



Typical Design



# Industrial Solutions Flatpanel Technology

## DESIGN FOR TFT COLOR LCD MODULE

Design No.	dah256_121
Revision	Rev. 1.1
Type	12,1" 800 x 600
Specification	
Version	Internal Revision 1.0
Date	28.11.2007
Preliminary <input checked="" type="checkbox"/>	
Final <input type="checkbox"/>	

This typical design can be used to manufacture dedicated products at i-sft according to the mentioned specification without additional NRE cost. Please send us a RFQ for this design and stating the number of displays to be build. We will send a formal quote including a final specification. With your formal order please also send a written approval of the final specification. No further activities will start before formal order is processed and written approval of final specification is in!



Typical Design

# Liquid Crystal Display Design

I-SFT dah256\_121



Revision	Date	Description
0.1	14.12.06	pre series / prototype
1.1	28.11.07	first draft



<b>1</b>	<b>DESCRIPTION.....</b>	<b>4</b>
<b>2</b>	<b>FEATURES.....</b>	<b>4</b>
<b>3</b>	<b>APPLICATIONS.....</b>	<b>4</b>
<b>4</b>	<b>STRUCTURE AND FUNCTIONS.....</b>	<b>5</b>
<b>5</b>	<b>OUTLINE OF CHARACTERISTICS.....</b>	<b>6</b>
<b>6</b>	<b>RESOLUTION.....</b>	<b>7</b>
<b>7</b>	<b>SPECIFICATIONS .....</b>	<b>8</b>
	7-1 GENERAL SPECIFICATIONS.....	8
	7-2 ABSOLUTE MAXIMUM RATINGS.....	8
	7-3 CONNECTORS .....	9
	7-4 ELECTRICAL CHARACTERISTICS .....	9
	7-5 OPTICAL CHARACTERISTICS.....	10
	7-6 OUTLINE DIMENSIONS.....	13
	7-7 MEASUREMENTS .....	14
	7-8 RELIABILITY .....	15
	7-9 DEFECT SPECIFICATIONS.....	15
<b>8.</b>	<b>GENERAL PRECAUTIONS.....</b>	<b>18</b>
	8-1 HANDLING.....	18
	8-2 STORAGE.....	18
	8-3 OPERATION .....	19
	8-4 OTHERS .....	19



Typical Design



## 1 DESCRIPTION

**I-SFT dah256\_121** is a custom specific development based module and is not available on the open market.

**I-SFT dah256\_121** is a TFT (thin film transistor) active matrix color liquid crystal display (LCD) comprising amorphous silicon TFT attached to each signal electrode, a driving circuit.

**I-SFT dah256\_121** is an **i-sft** GmbH in-house design consisting of:

- a. **i-sft** specific third party manufactured LCD-Glass-Matrix (NOT available in retail).
- b. **i-sft** customized backlight emitting a display surface brightness typ. 1200 nits.
- c. **i-sft** custom made integrated e<sup>3</sup> driver to control the backlight.

The 12.1 inch diagonal display area contains 800x600 pixels and can display 262,144 colors.

## 2 FEATURES

12.1" SVGA for Highbright Applications

DVI interface system

Long life lamp system

Color temperature 9000K

## 3 APPLICATIONS

The **I-SFT** D-sh256 Display is an open frame device with accessible hazardous voltage.

The display must be installed in a limited access compartment that is accessible only by the use of a tool.



Typical Design



## 4 STRUCTURE AND FUNCTIONS

A TFT color LCD module comprises a TFT LCD panel, LSIs for driving liquid crystal. The TFT LCD panel is composed of a TFT array glass substrate superimposed on a color filter glass substrate with liquid crystal filled in the narrow gap between two substrates.

RGB (Red, Green, Blue) data signals are sent to LCD panel drivers after modulation into suitable forms for active matrix addressing through signal processor.

Each of the liquid crystal cells acts as an electro-optical switch that controls the incident light transmission by a signal applied to a signal electrode through the TFT switch.

The user interface is usual DVI-I (VGA and Digital Video Interface). The i-sft converter card is designed to convert the input signals to high quality digital flat panel output signals. The integrated auto-sampling feature scale the input signals automatically to the flat panel resolution, in this case to 800x600 pixel. The sophisticated auto-tracking and auto-phasing logic adjust the input picture automatically to the flat panel resolution and timing, no manual picture positioning adjustment is necessary.



Typical Design



## 5 OUTLINE OF CHARACTERISTICS

Display area	246.0 mm(H) × 184.5 mm(V)
Drive system	a-Si TFT active matrix
Display colors	262,144 colors
Number of pixels	800 × 600
Pixel arrangement	RGB, vertical stripe
Pixel pitch	0.3075 mm(H) × 0.3075 mm(V)
Module size	308 mm(H) × 213.2 mm(V) × 61.8 mm(D)
Weight	2050 g (typ.)
Luminance	1200 cd/m <sup>2</sup> (typ.)
Contrast ratio	600:1 (typ.)
Response time	15 ms (typ.), "white" to "black" *) 30 ms (typ.), "black" to "white" *)
Signal system	DVI - I
Supply voltage	25 VDC for integrated Inverter 12 VDC for integrated controller

\*) in according on specification of the Sharp LQ121S1LG41



Typical Design



## 6 RESOLUTION

Resolution	Hz	
640 x 480	60	
640 x 480	67	(1)
640 x 480	72	(1)
640 x 480	75	(1)
720 x 400	70	(1)
720 x 400	88	(1)
800 x 600	56	phys. resolution (1)
800 x 600	60	phys. resolution
800 x 600	72	phys. resolution (1)
800 x 600	75	phys. resolution (1)
1024 x 768	60	
1024 x 768	70	(1)
1024 x 768	75	(1)
1024 x 768	75	(1)

(1) moiré possible

The integrated DVI controller has a DDC module for the recognition of the automatic Plug+Play function.

For other resolutions the display has auto-scaling.



Typical Design



## 7 SPECIFICATIONS

### 7-1 GENERAL SPECIFICATIONS

Item	Specifications	Unit
Module size	213.2 (H) × 308 (V) × 61.8 (D)	mm
Display area	249 (H) × 187.5 (V)*)	mm
Number of pixels	800×3 (H) × 600 (V)*)	pixel
Dot pitch	03075. (H) × 0.1025 (V)*)	mm
Pixel pitch	0.3075 (H) × 0.3075 (V)*)	mm
Pixel arrangement	RGB (Red, Green, Blue) vertical stripe*)	-
Display Mode	Normally white*)	-
Surface treatment	Antiglare, Hard-Coating (3H)*)	-
Display colors	262,144*)	color
Weight	2050 (typ.)	g

### 7-2 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit	Remarks
Supply voltage	V <sub>inv</sub>	27.39 VDC	V	T <sub>a</sub> = 25°C
Supply voltage	V <sub>con</sub>	13.2 VDC	V	T <sub>a</sub> = 25°C
Storage temp.	T <sub>st</sub>	-20 to 60 *1*)	°C	70% rel. humidity level no condensation*)
Operation temp.	T <sub>op</sub>	-10 to 60 *1*2*)	°C	

\*1: for backlight unit only

\*2: measured at center display area (Front side)

\*) in according on specification of Sharp LQ121S1LG41

**7-3 CONNECTORS**

Connector	Pin	Description	Typ
Power	1	25 VDC (V <sub>inv</sub> )	MOLEX 39-29-1027
	2	GND	
Backlightcontroll	1	GND	MOLEX 39-30-3046
	2	GND	
	3	12 VDC (V <sub>con</sub> )	
	4	5 VDC BL ON/OFF	
Dimming	1	nc	
	2	+5VDC	
	3	GND	
	4	Analog Dimming input	

**7-4 ELECTRICAL CHARACTERISTICS**

Panel driving

Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage	V <sub>inv</sub>	22.41	24.9	27.39	V	at full brightness and full fanunit
Supply voltage	V <sub>con</sub>	10.8	12	13.2	V	
Supply current	I <sub>inv</sub>	-	1.3	1.8	A	
Supply current	I <sub>con</sub>	-	0.5	-	A	

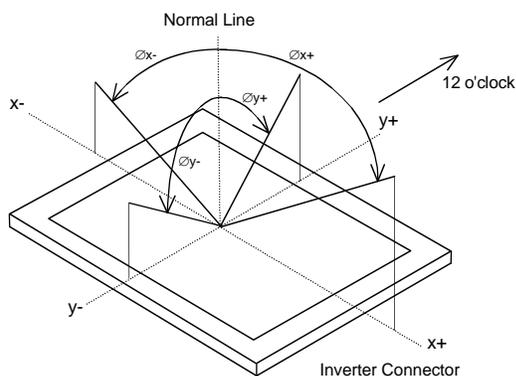
**7-5 OPTICAL CHARACTERISTICS**

Ta = 25°C ± 5°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	
Viewing angle range	Horizontal	∅x+	CR>10, ∅y = ±0°	-	60	-	deg.	note 1
		∅x-	CR>10, ∅y = ±0°	-	60	-	deg.	note 1
	Vertical	∅y+	CR>10, ∅x = ±0°	-	50	-	deg.	note 1
		∅y-	CR>10, ∅x = ±0°	-	60	-	deg.	note 1
Contrast ratio	CR	∅y=0°, ∅x=±0°	-	600:1	-	-	note 2	
Response time	tpd	white to black	-	15	-	ms	note 3 *)	
		black to white	-	30	-			
Luminance (center of screen)	Lw	at center Vabs	-	1200	-	cd/m <sup>2</sup>	note 4 note 5	
		at center V(λ)	972	1080	-			
Dimming range	DR			1000:1			note 6	
Colour gamut	C	PAL		65		%	note 7	
Chromaticity	red x red y	at center	-	xxx	-		note 7	
	green x green y	at center	-	xxx	-		note 7	
	blue x blue y	at center	-	xxx	-		note 7	
	white x white y	at center	-	xxx	-		note 7	
	uniformity			-	1,26	-		

\*) in according on specification of Sharp LQ121S1LG41

note 1: Definitions of viewing angle are as follows. (matrix facing up, connector on the right side)



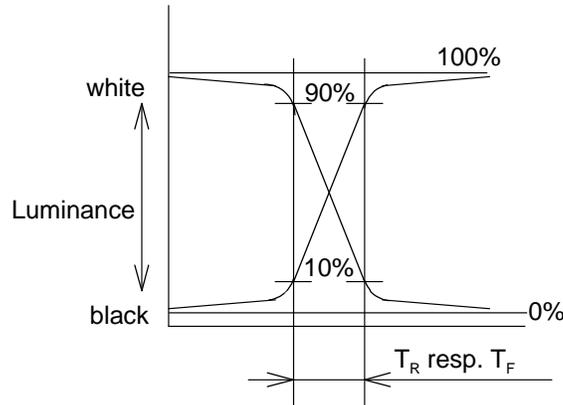
note 2: The contrast ratio is calculated by using the following formula:

$\text{Contrast ratio} = \frac{\text{Brightness (Luminance) with all pixels in "White"}}{\text{Brightness(Luminance) with all pixels in "Black"}}$
--

the brightness is measured in darkroom.

note 3: Definition of response time is as follows.

Photodetector output signal is measured when the brightness changes "white" to "black". Response time is the time between 10% and 90% of the photodetector output amplitude.



Reference data

Ta = 0°C white to black tpd = 15 ms typ.

black to white tpd = 30 ms typ.

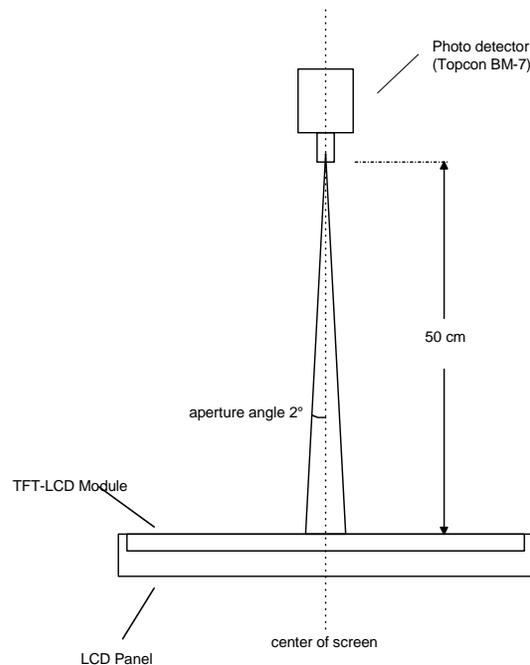
note 4: Brightness measurements setup.

measurement should be executed in a dark room 30 min.

after lightning the backlight. Matrix: off state.

The brightness is measured in the center of the screen.

Environment condition: T = 25 ± 2 °C, it has to be assured that a sufficient heat flow / air circulation is given





Typical Design

## Liquid Crystal Display Design

I-SFT dah256\_121



---

note	5:	Brightness	measurements	setup.
------	----	------------	--------------	--------

measurement should be executed in a daylight room 30 min.

after lightning the backlight. Matrix: off state.

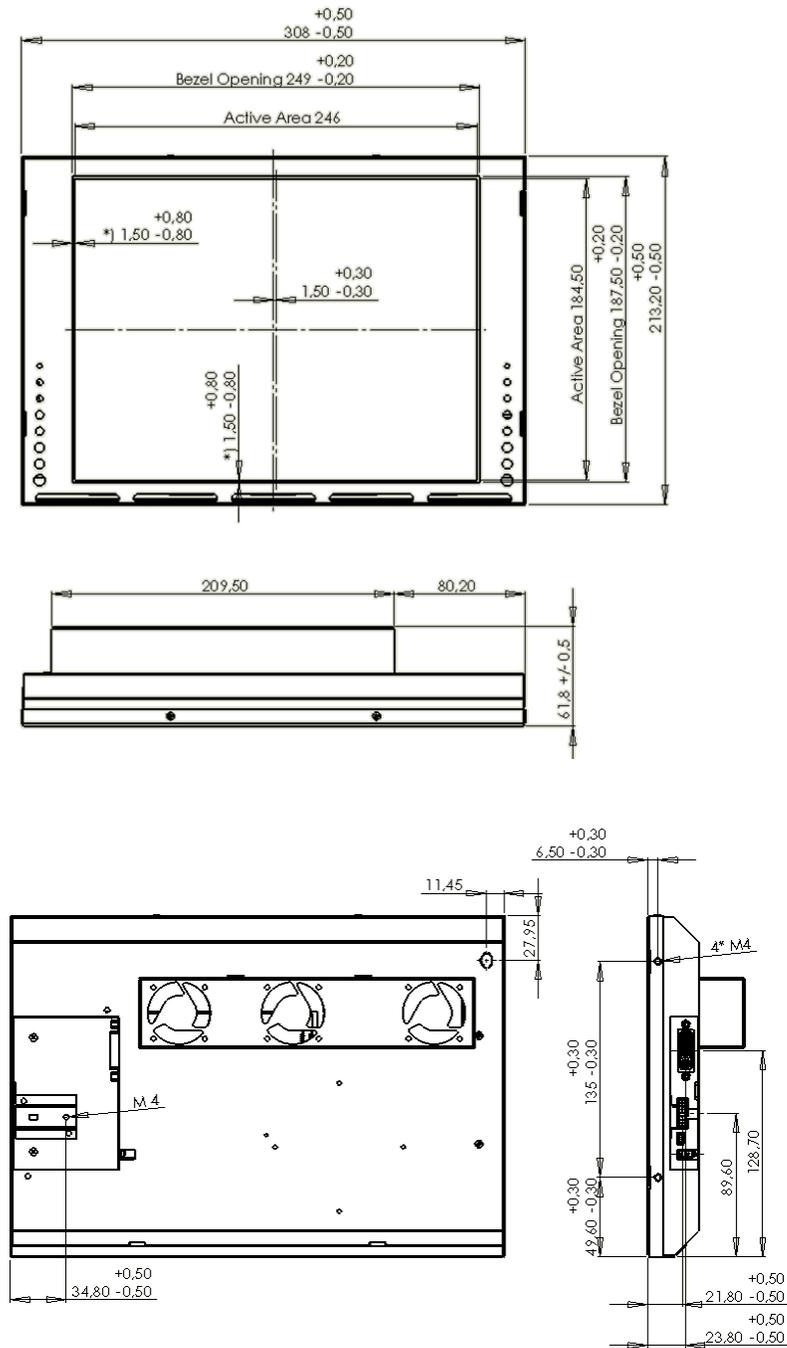
The brightness is measured in the center of the screen.

Environment condition:  $T = 25 \pm 2 \text{ }^\circ\text{C}$ , it has to be assured that a sufficient heat flow / air circulation is given

note 6: Dimming range can be decrease by using Dimmingmodul.

note 7: For the measurement of color gamut and chromaticity use a lamp with a color temperature of 9000 K.

7-6 OUTLINE DIMENSIONS

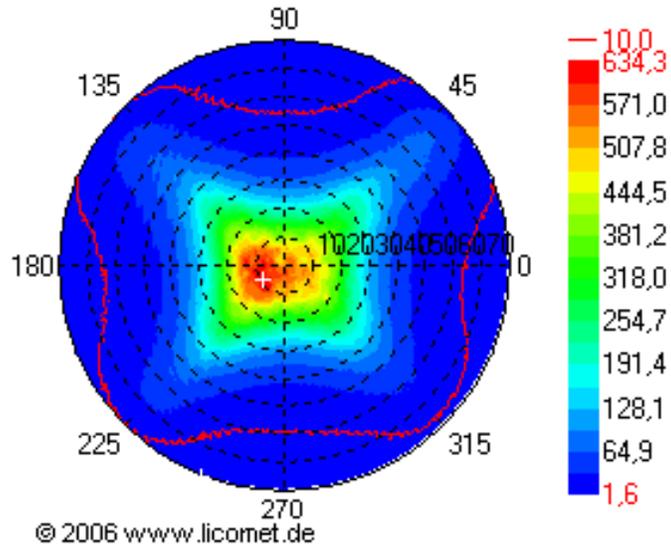


\*) in according on specification of the Sharp LQ121S1LG41

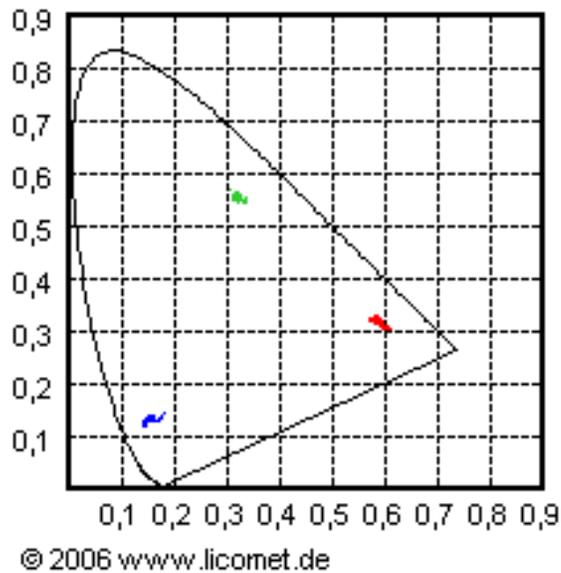
tolerances in DIN ISO 2768 T1 class m

**7-7 MEASUREMENTS**

7-7-1 CONTRAST



7-7-2 COLOR DISPERSION



**7-8 RELIABILITY**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Lamp operating life time	hr	at 25°C	-	150.000	-	hour	
Matrix MTBF	hr	at 25°C	-	-	-	hour	*)
Backlight unit MTTH	hr	7-2	-	50.000	-	hour	

\*) in according on specification of Sharp LQ121S1LG41

## Standarts:

CSA CAN/CSA C22.2 No. 60950-1-03

UL ANSI/UL No. 60950-1, 1<sup>st</sup> Ed

IEC IEC 60950-1:2001 (1<sup>st</sup> Ed)

**7-9 DEFECT SPECIFICATIONS**

## a) Inspection conditions

Distance : the distance between the inspector's eye and the LCD panel is 20cm.

Illumination : the distance between a 20-W fluorescent lamp and the LCD panel is 25-30 cm.

Temperature : Room temperature is  $25\text{C}^{\circ} \pm 5\text{C}^{\circ}$ .

Viewing angle:

Display specifications :  $-20^{\circ} \leq \theta x \leq +20^{\circ}$ ,  $0^{\circ} \leq \theta y \leq +20^{\circ}$

Appearance specifications:  $-45^{\circ} \leq \theta x \leq +45^{\circ}$ ,  $-45^{\circ} \leq \theta y \leq +45^{\circ}$

Measuring light conditions: Lamp: Cold Cathode Fluorescent Lamp

Chromaticity coordinates (x = 0.320, y = 0.325) typ.

Luminance of backlight surface for inspection: 1200 cd/m<sup>2</sup>

b) Display specifications

Item	Specifications			
Line defect	Not allowed			
Luminous dots *1	Color	Brightness	Distance between same color dots	Quantity
	Red, Green	F + H	-	R + G ≤ 6
		F	-	R ≤ 6 , G ≤ 3
	Blue	F + H	-	≤ 6
		F	-	≤ 6
	Red, Green, Blue	F	≤ 6.5 mm *4	R, G, B ≤ 0
Linked two or *3 more dots			R, G, B ≤ 0	
Dark dots *2	Color	Distance between dark dots		Quantity
	Black	-		R + G + B ≤ 16 R, G, B ≤ 7
		Linked two dots *3	≤ 1 pair	
		Linked three or *3 more dots	≤ 0	
		≤ 6.5 mm *4	≤ 0	

\*1 F: Full luminous dots (Bright point independent of viewing angle)

H: Half luminous dots (Bright point dependent on viewing angle)

Luminous dots are measured while the screen is black.

\*2 Dark dots are measured while the screen is illuminated with Red, Green, or Blue.

\*3 Linkage means linked two or more dots.

■ ( Luminous or Dark dot)

To be counted

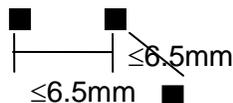


To be uncouped



\*4 ≤ 6.5 mm is considered with:

■ ( :Luminous or Dark dot)



	To be counted	To be uncouped
Luminous dots	Same color	Different color
Dark dots	Same screen	Different screen

\*5 The dot-amounts of linkage and <6.5 mm are counted when the dots are only full luminous.

c) Appearance specifications

Item	Specifications		Quantity
	Measurement criteria		
Other objects Stains Dust (dot shape)	Average diameter( $\varnothing$ ) mm		Allowed value
	$\varnothing \leq 0.2$		all allowed
	$0.2 < \varnothing < 0.3$		$\leq 10$ points
	$0.3 < \varnothing \leq 0.5$		$\leq 3$ points
	$0.5 < \varnothing$ Linked other objects		0 point
Other objects Stains Dust (line shape)	Width(W) mm	Length(L) mm	all allowed
	$W \leq 0.05$	-	
	$0.05 \leq W \leq 0.1$	$L < 0.7$	$\leq 4$ points
		$0.7 \leq L \leq 1.0$	0 point
	$0.1 < W$	-	
Polarizer Bubbles	Average diameter( $\varnothing$ ) mm		
Wrinkles Dent	$\varnothing \leq 0.5$		< 2 points
Panel dent	$\varnothing \leq 0.5$		< 2 points
Polarizer scratch	Remarkable scratches		0 point
Form	Specified labels and parts are put		

The relevant data for the values above are only valid under conditions described at 7-7 "a".



## 8. GENERAL PRECAUTIONS

### 8-1 HANDLING

- (a) When the module is assembled, it should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
- (b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT backlight.
- (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
- (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (f) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might produce a permanent damage to the polarizer due to chemical reaction.
- (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- (h) Protect the module from static, it may cause damage to the C-MOS Gate Array IC.
- (i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (j) Do not disassemble the module.
- (k) Pins of I/F connector shall not be touched directly with bare hands.

### 8-2 STORAGE

- (a) Do not store the TFT-LCD module in direct sunlight.
- (b) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.



Typical Design



---

### 8-3 OPERATION

- (a) Do not connect, disconnect the module in the “Power On” mode.
- (b) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

### 8-4 OTHERS

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating values (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on). Otherwise the module may be damaged.
- (d) If the module displays the same pattern continuously for a long period of time, it can be the situation when the image “sticks” to the screen.
- (e) This module has its circuitry PCB’s on the rear side and should be handled carefully in order not to be stressed.