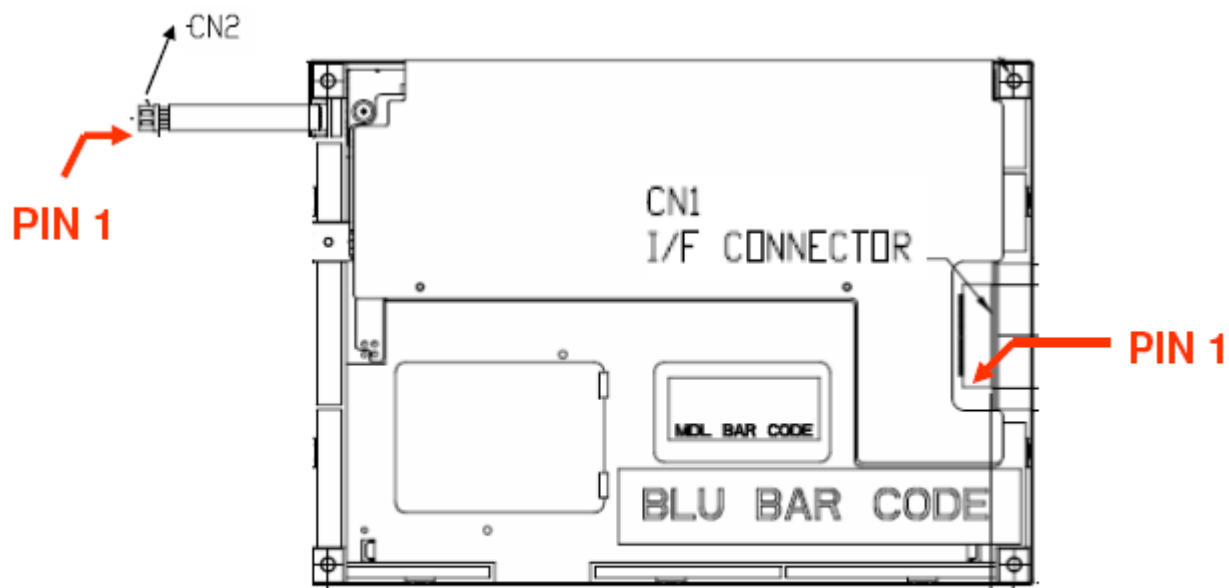
Pin#	Symbol	Pin#	Symbol	Pin#	Symbol
1	GND	12	GND	23	B3
2	CLK	13	G0	24	B4
3	Hsync	14	G1	25	B5
4	Vsync	15	G2	26	GND
5	GND	16	G3	27	DE
6	R0	17	G4	28	VDD
7	R1	18	G5	29	VDD
8	R2	19	GND	30	R/L
9	R3	20	B0	31	U/D
10	R4	21	B1	32	NC
11	R5	22	B2	33	GND

7.2 LED Backlight Unit (CN2): LED Connector

Connector Name / Designation	Lamp Connector
Manufacturer	JST or compatible
Connector Model Number	SHLP-06V-S-B or compatible
Mating Model Number	SM06B-SHLS-TF or compatible

Pin #	Symbol	Cable color	Pin #	Symbol	Cable color
1	AN1	Red	4	CA1	Blue
2	AN2	Red	5	CA2	White
3	An3	Red	6	CA3	Black

7.3 PIN 1 definition of CN1 and CN2



(Rear side of TFT-LCD)

8. Reliability Test Criteria

Items	Required Condition	Remark
Temperature Humidity Bias	40°C/90%,300Hr	Note 2
High Temperature Operation	85°C,300Hr	Note 2
Low Temperature Operation	-30°C,300Hr	Note 2
High Temperature Storage	85°C,300 hours	Note 2
Low Temperature Storage	-30°C,300 hours	Note 2
Thermal Shock Test	-20°C/30 min ,60°C/30 min ,100cycles	Note 2
Hot Start Test	85°C/1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Cold Start Test	-30°C/1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(+X,+Y,+Z)	Note 2
Vibration Test (Non-Operating)	1.5G, 10~200~10Hz, Sine wave, 30mins/axis, 3 direction (X, Y, Z)	Note 2
ESD	Contact : ± 8KV/ operation, Class B; Air : ± 15KV / operation, Class B (RL=150Ω, CL=330pF)	Note 1,2
Attitude Test	Operating: 14,000 ft, Ramp: 2000 ft/min, 8hrs Non-operating: 40,000 ft, Ramp: 2000 ft/min, 24hrs	Note 2

Note1: According to EN61000-4-2 ESD class B criteria, some performance degradation is allowed. No data lost, Self-recoverable. No hardware failures.

Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Please don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD' module.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hour at least in advance.

10. Label and Packaging

10.1 Shipping Label (on the rear side of TFT-LCD display)

TBD

10.2 Carton Package

TBD

11 Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the TFT-LCD module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the TFT-LCD module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the TFT-LCD module, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The TFT-LCD module will satisfy all requirements for compliance to UL 60950 (U.S.A. Information Technology Equipment).