AU Optronics Authorized Distributor

Specification

G104SN03 V1

Version April **2007**

Note: This specification is subject to change without prior notice

Contents

Record of Revision

Version and Date	Page	Old description	New Description
0.1 Nov 23, 2006	All	First draft specification	-
1.0 Apr 20, 2007	5	Power Consumption: 4.26W (IRCFL=5.0 mA) 3.56W (IRCFL=3.8 mA)	Power Consumption: 3.5W (IRCFL=4.5mA)
	5	Physical Size: 5.6(D) typ.	Physical Size: 5.7(D) typ.
	5	Support Color:16.8M/ 262K colors	Support Color: 16.2M/ 262K colors
	6	Response time: Falling Typ. 25	Response time: Falling Typ. 20
	6	Response time: Rising+Falling Typ. 35	Response time: Rising+Falling Typ. 30
	6	Uniformity: TBD	Uniformity: Min. 65%; Typ.75%
	11	IDD: TBD	IDD: 300 (Typ.)
	11	Irush: TBD	Irush: 1.5 (Max.)
	11	PDD: TBD	PDD: 1 (Typ.)
	11	VDDrp: TBD	VDDrp: 100 (Max.)
	12	| VID | : Min. 130; Typ. 350; Max. 450	| VID | : Min. 100; Typ. 400; Max. 600
	12	VICM: TBD	VICM: Min. 1.125; Typ. 1.25; Max. 1.375
	13	ViCFL (-20°C): TBD	ViCFL (-20°C): Typ. 1140; Max. 1430
	13	ViCFL (25°C): TBD	ViCFL (25°C): Max. 1020
	13	VCFL: Typ. 560, IRCFL=5mA	VCFL: Typ. 540, IRCFL=4.5mA
	13	PCFL: Typ. 2.52, IRCFL=5mA	PCFL: Typ. 2.43, IRCFL=4.5mA
	15	Pin no 19: AG Mode	Pin no 19: Reserved
	19	LVDS Connector Model Number: DF19G-20S-1C or compatible	L VDS Connector Model Number: DF19K-20P-1H or compatible
	19	Adaptable Plug: DF19-20S-1F or compatible	Adaptable Plug: DF19-20S-1C or compatible
	19	Lamp Connector Model Number: BHSR-02VS-1 or compatible	Lamp Connector Model Number: BHSR-02VS-1H or compatible

1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop 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) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a 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 CCFL Reflector edge. Instead, press at the far ends of the CCFL Reflector edge softly. Otherwise the TFT Module may be damaged.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12) Cold cathode fluorescent lamp in LCD contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
13) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
14) The LCD module is designed so that the CCFL in it is supplied by Limited Current Circuit (IEC60950 or UL1950). Do not connect the CCFL in Hazardous Voltage Circuit.
15) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
16) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
17) The data on this specification sheet is applicable when LCD module is placed in landscape position.
18) Continuous displaying fixed pattern may induce image sticking. It 's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

2. General Description

G104SN03 V1 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support SVGA (800(H) x 600(V)) screen and 16.8M (RGB 8-bits) or 262K colors (RGB 6-bits). All input signals are LVDS interface compatible. Inverter card of backlight is not included.

G104SN03 V1 is designed for industrial display applications.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 °C condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	10.4
Active Area	[mm]	211.2(H) x 158.4(V)
Pixels H x V		800x3(RGB) x 600
Pixel Pitch	[mm]	0.264 x 0.264
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 (typ.)
Typical Power Consumption	[Watt]	3.5W (IRCFL=4.5mA) All black pattern
Weight	[Grams]	300g(typ.)
Physical Size	[mm]	236.0(H)x 174.3(V) x 5.7(D) (typ.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M / 262K colors
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 -20 to +70 -30 to +80
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.	Note
White Luminance	[cd/m2]	IRCFL= 4.5mA (center point)	200	230	-	1
Uniformity	%	5 points	65	75	-	2
Contrast Ratio			400	500	-	3
Response Time	[msec]	Rising	-	10	20	4
	[msec]	Falling	-	20	30	
	[msec]	Rising + Falling	-	30	50	
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	60	70	-	5
	[degree]		60	70	-	
	[degree]	Vertical (Upper) CR = 10 (Lower)	45	55	-	
	[degree]		55	65	-	
Color Gamut	%			45	-	

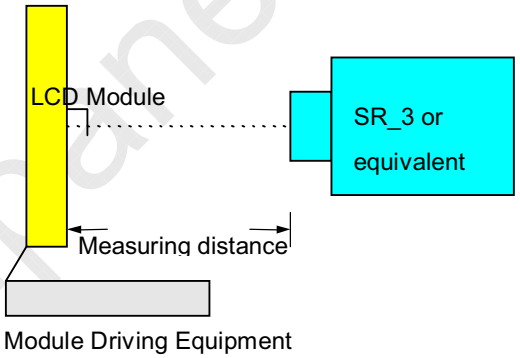
Note 1: Measurement method

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

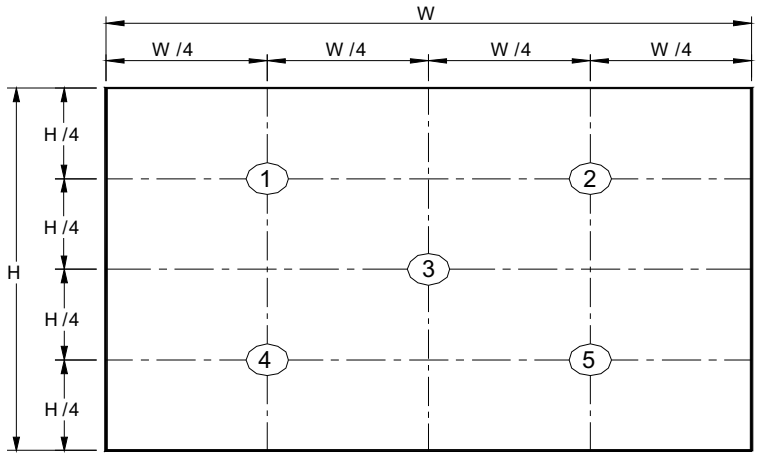
Aperture 1° with 50cm viewing distance

Test Point Center

Environment *< 1 lux*



Note 2: Definition of 5 points position (Display active area: 211.2mm (H) x 158.4mm (V))

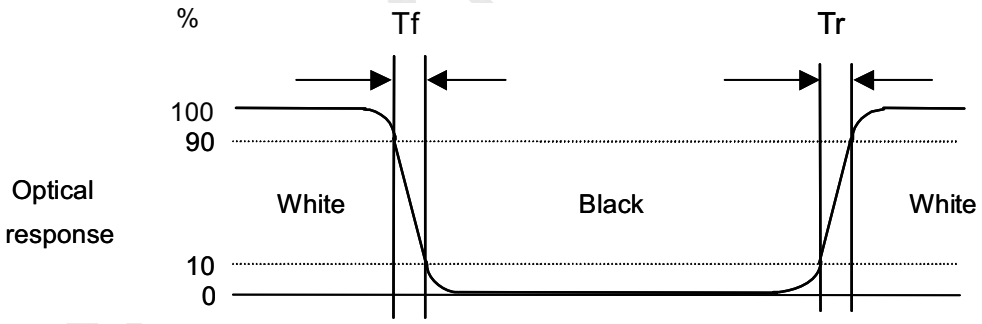


Note 3: Definition of contrast ratio (CR):

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

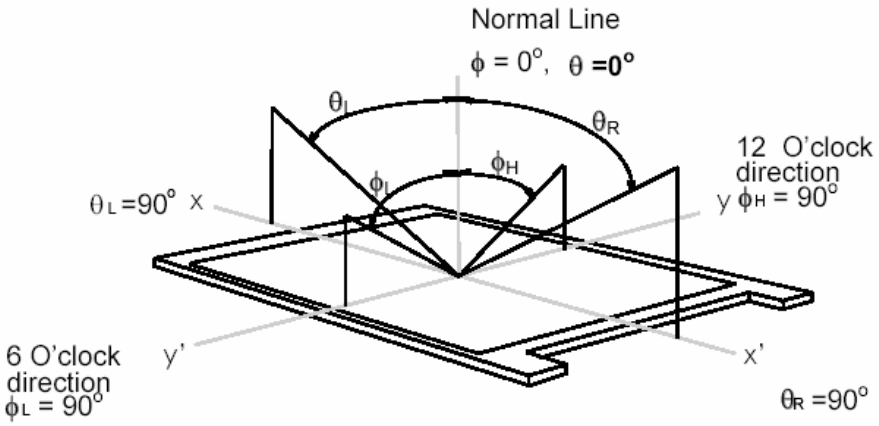
Note 4: Definition of response time:

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.



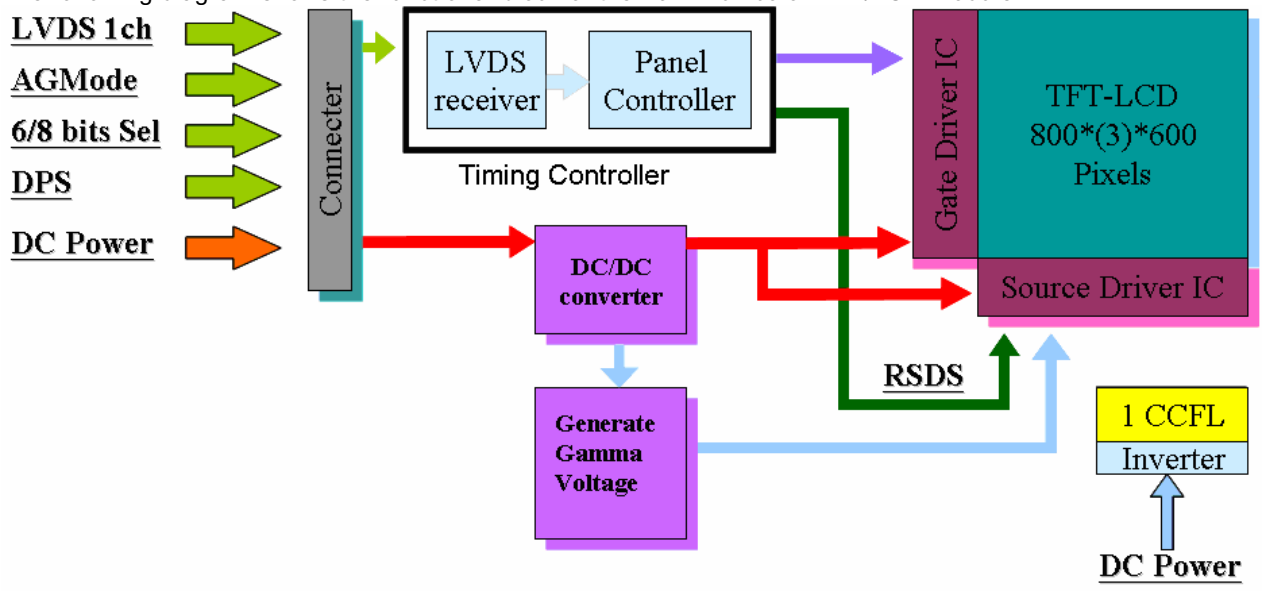
Note 5: Definition of viewing angle

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 10.4 inch 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	Vin	-0.3	+4.0	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-20	+70	[°C]
Operation Humidity	HOP	5	95	[%RH]
Storage Temperature	TST	-30	+80	[°C]
Storage Humidity	HST	5	95	[%RH]

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

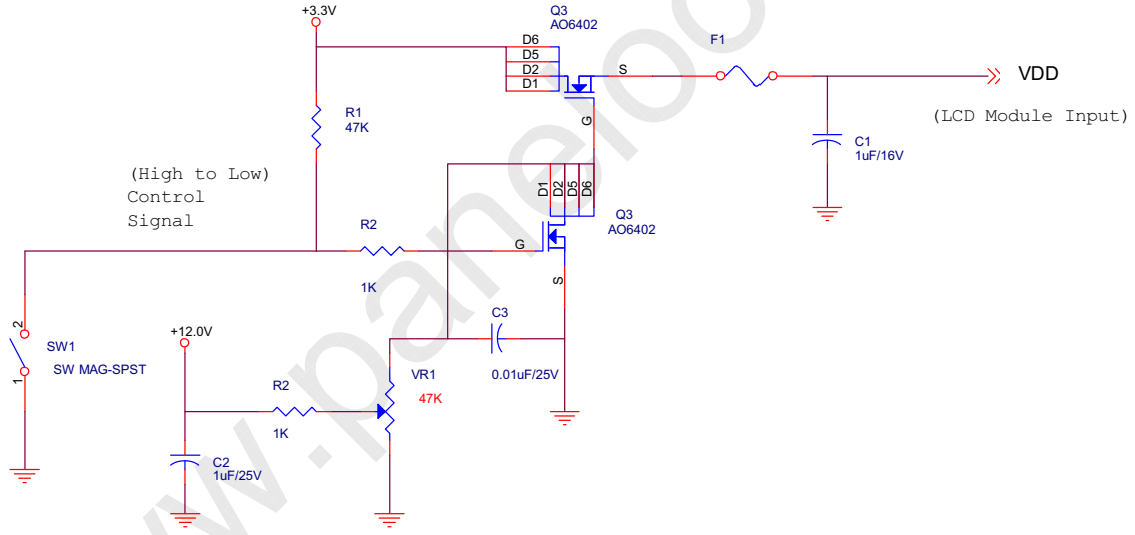
5. Electrical Characteristics

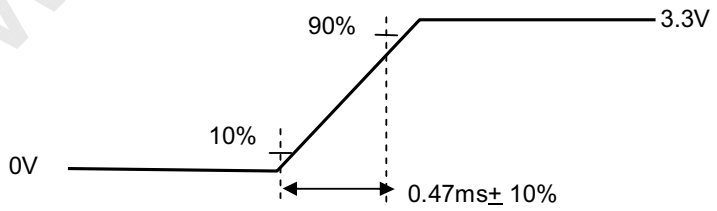
5.1 TFT LCD Module

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	-	300	-	[mA]	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	1.5	[A]	Note 1
PDD	VDD Power	-	1	-	[Watt]	All Black Pattern (VDD=3.3V, at 60Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:





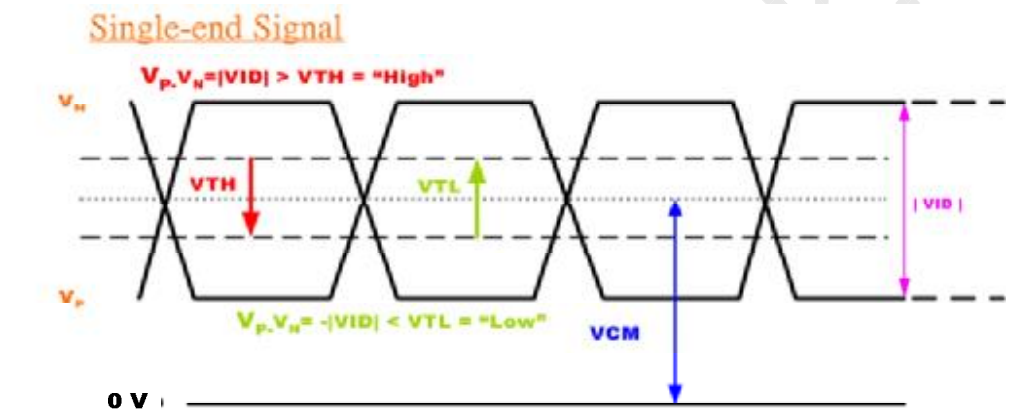
VDD rising time

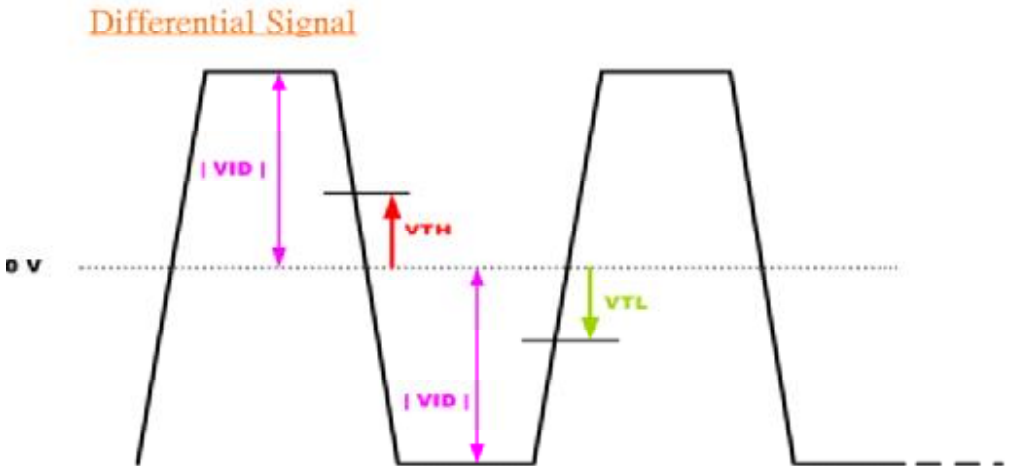
5.1.2 Signal Electrical Characteristics

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

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	100	-	-	[mV]	VCM=1.2V
| VID |	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.125	1.25	1.375	[V]	VTH/VTL=+-100mV

Note: LVDS Signal Waveform.





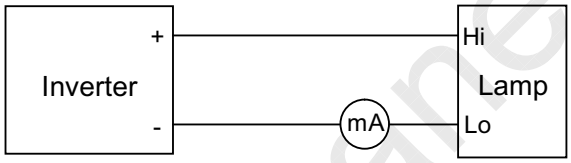
5.2 Backlight Unit

5.2.1 Parameter guideline for CCFL

Following characteristics are measured under a stable condition using an inverter at 25 ℃(Room Temperature):

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
IRCFL	CCFL operation range	3.0	4.5	5.5	[mA] rms	(Ta=25°C) Note 1, 2
FCFL	CCFL Frequency	40	60	65	[KHz]	(Ta=25°C) Note 3
ViCFL (-20°C) (reference)	CCFL Ignition Voltage	-	1140	1430	[Volt] rms	(Ta= -20°C)
ViCFL (25°C) (reference)	CCFL Ignition Voltage	-	-	1020	[Volt] rms	(Ta=25°C)
VCFL	CCFL Discharge Voltage	-	540	-	[Volt] rms	(Ta=25°C) Note 4 IRCFL=4.5mA
PCFL	CCFL Power consumption (inverter excluded)	-	2.43	-	[Watt]	(Ta=25°C) Note 4 IRCFL=4.5mA
Lamp Life			30,000		Hrs	(Ta=25°C) Note 2 IRCFL = 4.5mA

Note 1: IRCFL is defined as the return current of an inverter. (In Figure. 1)



(Figure. 1: Measurement of return current)

A stable IRCFL is a current without flicker or biasing waveform provided by inverter that ensures the backlight perform to its specification. The ideal sine waveform should be symmetric in positive and negative polarities and the asymmetry rate of the inverter waveform should be below 10%.

It is recommended to use the inverter with detection circuit to avoid overvoltage, overcurrent, or mismatching waveform. The purpose is to avoid current flow into only one of the lamps when the other one is not in operation.

Note 2: The definition of lamp life means when any of following conditions happen:

a) Luminance falls to 50% or less of the initial value.

b) Normal lighting is no more available (flickering, pink lighting, no lighting, etc.)

c) Lamp voltage or lighting start voltage exceeds the specified value.

Note 3: CCFL frequency should be carefully determined to avoid interference between inverter and TFT LCD. Higher frequency will induce higher leakage current and further impact lamp life.

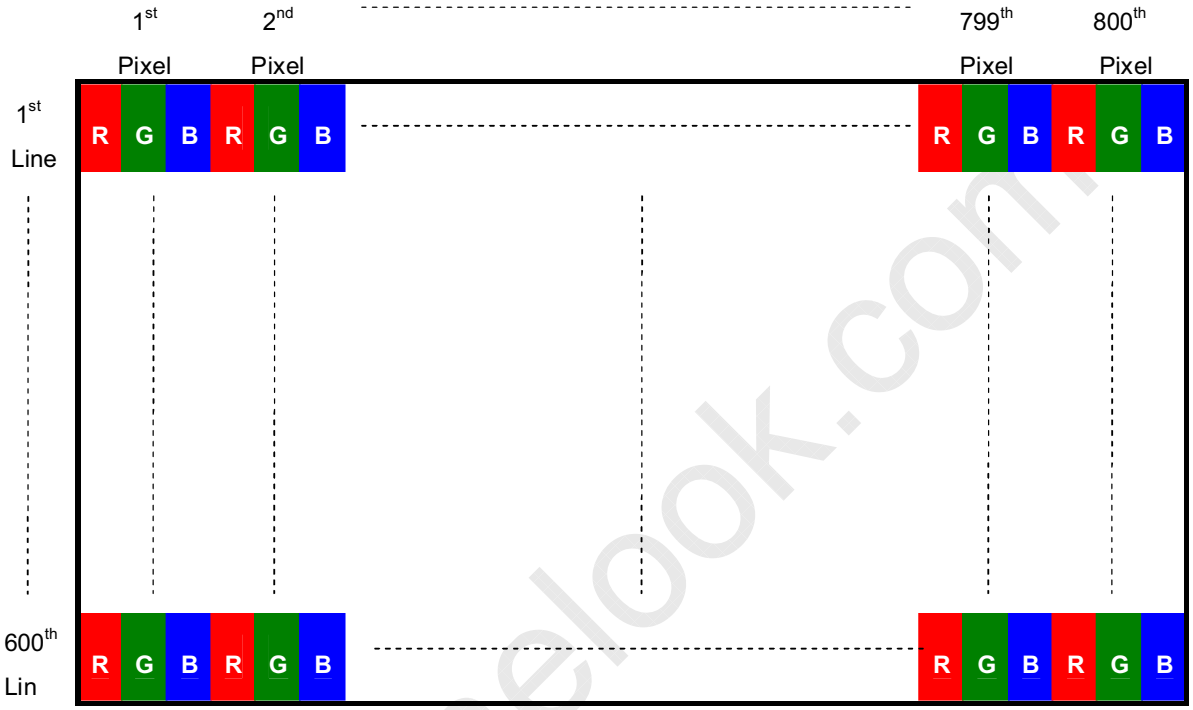
Note 4: Calculator value for reference (IRCFLxVCFLx1=PCFL).

Note 5: The display is with single lamp design, and the CCFL current in above table refers to each lamp

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.

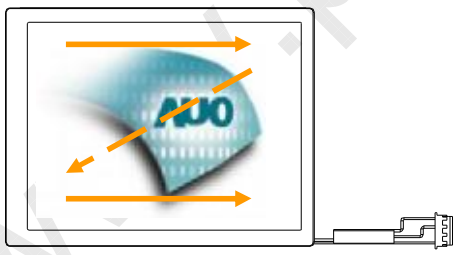


Fig. 1 Normal scan (Pin4, DPS = Low or NC)

Fig. 2 Reverse scan (Pin4, DPS = High)

6.3 Signal Description

The module uses a LVDS receiver embedded in AUO's ASIC. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

(1)Input signal interface

Pin no	Symbol	Function	Etc.
1	V_{DD}	+3.3 V power supply	
2	V_{DD}	+3.3 V power supply	
3	GND	Ground	
4	DPS	Reverse Scan Function [H: Enable; L/NC:Disable]	
5	RxIN0-	LVDS receiver signal channel 0	
6	RxIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)	
7	GND	Ground	
8	RxIN1-	LVDS receiver signal channel 1	
9	RxIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)	
10	GND	Ground	
11	RxIN2-	LVDS receiver signal channel 2	
12	RxIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)	
13	GND	Ground	
14	CKIN-	LVDS receiver signal clock	
15	CKIN+		
16	GND	Ground	
17	RxIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input	
18	RxIN3+	LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV)	
19	Reserved	Reserved for AUO internal test. Please treat it as NC.	
20	SEL68	6/8 bits LVDS input setting [H: 8 bits; L/NC:6 bits]	

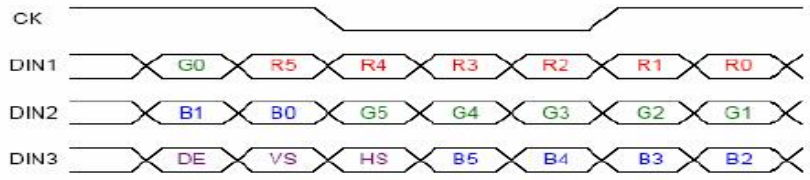
Note: 1. Input Signals shall be in low status when VDD is off.

2. NC means "No Connection".

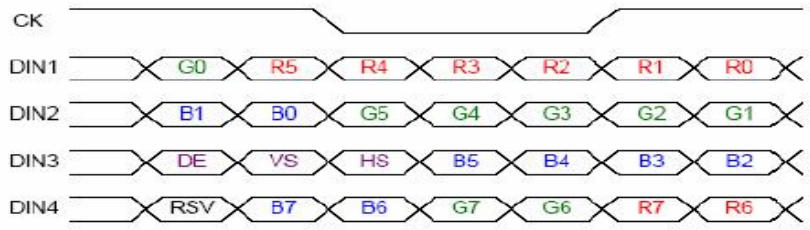
3. RSV means "Reserved".

6.4 The Input Data Format

SEL68="L" or "Floating" for 6 bits LVDS input



SEL68="H" for 8 bits LVDS input



Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0	Red-pixel Data Each red pixel's brightness data consists of these pixel data. For 8Bits LVDS input MSB: R7 ; LSB: R0 For 6Bits LVDS input MSB: R5 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0	Green-pixel Data Each green pixel's brightness data consists of these pixel data For 8Bits LVDS input MSB: G7 ; LSB: G0 For 6Bits LVDS input MSB: G5 ; LSB: G0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0	Blue-pixel Data Each blue pixel's brightness data consists of these pixel data For 8Bits LVDS input MSB: B7 ; LSB: B0 For 6Bits LVDS input MSB: B5 ; LSB: B0
CLK	Data Clock	The typical frequency is 40MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of CLK. When the signal is high, the pixel data shall be valid to be displayed.
VSYNC	Vertical Sync	The signal is synchronized to CLK.
HSYNC	Horizontal Sync	The signal is synchronized to CLK.

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.