AND-TFT-25XS-LED-KIT

160 x 234 Pixels
LCD Color Monitor

The AND-TFT-25XS-LED-KIT is a compact full color TFT LCD module, that is suitable for applications such as a camcorder, digital camera application and other electronics 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 2.45 inch diagonal screen, X and Y drivers, an LSI controller, and a built-in LED backlight.

Features

- Long Life LED Backlight
- Ultra Compact
- Compatible with NTSC or PAL system
- DC/DC, LED Driver, Video Decoder all in one
- High Resolution: 112,320 dots
- Optimum Viewing Direction: 6 o'clock
- Up/Down and Left/Right Image Reversion
- Accepts Analog RGB input
- Applications: camcorder, digital camera applications

Mechanical Characteristics

Item	Specification	Unit
Screen Size	2.45 inch (6.4 cm) diagonal	inch
Display Format	160 x 234	dot
Active Area	49.68 (W) x 37.44 (H)	mm
Dot Pitch	0.1025 (W) x 0.163 (H)	mm
Pixel Configuration	Delta	–
Outline Dimension	60.6 (W) x 48.4 (H) x 3.45(D)	mm
Weight	20 ± 3	g
Surface Treatment	Anti-Glare	–
Birghtness	250	cd/m^2

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

Item		Symbol	Absolute Maximum Rating		Unit	Remarks
			Min.	Max.		
Supply Voltage for Source Driver	Analog	AV_{DD}	-0.3	+7.0	V	
	Digital	V_{DD}	-0.3	+7.0	V	
Supply Voltage for Gate Driver	Positive	V_{GH}	-0.3	+45	V	
	Negative	V_{GL}	-23	+0.3	V	
		V_{GH} - V_{GL}	+15	+40	V	
Operating Temperature		–	0	+60	ºC	Note 2
Storage Temperature		–	-20	+70	°C	
Analog input voltage		V_{Video}	-0.3	+7.3	V	Note 1

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

Note 2: Operating Temperature define that contrast, response time, other display optical character are Ta=+25.

Electrical Characteristics - Recommended Operating Conditions

Item		Symbol	Specifications			Unit	Remarks
			Min.	Typ.	Max.		
Power Supply		V_{CC}	+4.5	+5.0	+5.5	V	
		V_{DD}	+3.0	+3.3	+3.6	V	
		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_R, V_G, V_B)		$V_{I\ AC}$	–	+4.0	+4.2	V	AC Component Note 2
		$V_{I\ DC}$	–	+2.5	–	V	DC Component
V_{COM}		$V_{COM\ AC}$	–	+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 2: Both NTSC and PAL system Video Signal input waveform is based on 8 steps gray scale.

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

Item	Symbol	Condition	Specifications			Unit	Remarks
			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	mA	V_{GL} center voltage
	I_{CC}	V_{CC}=+5V	–	0.2	0.4	mA	
	AI_{DD}	AV_{DD}=+5V	–	3.5	5.0	mA	
	I_{DD}	V_{DD}=+5V	–	0.6	1.5	mA	
	I_{EE}	V_{EE}=-15V	–	0.3	0.6	mA	

Note: Ta = 25° C

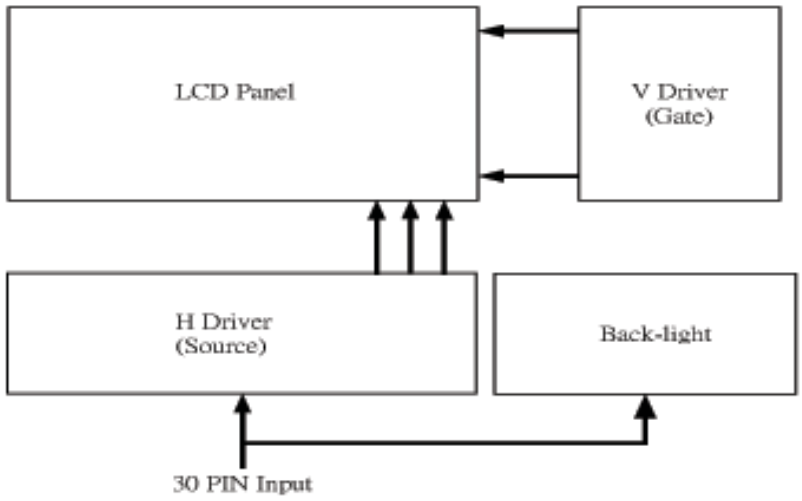
Backlight Driving & Power Consumption

Pin No.	Symbol	Description	Remark
29	GLED	Supply Current for LED	I_L
30	VLED	Supply voltage for LED	V_L; Note 3

Note 3: Supply voltage for LED would depend on supply current.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply Voltage	V_L	–	17	–	V	I_L = 20 mA
Supply Current	I_L	–	20	–	mA	

Block Diagrams



Power Consumption

Item	Symbol	Typ.	Unit	Remark
LCD Panel Power Consumption	–	31.82	mW	Note 5
Backlight Lamp Power Consumption	–	0.34	W	Note 6
Total Power Consumption	–	0.372	W	–

Note 5: The power consumption for backlight is not included
Note 6: Backlight power consumption is calculated by I_L x V_L.

Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle	Horizontal	θ	CR≥ 10	± 45	± 50	–	deg
	Vertical	θ (to 12 o'clock)		10	15	–	deg
		θ (to 6 o'clock)		30	35	–	deg
Contrast Ratio		CR	At optimized viewing angle	200	350	–	–
Response Time	Rise	T_r	θ = 0°	–	15	30	–
	Fall	T_f		–	25	50	ms
Transmission Ratio		T		7.3	7.8	8.3	%
Uniformity		U		65	70	–	
Brightness				200	250		cd/m^2
White Chromaticity		X	θ = 0°	0.280	0.310	0..340	
		Y		0.300	0.330	0.360	
		–		1000	5000		hrs

Note 5: The power consumption for backlight is not included
Note 6: Backlight power consumption is calculated by I_L x V_L.

Pin Description: J201 LCD Panel Input/Output Terminals

Pin No.	Symbol	Function	Input/Output	Remarks
1	STH1	Start pulse for source driver	I/O	Note 1
2	AV_{SS1}	Analog GND for source driver	I	
3	AV_{DD}	Analog power input for source driver	I	Note 2
4	V_B	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-H)	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: STH1, STH2 and R/L mode

R/L	STH1	STH2	Remarks
High (VDD)	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

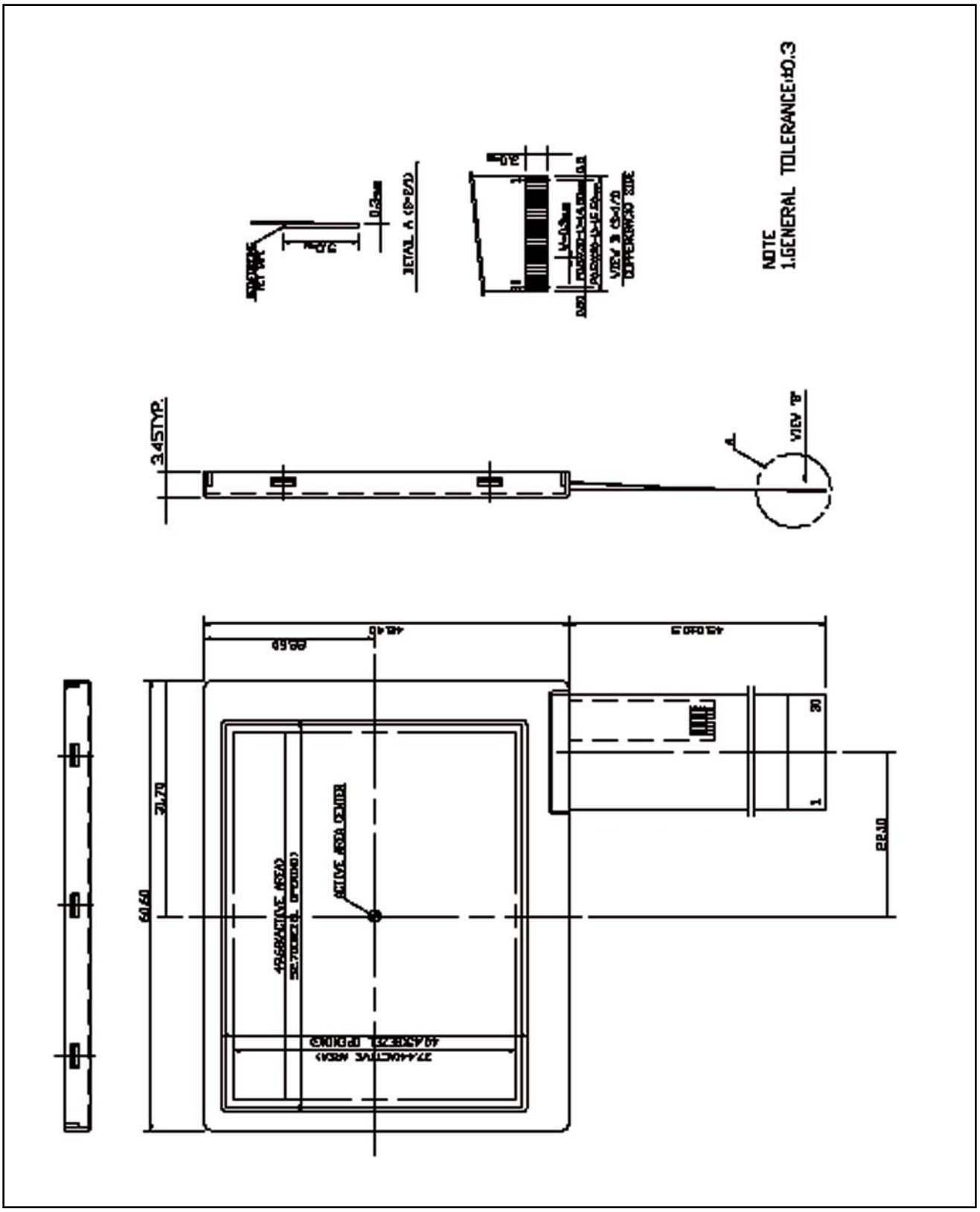
U/D	DIO1	DIO2	Remarks
High (VDD)	Input	Output	Down to Up
Low (O Volt.)	Output	Input	Up to Down

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

Input/Output Connector, LCD Module Connector, FFC Down Connector, 30 pins Pitch: 0.5 mm
Timing Characteristics of Input SIgnal

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 Samplin Pulse Delay (L)	tchwl	14.29	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 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	tsvhold	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



PC-TFT-25XS

Interface Board

Features

- Used for TFT-LCD display: 2.5" AND-TFT-25XS-LED
- Compatible with NTSC or PAL system
- High Resolution: 112,320 dots
- Optimum Viewing Direction: 6 o'clock
- Up/Down and Left/Right Image Reversion

The PC-TFT-25XS is designed to work with the AND-TFT-25XS-LED color TFT display which is suitable for camcorders, digital camera applications and other electronic products which require high quality flat panel displays.

Mechanical Characteristics

Item	Specification	Unit
Screen Size	2.45 (diagonal)	inch
Surface Treatment	Anti-Glare	–
Display Format	160 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	Stripe	–
Outline Dimension	60.6 (W) x 48.4 (H) x 3.45 (D)	mm
Weight	20 ± 3	g
Contrast Ratio	350:1	
View Angle	(V) +15 ºC / -35ºC (H) ± 50ºC	
Color	Full Color	
Brightness	250	cd/m2

Please refer to data sheet for AND-TFT-25PXS-LED for more details on panel information.

Absolute Maximum Rating

Item	Symbol	Specifications		Unit	Remarks
		Min.	Max.		
Input Voltage	Vin	+8	+16	V	
Input Voltage	Vin	+4	+6	V	
Video Input Signal	Video in	0.5	2.0	Vp-p	Note 1
Digital Input Signal	TTL	+0.3	+5.3	V	
Operating Temperature		-10	60	ºC	
Relative Humidity		5	90	%RH	
Storage Temperature		-25	80	ºC	
Relative Humidity		0	90	%RH	
Supply Voltage	V_L	–	13.2	V	IL=20mA
Supply Current	I_L	–	20	mA	

Note 1: @ 75 Ω

Electrical Characteristics - Operating Conditions

Item	Symbol	I/O	Specifications			Unit	Remarks
			Min.	Typ.	Max.		
Input Voltage	Vin	I	+10	+12	+14	V	
Total Current	Iin	I		153		mA	
Power Consumption		I		1.84		W	@+12V
Input Voltage	Vin	I	+4	+5	+6	V	
Total Current	Iin	I		300		mA	
Power Consumption		I		1.5		W	@+5V
Video Input Signal	Video in	I		-1.0		Vp-p	@ 75 Ω
Output Voltage	+5V	O	–	+5V		V	
Brightness Adjust	Bright	I	+1.13	+1.3	+1.43	V	
Contrast Adjust	Contrast	I	+2.10	+2.57	+2.98	V	
Color Adjust	Color	I	+2.26	+2.72	+3.59	V	
Tint Adjust	Tint (NTSC only)	I	+1.5	+3.09	+4.6	V	
Viedo Auto Detect	NTSC/PAL	O	–	TTL		V	

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

Item	White Window	Red	Green	Blue	Remark
S/N: 001 x	0.307	0.558	0.340	0.161	
y	0.326	0.349	0.541	0.128	
L	300 (cd/m^2)	–	–	–	± 15%
TC	8650(°K)	–	–	–	

Note 1. Luminance: BM-7 FAST (TOPCON)
Note 2. Pattern Generator: FLUKE PM54200
Note 3. Measurement Distance: 500mm ± 500mm
Note 4. TOPCON BM-7 Luminance Meter 2° field of view is used in the testing (After 10 min ~ 20 min Operation)

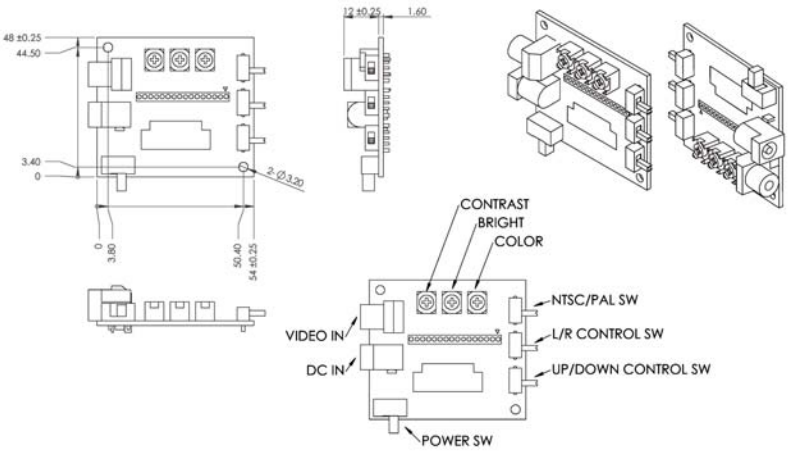
LED Driver Data: Ta - 25°C @+5V

Item	Symbol	Specifications		Unit	Remark
		Min.	Typ.		
Supply voltage of LED backlight	V_L	–	13.8	V	I_L = 23.3 mA
Supply current of LED backlight	I_L	–	23.3	mA	

Terminal Pin Assignment

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

2535 Demo Board

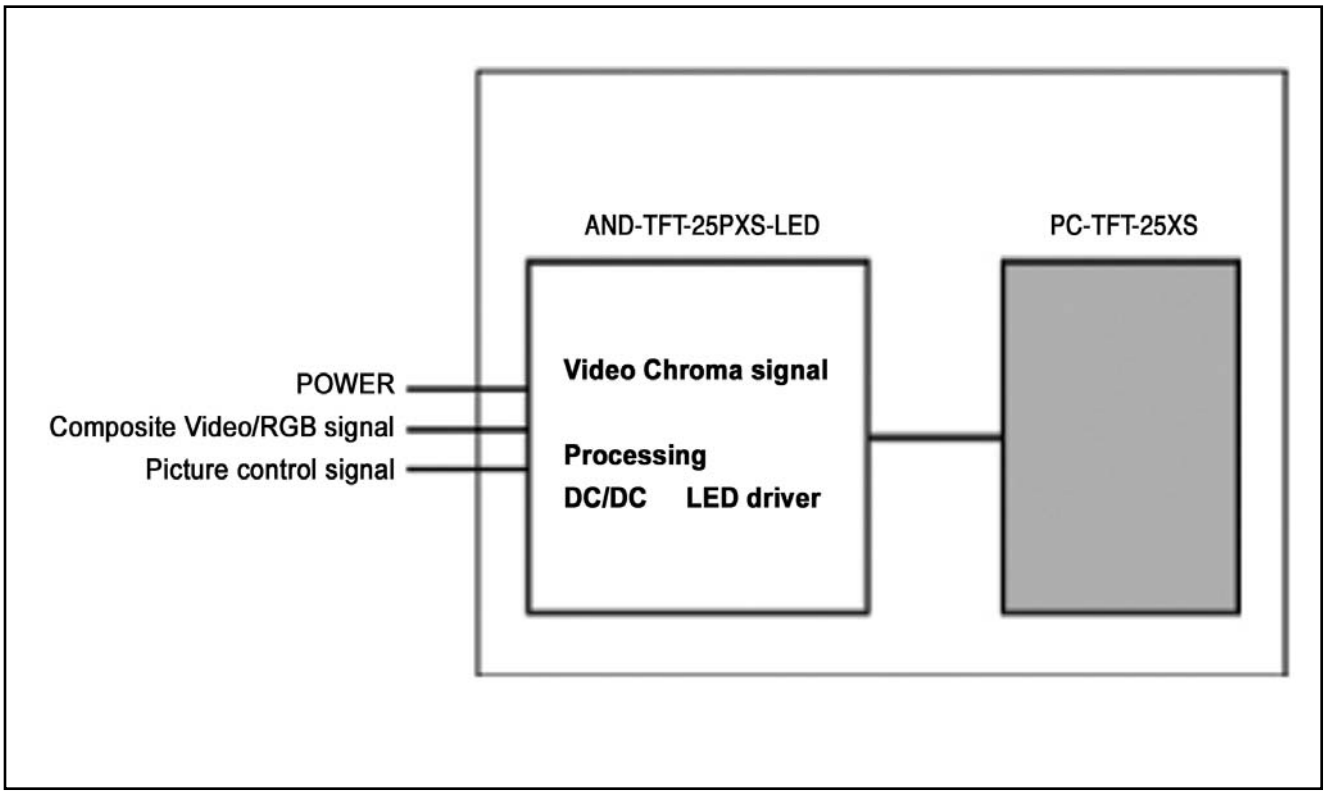


J301: Pin Assignment of SIgnal Input (Pitch 1.25 mm 15P, Side Entry Type)

Pin No.	Symbol	I/O	Description	Remarks
1	Vin	I	+12 V Voltage Power supply	
2	GND	–	Power Ground	
3	GND	–	Power Ground	
4	GND	–	Signal Ground	
5	Video-IN	I	Video input (1Vp-p/75 Ω)	
6	+5V	O	Voltage DC Output	Note 1
7	Bright	I	Brightness control	
8	Contrast	I	Contrast control	
9	Color	I	Color control	
10	Tint	I	Tint control	Note 2
11	NTSC/PAL	O	Systemm Auto detect output	Note 3
12	LRC	I	Screen Left / Right reverse	Note 4
13	UDC	I	Screen Up / Down reverse	Note 4
14	Dimmer	I	Backlight brightness control	
15	Enable	I	Backlight On/Off	Note 5

Note 1: The +5V power supply external control circuit. (Max. output is 10mA)
Note 2: The TINT is only operating in NTSC system.
Note 3: The output High level for NTSC mode and Low level for PAL mode.
Note 4: Default +5V or floating is normal scanning and 0V is for reversed scanning.
Note 5: The floating or 0V is backlight on and 5V is backlight off.

Block Dlagram



Application Circuit