AND-TFT-25PA-LED

480 x 234 Pixels
LCD Color Monitor

The AND-TFT-25PA-LED is a compact full color TFT LCD module, that is suitable for applications such as a camcorder, digital camera applications and other electronic products which require high quality flat panel displays. This device consists of a twisted nematic (TN) liquid crystal cell, that incorporates a TFT-array that has 480 x 234 pixels on a 2.45 inch diagonal screen, X and Y drivers, an LSI controller, and a built-in LED backlight.

Features

- Long Life LED Backlight
- Controller IC is not necessary
- Compatible with NTSC or PAL system
- High Resolution: 112,320 dots
- High Brightness
- Optimum Viewing Direction: 6 o'clock
- Up/Down and Left/Right Image Reversion
- Accepts Analog RGB input

Mechanical Characteristics

Item	Specification	Unit
Screen Size	2.45 inch (6.4 cm) diagonal	inch
Surface Treatment	Anti-Glare	–
Display Format	480 x 234	dot
Active Area	49.68 (W) x 37.44 (H)	mm
Dot Pitch	0.1035 (W) x 0.160 (H)	mm
Pixel Configuration	Delta	–
Outline Dimension	60.6 (W) x 48.4 (H) x 3.45(D)	mm
Weight	20 ± 3	g

Absolute Maximum Rating (GND = 0V, Ta = 25°C)

Item			Symbol	Absolute Maximum Rating		Unit
				Min.	Max.	
Supply Voltage	for Source Driver	Analog	AV_{DD}	-0.3	+7.0	V
		Digital	V_{DD}	-0.3	+7.0	
	for Gate Driver	Positive	V_{GH}	-0.3	+45	
		Negative	V_{GL}	-23	+0.3	
			$V_{GH} - V_{GL}$	+15	+40	
Analog Input Voltage (Note1)			V_{Video}	-0.3	+7.3	V
Operating Temperature (Note 2)			Top	0	+60	°C
Storage Temperature			Tstg	-20	+70	°C

Note 1: Analog Input Voltage means V_R, V_G, V_B

Note 2: Operating Temperature defines that contrast, response time, & other display optical characteristics are Ta=+25ºC.

Product specifications contained herein may be changed without prior notice.
It is therefore advisable to contact Purdy Electronics before proceeding with the design of equipment incorporating this product.

Power Consumption

Item		Symbol	Remarks	Specifications			Units
				Min.	Typ.	Max.	
Power Consumption	for LCD Panel	–	Note 1	–	31.82	–	mW
	for Backlight Lamp	–	Note 2	–	0.34	–	W
	TOTAL	–	–	–	0.372	–	W

Note 1: The power consumption for backlight is not included. **Note 2:** Backlight power consumption is calculated by I_L x V_L.

Electrical Characteristics - Operating Conditions

Item		Symbol	Specifications			Unit	Remarks
			Min.	Typ.	Max.		
Supply Voltage		V_{CC}	+4.5	+5.0	+5.5	V	
		V_{DD}	+3.0	+3.3	+3.6		
		AV_{DD}	+4.5	+5.0	+5.5	V	
		V_{GH}	+14.5	+15.0	+15.5	V	
		V_{EE}	-15.5	-15.0	-14.5	V	
		$V_{GL\ AC}$	–	+6.0	–	V_{P-P}	AC Component of V_{GL}
		$V_{GL\ DC}$	-12.5	-11.0	-9.5	V	DC Component of V_{GL}
Video Signal (V_B, V_R, V_G)		$V_{i\ AC}$	–	+4.0	+4.2	V_{P-P}	AC Component , Note 2
		$V_{i\ DC}$	–	+2.5	–	V	DC Component
Vcom		$V_{COM\ AC}$	–	+6.0	–	V_{P-P}	AC Component of V_{COM}
		$V_{COM\ DC}$	+0.9	+1.0	+1.1	V	DC Component of V_{COM}
	H Level	V_{IH}	+0.7 V_{DD}	–	–	V	Note 1
	L Level	V_{IL}	–	–	+0.3 V_{DD}	V	

Note 1: STH1, STH2, CPH1, CPH2, CPH3, Q2H, INH, CPV, XOE, DIO1, DIO2

Note 1: Both NTSC and PAL system Video Signal input waveform is based on 8 steps gray scale.

Optical Specifications

Item		Symbol	Conditions	Specifications			Unit
				Min.	Typ.	Max.	
Viewing Angle	Horizontal	θ		± 45	± 50	–	deg
	Vertical	θ (to 12 o'clock)	CR ≥ 10	10	15	–	
		θ (to 6 o'clock)		30	35	–	
Contrast Ratio (Note 1)		CR	At optimized viewing angle	200	350	–	
Response Time	Rise	Tr	θ = 0°	–	15	30	ms
	Fall	Tf		–	25	50	
Transmission	Ratio	T	–	7.3	7.8	8.3	%
Uniformity		U	–	65	70	–	–
Brightness (Note 2)		LUM	–	200	250	–	cd/m^2
White Chromaticity (Note 2)		X	θ = 0°	0.280	0.310	0.340	–
		Y		0.300	0.330	0.360	
LED Life Time + 25°C		–	–	1,000	5,000	–	hrs

Note 1: CR= Luminance when LCD is White / Luminance when LCD is Black

Contrast Ratio is measured in optimum common electrode voltage.

Note 2: Topcon BM-7 (fast) luminance meter 1.0° field of view is used in the testing (after 10 minutes operation.)

Current Consumption (GND = AV_{SS} = 0V, Ta=25°C)

Parameter	Symbol	Condition	Specifications			Unit	Remark
			Min.	Typ.	Max.		
Current for Driver	I_{GH}	V_{GH} = +15V	–	0.1	0.2	mA	
	I_{GL}	V_{GL} = -12V	–	0.36	0.9		V_{GL} center voltage
	I_{CC}	V_{CC} = +5V	–	0.2	0.4		
	AI_{DD}	AV_{DD} = +5V	–	3.5	5.0		
	I_{DD}	V_{DD} = +5V	–	0.6	1.5		
	I_{EE}	V_{EE}= -15V	–	0.3	0.6		

Backlight Driving for Power Consumption

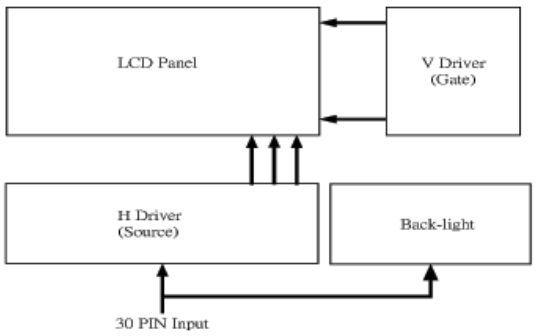
Pin No.	Symbol	Description	Remarks
29	GLED	Supply current for LED	I_L
30	VLED	Supply voltage for LED	V_L, Note 1

Note 1: Supply voltage for LED would depend on supply current.

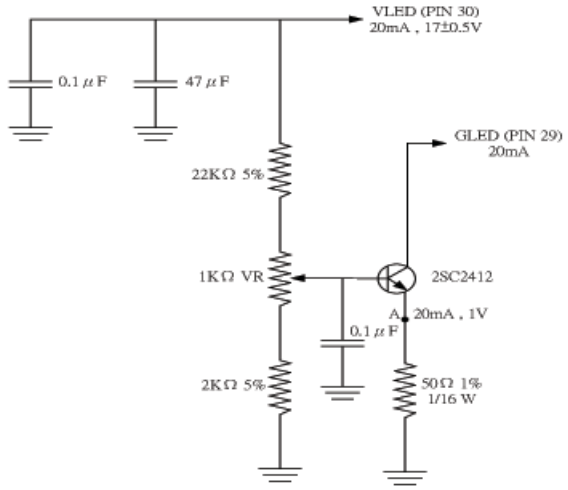
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage	V_L	–	17	–	V	I_L=20mA Ta=25° C
Supply current	I_L	–	20	–	mA	Ta=25° C

Block Diagrams

LCD Module Diagram



Backlight Driving Diagram



Input/Output Terminals

Pin No.	Symbol	Function	Input/ Output	Remarks
1	STH1	Start pulse for source driver	I/O	Note 1
2	AV_{SS}	Analog GND for source driver	I	–
3	AV_{DD}	Analog power input for source driver	I	Note 2
4	V_S	Video Input B	I	Note 4
5	V_G	Video Input G	I	
6	V_R	Video Input R	I	
7	V_{SS}	Digital GND	I	–
8	V_{DD}	Digial power input	I	Note 3
9	CPH1	Sampling and shift clock for source driver	I	–
10	CPH2	Sampling and shift clock for source driver	I	–
11	CPH3	Sampling and shift clock for source driver	I	–
12	STH2	Start pulse for source driver	I/O	Note 1
13	Q2H	Video input rotation control	I	–
14	INH	Output enable for sourec driver	I	–
15	R/L	Left/Right Control for source driver	I	Note 1
16	V_{COM}	Common electrode voltage	I	Note 4
17	XOE	Output enable for gate driver	I	–
18	CPV	Clock input for gate driver	I	–
19	U/D	Up/Down Control for gate driver	I	–
20	DIO2	Vertical start pulse	I/O	Note 5
21	DIO1	Vertical start pulse	I/O	
22	V_{GL}	Gate off voltage (alternative every 1-H0	I	Note 4
23	V_{EE}	Gate driver negative voltage	I	Note 6
24	V_{SS}	GND	I	–
25	V_{CC}	Logic power for gate driver	I	Note 3
26	V_{GH}	Gate on voltage	I	Note 7
27	NC	No connection	–	–
28	NC	No connection	–	–
29	GLED	Supply current for LED	–	Note 8
30	VLED	Supply voltage for LED	–	Note 9

Note 1: R/L, STHL and STHR mode

R/L	STH1	STH2	Remarks
High (V_{DD})	Input	Output	Left to Right
Low (0 Volt.)	Output	Input	Right to Left

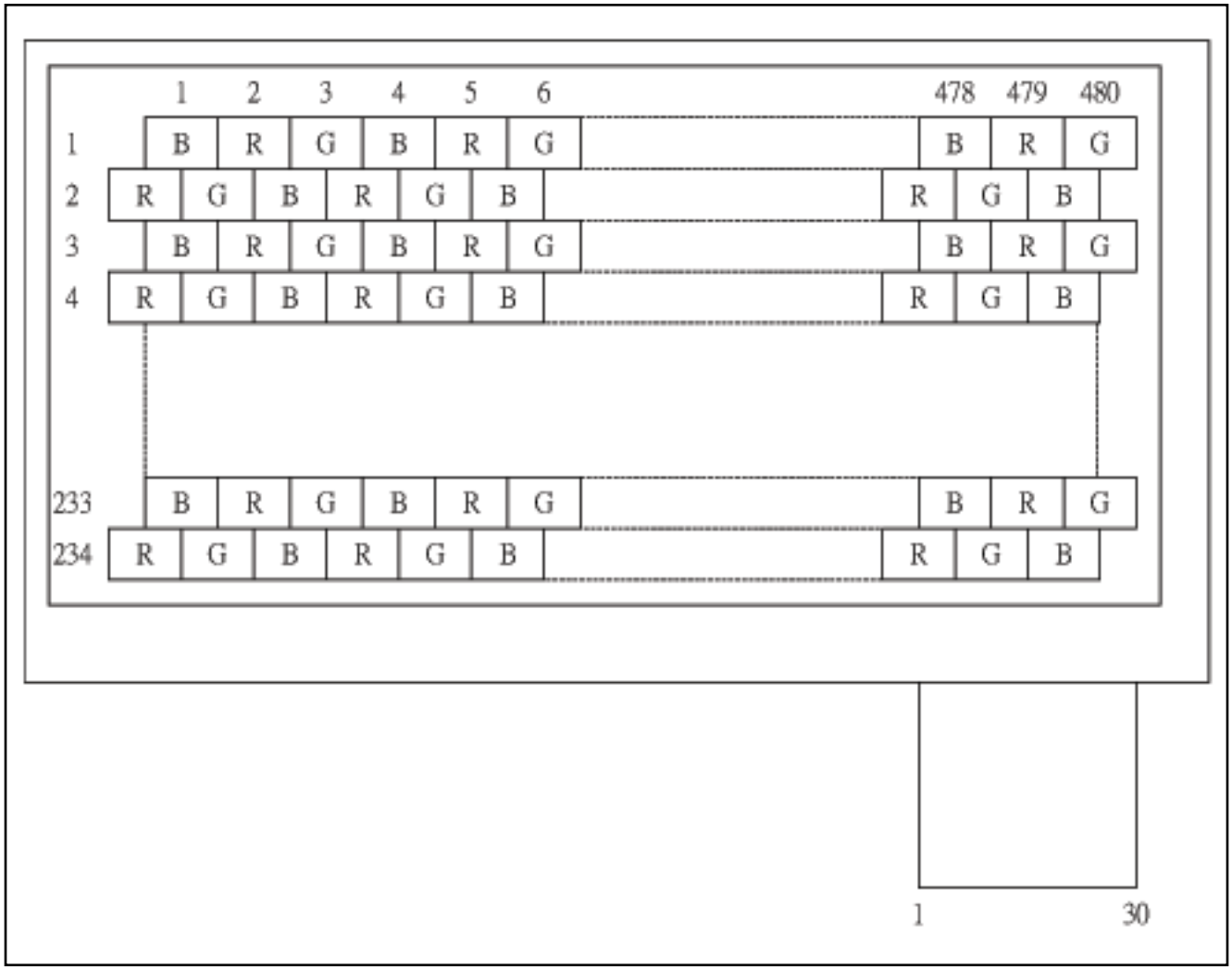
Note 2: AV_{DD} = +5V (Typ.)
Note 3: V_{DD}, V_{CC} = +5V (Typ.)
Note 4: $V_{COM} = 6V_{PP}$

Note 5: DIO1, DIO2 and U/D mode

U/D	DIO1	DIO2	Remarks
Hiigh (VDD)	Input	Output	Down to Up
Low (0 Volt.)	Output	Input	Up to Down

Note 6: V_{EE} = -15V (Typ.)
Note 7: V_{GH} = +15V (Typ.)
Note 8: G_{LED} = 20 mA (Typ.)
Note 9: V_{LED} = +17V (Typ.)

Pixel Arrangement and input connector pin NO.



Input / Output Connector

LCD Module Connector, FFC Down Connector, 30 pins, Pitch: 0.5 mm

Timing Characteristics of Input Signals

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Remarks
1 Field Scanning Period	t1V	–	262.5	–	H	
1 Line Scanning Period	t1H	–	63.5	–	μs	
Source Driver Operating Frequency	fhc	1.0	3.14	5.0	MHz	
Signal Sampling Pulse Width	tchw	200	317.7	1000	ns	
Signal Sampling Pulse Delay	tchd	95.3	105.9	116.5	ns	tchd 12, 23
Signal Sampling Pulse Width (H)	tchwh	142.9	158.8	174.7	ns	
Signal Sampling Pulse Delay (L)	tchwl	142.9	158.8	174.7	ns	
Source Start Signal Pulse Width	tshw	90	317.7	630*	ns	*tshset = tshhld
Source Start Signal Setup Time	tshset	20	158.8	–	ns	
Source Start Signal Hold Time	tshhld	20	158.8	–	ns	
Source Output Enable Pulse Width	tohw	1.0	2.0	–	μs	
Source STart Signal Rising TIme	tss	–	9.8	–	μs	
Video Input Signal Start Point	tvs	–	10.0	–	μs	
Phase Difference Between OEH & CPV	toc	1.5	2.3	–	μs	
Gate Clock Period	tcvw	10	63.5	–	μs	
Gate Clock Pulse Width (H)	tcvwh	10	31.7	48	μs	
Gate Clock Pulse Width (L)	tcvwl	10	31.7	48	μs	
Gate Start Signal PulselWidth	tsvw	5	63.5	126**	μs	**tsvset = tsvhld
Gate Start Signal Setup Time	tsvset	5	53.2	–	μs	
Gate Start Signal Hold Time	tsvhld	5	10.3	–	μs	
Phase Difference Between OEH & STH	tosp	–	4	–	μs	
Phase Difference Between SYNC & OEH	tohs	–	1.4	–	μs	
Gate Output Enable Pulse Width	toev	–	2.5	–	μs	
V_{COM} Delay Time	t_{DCOM}	–	–	3	μs	
RGB Delay Time	t_{DRGB}	–	–	2	μs	
Vertical Display Start	tsv	–	3	–	tH	

Dimensional Outline