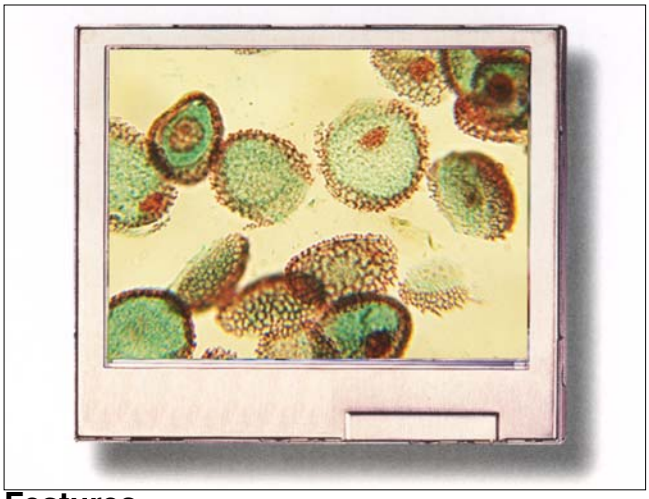

AND-TFT-25PA-KIT

160 x 234 Pixels
LCD Color Monitor

The AND-TFT-25PA-KIT is a compact full color TFT LCD module, that is suitable for applications such as a portable television (NTSC), camcorder, digital cameral 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 160 x 234 pixels on a 2.5 inch diagonal screen, X and Y drivers, an LSI controller, and a built-in CCFL backlight.

Features

- Controller IC is not necessary
- Compatible with NTSC or PAL system
- High Resolution: 160 x 234
- High Brightness
- Optimum Viewing Direction: 6 o'clock
- Up/Down and Left/Right Image Reversion
- Accepts Analog RGB input
- Requires external chroma decoder to accept composite video card

Mechanical Characteristics

Item	Specification	Unit
Screen Size	2.5 inch (6.4 cm) diagonal	inch
Outline Dimensions	61.6 (H) x 49.3 (V) x 5.9 (D)	mm
Active Area	50..21 (H) x 37.67 (V)	mm
Input Signal	NTSC/PAL	–
Sub Pixel No.	160 (H) x 234 (V)	–
Sub Pixel Arrangement	Delta	–
Dot Pitch	0.105 (H) x 0.161 (V)	mm
Weight	28 ± 3	g

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

Item			Symbol	Conditions	Absolute Maximum Rating		Unit
					Min.	Max.	
Supply Voltage	for Source Driver	Analog	V_{DD}	Ta = 25°C	-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 (V_B, V_R, V_G)			V_{VIDEO}		-0.3	+7.3	V
Operating Temperature (note 1)			Top	–	0	+60	°C
Storage Temperature			Tstg	–	-20	+70	°C
Humidity (No condensation of water)			–	+60°C	–	95%	RH

note 1: Operating Temperature defines that conrast, response time, other display optical characteristics are Ta=+25.

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	Conditions	Specifications			Units
				Min.	Typ.	Max.	
Power Consumption	for LCD Panel	–	–	–	18.5	–	mW
	for Backlight Lamp	–	–	–	0.71	–	W
	TOTAL	–	–	–	0.73	–	W

(Ta = RT, VSS = 0V)

Recommended Operating Conditions

Item		Symbol	Specifications			Unit	Remarks
			Min.	Typ.	Max.		
Supply Voltage		V_{CC}, V_{DD}	+4.5	+5.0	+5.5	V	
		AV_{DD}	+4.5	+5.0	+5.5	V	
		V_{GH}	+14.5	+15.0	+15.5	V	
		V_{EE}	-14.5	-15.0	-15.5	V	
		$V_{GL\ AC}$	–	+6.0	–	V_{P-P}	AC Component of V_{GL}
		$V_{GL\ DC}$	-11.5	-12.0	-12.5	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
		$V_{i\ DC}$	–	+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

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		CR	At optimized viewing angle	110	150	–	
Response Time	Rise	Tr	θ = 0°	–	15	30	ms
	Fall	Tf	ϕ = 0°	–	25	50	
Transmission	Ratio	T	–	7.5	8.0	8.5	%
Uniformity		U	–	65	70	–	ms
Brightness		LUM	–	200	250	–	cd/m^2
White Chromaticity		X	θ = 0°	0.260	0.310	0.360	–
		Y		0.280	0.330	0.380	
		Tc		6650	6850	7050	
Lamp Life	+ 25°C	–	–	10,000	–	–	hr

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

Contrast Ratio is measured in optimum common electrode voltage.

Current Consumption (GND = AV_{SS} = 0V)

Parameter	Symbol	Condition	Specifications			Unit	Remark
			Min.	Typ.	Max.		
Current for Driver	I_{GH}	V_{GH} = +15V	–	0.026	0.03	mA	
	I_{GL}	V_{GL} = -12V	–	0.35	0.4		V_{GL} center voltage
	I_{CC}	V_{CC} = +5V	–	0.1	0.15		
	AI_{DD}	AV_{DD} = +5V	–	1.73	1.83		
	I_{DD}	V_{DD} = +5V	–	0.66	0.7		
	I_{EE}	V_{EE} = -15V	–	0.1	0.15		

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 Width (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	
Souce 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 Pulse Width	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	
Gaite 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	

Interface Pin Assignment

Pin No.	Symbol	Function	Input/Output	Remarks
1	STH1	Start pulse for source driver	Input/Output	Note 1
2	AV_{SS}	Analog GND for source driver	Input	
3	AV_{DD}	Analog power input for source driver	Input	AV_{DD} = +5V (typ.)
4	V_B	Video input B	Input	$V_{COM} = 6V_{PP}$
5	V_G	Video input G	Input	
6	V_R	Video input R	Input	
7	V_{SS}	Digital GND	Input	
8	V_{DD}	Digital power input	Input	V_{DD}, V_{CC} = +5V (typ.)
9	CPH1	Sampling & shift clock for source driver	Input	
10	CPH2	Sampling & shift clock for source driver	Input	
11	CPH3	Sampling & shift clock for source driver	Input	
12	STH2	Start pulse for source driver	Input/Output	Note 1
13	Q2H	Video input rotation control	Input	
14	INH	Output enable for source driver	Input	
15	R/L	Left/Right control for source driver	Input	Note 1
16	V_{COM}	Common electrode voltage	Input	$V_{COM} = 6V_{PP}$
17	V_{COM}	Common electrode voltage	Input	
18	XOE	Output enable for gate driver	Input	
19	CPV	Clock input for gate driver	Input	
20	U/D	Up/Down control for gate driver	Input	
21	DIO2	Vertical start pulse	Input/Output	Note 2
22	DIO1	Vertical start pulse	Input/Output	
23	V_{GL}	Gate off voltage (alternative every 1-H)	Input	$V_{COM} = 6V_{PP}$
24	V_{EE}	Gate driver negative voltage	Input	V_{EE} = -15V (typ.)
25	V_{SS}	GND	Input	
26	V_{CC}	Logic power for gate driver	Input	V_{DD}, V_{CC} = +5V (typ.)
27	V_{GH}	Gate on voltage	Input	V_{GH} = +15V (typ.)
28	NC	No Connection	–	–

Note 1: R/L, STH1 and STH2 mode

R/L	STH1	STH2	Remarks
High (VDD)	Input	Output	Left to Right
Low (0 Volt)	Output	Input	Right to Left

Note 2: 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

Dimensional Outline

General mechanical tolerance = 0.5mm