# ILLUMINANT 北極光企業有限公司

### **PRODUCT SPECIFICATION**

<b>CUSTOMER:</b>	
<b>MODEL NO:</b>	IG-G120601-6GFLYA
ACCEPTED BY:	



Note 1. Version of Specifications : 1.1

2. Others : ROHS Compliant

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### **RECORD OF REVISION**

Version	Date	Contents
1.0	2008/07/22	New Release
1.1	2009/3/29	Adjust the Led color and VLED

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### **1. Mechanical Specification:**

Item	Standard Value	Unit
LCD Туре	STN/Yellow-Green mode/Transflective/Positive	
Number of Dots	128*64	
Module Dimension	80.5(W)*45(H)*5.3(Max)	mm
View Area	60(W)*32.6(H)	mm
Duty	1/65	
Bias	1/9	
Viewing Direction	6Н	-
Driver	NT7538	-
Backlight Type	Yellow-Green 6-LED Parallel	
Touch Panel	Without	



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### **<u>2. Interface:</u>**

No.	Symbol	I/O	Function							
1	/CS1	Ι	Chip Select Input : L Lever Active							
2	/RESET	Ι	Reset Input Pin							
3	A0	Ι	Control Data or Display Data Selection							
4	WR	Ι	Write Signal							
5	RD	Ι	Read Signal							
6	DB0	I/O	Data Bus							
7	DB1	I/O	Data Bus							
8	DB2	I/O	Data Bus							
9	DB3	I/O	Data Bus							
10	DB4	I/O	Data Bus							
11	DB5	I/O	Data Bus							
12	DB6	I/O	Data Bus							
13	DB7	I/O	Data Bus							
14	VDD	Р	Power Supply for Logic							
15	VSS	Р	Signal Ground (GND)							
16	VOUT	Р	Voltage Converter Out Pin							
17	CAP3+	Ι	Capacitor 3+ connected to the internal voltage converter							
18	CAP1-	Ι	Capacitor 1- connected to the internal voltage converter							
19	CAP1+	Ι	Capacitor 1+ connected to the internal voltage converter							
20	CAP2+	Ι	Capacitor 2+ connected to the internal voltage converter							
21	CAP2-	Ι	Capacitor 2- connected to the internal voltage converter							
22	V1	Р	LCD Driver Power Supply Voltages							
23	V2	Р	LCD Driver Power Supply Voltages							
24	V3	Р	LCD Driver Power Supply Voltages							
25	V4	Р	LCD Driver Power Supply Voltages							
26	V0	Р	LCD Driver Power Supply Voltages							
27	VR	Р	Voltage Adjustment Pin							
28	IRS	Р	The Terminal Select the Resistors for the V0 Voltage Level Adjustment							

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### 3. Absolute Maximum Ratings:

Item	Symbol	Min.	Тур.	Max.	Unit
Supply Voltage (Logic)	V <sub>DD</sub>	-0.3		+3.6	V
Supply Voltage (LCD)	VLCD	-0.3		+14.2	V
Operating Temperature	T <sub>OP</sub>	-20	-	+70	C
Storage Temperature	T <sub>ST</sub>	-30	-	+80	C

Note : If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

### **4. Electrical Characteristics:**

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Supply Voltage for Logic	VDD			3.0		V
Supply Voltage for LCD	VLCD			8.0		V
High-Level Input Voltage	VIH		0.8 VDD		VDD	V
Low-Level Input Voltage	VIL		Vss		0.2 VDD	V

#### 4.1 Backlight

Item	Symbol	Conditions	Min.	Тур.	Max.	Unit
Supply Voltage	Vdd	If=90mA		2.0		$\mathbf{V}$
Current Consumption	Idd			90	120	mA

### **5. Optical Characteristics:**

Item		Symbol	Condition	Min.	Тур.	Max.	Unit	Remark	
	Тор	$\phi$ H		_	30	-			
Viewing	Bottom $\phi$	ΦL	CD > 10	-	15	-	Dagraa	Nota 1	
Angle	Left	ΘL	$CR \ge 10$	-	30	-	Degree	Note.1	
	Right	ΘR		_	30	-			
Response Time	e (Tr+Tf)		$\Theta = 0$	_	500	650	ms	Note.2	
Uniformity		$\triangle \mathbf{B}$	If=90 mA	80	85		%	Note.0	
Contrast Ratio		CR	At optimized viewing angle		4	-	-	Note.3	

#### Note.0 : $\triangle B=B(min)/B(max)$





Note. 2 : Definition of Response Time : TR and TF. The figure below is the output signal of the photo detector.



Note. 3 : Definition of Contrast Ratio (CR) Ratio of gray max (G max) & gray min (G min) Contrast ratio (CR) = (G max) / (G min) (G max) = luminance with all pixel white (G min) = luminance with all pixel black

								Code					
Command	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D 0	Hex	Function
(1) Display OFF	0	1	0	1	0	1	0	1	1	1	0	AEh	Turn on LCD panel when high, and turn
	Ŭ		Ŭ		Ŭ		Ŭ				1	AFh	off when low
(2) Display Start								40h					
(2) Display Start	0	1	0	0	1		Display Start Address To				То	Specifies RAM display line for COM0	
												7Fh	
(3) Page Address Set	0	1	0	1	0	1	1	F	Page Address		B0h To B8h	Set the display data RAM page in Page Address register	
(1) Column Addroso Sot	0	1	0	0	0	0	1	F	ligher ( Addi	≿olumn ress		00h	Set 4 higher bits and 4 lower bits of
(4) Column Address Set	0	1	0	0	0	0	0	L	ower ( Addı	Columi ress	n	18h	register
(5) Read Status	0	0	1		St	atus		0	0	0	0	хх	Reads the status information
(6) Write Display Data	1	1	0				Write	Data				хх	Write data in display data RAM
(7) Read Display Data	1	0	1				Read	Data				xx	Read data from display data RAM
(8) ADC Select	0	1	0	1	0	1	0	0	0	0	0 1	A0h A1h	Set the display data RAM address SEG output correspondence

### **6. Instruction Table:**

(9) Normal/Reverse	0	4	0	4	0	4	0	0	1	1	0	A6h	Normal indication when low, but full
Display	0	1	0	1	0	1	0	0	1	1	1	A7h	indication when high
(10) Entire Display	0	4	0	1	0	4	0	0	1	0	0	A4h	Select normal display (0) or entire
ON/OFF	0		0		0		U	0		0	1	A5h	display on
(11) LCD Bigs Set	0	4	0	4	0	4	0		0	4	0	A2h	Seta LCD driving voltage bios ratio
(TT) LOD Blas Set	0		0		0		U	0	0		1	A3h	Sets LCD driving voltage bias ratio
(12) Road Modify Write	0	4	0	4	4	4	0	0	0	0	0	Fah	Increments column address counter
	0	-	0			I	0	0	0	0	0	EOU	during each write
(13) End	0	1	0	1	1	1	0	1	1	1	0	EEh	Releases the Read_Modify_Write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	E2h	Resets internal functions
(15) Common Output								0				Coh	Select COM output scan direction :
Mode Select	0	1	0	1	1	0	0	1	-		•	То	invalid data
Mode Select												CFh	
										Inerativ	on	28h	
(16) Power Control Set	0	1	0	0	0	1	0	1		Status	3	То	Select the power circuit operation mode
										otatac	,	2Fh	
(17) V0 Voltage												20h	
Regulatorinternal	0	1	0	0	0	1	0	0	Re	sistor F	Ratio	То	Select internal resistor ratio Rb/Ra mode
Resistor ratio Set												27h	
(18) Electronic Volume	0	1	0	1	0	0	0	0	0	0	1	81h	
modeset	0	-	0		0	U	0	0	0	0	1	UIII	
Electronic Volume	0	1	0				Flootro		ontro I V	Value		~~	Sets the V0 output voltage electronic
Register Set	0		U				Electro		nuo	value		^^	volume register
(19) Set Static indicator	0	1	0	1	0	1	0	1	1	0	0	ACh	Sets static indicator ON/OFF
ON/OFF	0	-	0	1	0		0	I	I	0	1	ADh	0: OFF, 1:ON
Set Static indicator	0	1	0							Mo	do	vv	Sats the flash mode
Register	0		0	•	•	·	·	·	·		ue	~~	
(20) Power Save	0	1	0										Compound command of Display OFF
	Ŭ		Ŭ										and Entire Display ON
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	E3h	Command for non-operation
(22) Oscillation	0	1	0	1	1	1	0	0	1	0	0	E4h	Select the oscillation frequency
Frequency Select	Ŭ						Ŭ	Ű		Ŭ	1	E5b	Coloct the ocomation nequelley
(23) Partial Display	0	1										2.51	
mode Set	v		0	1	0	0	0	0	0	1	0	82h	Enter/Release the partial display mode
(24) Partial Display Duty			0	1	0	0	0	0	0	1	0 1	82h 83h	Enter/Release the partial display mode
	0	1	0	1	0	0	0	0	0	1	0 1	82h 83h 30h	Enter/Release the partial display mode Sets the LCD duty ratio for partial
Set	0	1	0	1 0	0	0	0	0	0 D	1 uty Rat	0 1 io	82h 83h 30h 37h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode
Set (25) Partial Display Bias	0	1	0	1	0	0	0	0	0 Di	1 uty Rat	0 1 io	82h 83h 30h 37h 38h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial
Set (25) Partial Display Bias Set	0	1	0	1 0 0	0 0 0	0 1 1	0 1 1	0 0 1	0 Di Bi	1 uty Rat as Rat	0 1 io	82h 83h 30h 37h 38h 3Fh	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode
Set (25) Partial Display Bias Set (26) Partial Start Line	0	1	0 0 0 0	1 0 0 1	0 0 0 1	0 1 1 0	0	0 0 1 0	0 Di Bi	1 uty Rat as Rat	0 1 io io	82h 83h 30h 37h 38h 3Fh	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode
Set (25) Partial Display Bias Set (26) Partial Start Line Set	0 0 0	1	0 0 0	1 0 0 1	0 0 0 1	0 1 1 0	0 1 1 1 1 1	0 0 1 0	0 D B 0	1 uty Rat as Rat	0 1 io io	82h 83h 30h 37h 38h 3Fh D3h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set	0 0 0 0	1	0 0 0 0 0	1 0 0 1	0 0 0 1 1	0 1 1 0	0 1 1 1	0 0 1 0	0 Dr Bi 0	1 uty Rat as Rat	0 1 io 1	82h 83h 30h 37h 38h 3Fh D3h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set	0 0 0 0 0	1 1 1 1 1 1	0 0 0 0	1 0 0 1 1	0 0 0 1	0 1 1 0	0 1 1 1 2 Pa	0 0 1 0 rtial St	0 Dr Bi 0 art Lir	1 uty Rat as Rat 1	0 1 io 1	82h 83h 30h 37h 38h 3Fh D3h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set	0 0 0 0	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0	1 0 1 1 1	0 0 0 1 1 0	0 1 1 0 0 0	0 1 1 1 Pa	0 0 1 0 rtial St	0 Di Bi 0 art Lir	1 uty Rat as Rat 1 ne	0 1 io 1 1	82h 83h 30h 37h 38h 3Fh D3h XX 85h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set (27) N-Line inversion Set	0 0 0 0 0	1 1 1 1 1 1	0 0 0 0 0	1 0 1 1 1	0 0 1 1 0	0 1 1 0	0 1 1 1 Pa 0	0 1 0 rtial St	0 D B 0 art Lir 1	1 uty Rat as Rat 1 ne 0	0 1 io 1 1	82h 83h 30h 37h 38h 3Fh D3h XX 85h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set (27) N-Line inversion Set Number of Line Set	0 0 0 0 0 0	1 1 1 1 1 1 1	0 0 0 0 0 0	1 0 1 1	0 0 1 1 0	0 1 1 0 0	0 1 1 1 Pa 0	0 1 0 rtial St 0 Num	0 D B art Lir 1	1 uty Rat as Rat 1 ne 0	0 1 io 1 1	82h 83h 30h 37h 38h 3Fh D3h XX 85h XX	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion Sets the number of line used for N-Line inversion
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set (27) N-Line inversion Set Number of Line Set	0 0 0 0 0 0	1 1 1 1 1 1 1	0 0 0 0 0 0	1 0 1 1	0 0 1 1	0 1 1 0 0	0 1 1 1 1 Pa 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1 o rtial St 0 Num	0 Di Bi art Lirr 1 ber of	1 uty Rat as Rat 1 ne 0	0 1 io 1 1	25h 82h 83h 30h 37h 38h 3Fh D3h XX 85h XX	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion Sets the number of line used for N-Line inversion
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set (27) N-Line inversion Set Number of Line Set (28) N-Line inversion Release	0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	0 0 0 0 0 0	1 0 1 1 1	0 0 1 1 0	0 1 1 0 0 0	0 1 1 1 Pa 0 0	0 1 0 rtial St 0 Num 0	0 D B art Lir 1 bber of	1 uty Rat as Rat 1 ne 0 : Line 0	0 1 io 1 1 0	82h 83h 30h 37h 38h 3Fh D3h XX 85h XX 85h	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion Sets the number of line used for N-Line inversion Exit N-Line inversion
Set (25) Partial Display Bias Set (26) Partial Start Line Set Partial Start Line Set (27) N-Line inversion Set Number of Line Set (28) N-Line inversion Release	0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	1 0 1 1 1	0 0 1 1 0	0 1 1 0 0 0 0	0 1 1 1 Pa 0 0	0 1 0 rtial St 0 Num 0	0 D Bi art Lir 1 bber of	1 uty Rat as Rat 1 ne 0 Line 0	0 1 io 1 1 0	2.5h 82h 83h 30h 37h 38h 3Fh D3h XX 85h XX 85h XX	Enter/Release the partial display mode Sets the LCD duty ratio for partial display mode Sets the LCD bias ratio for partial display mode Enter Partial Start Line Set Sets the LCD Number of partial display start line Enter N-Line inversion Sets the number of line used for N-Line inversion Exit N-Line inversion



DC/DC Clock Division Set	0	1	0	1	1	0	0	Clock Division		хх	Set the Division of DC/DC Clock Frequency		
(30) Test Command	0	1	0	1	1	1	1	-		•		F1h to FFh	IC test command. Do not use
(31) Test Mode Reset	0	1	0	1	1	1	1	0	0	0	0	F0h	Command of test mode reset

### 7. Timing Characteristics:

#### PARALLEL BUS TIMING CHARACTERISTICS (FOR 8080MCU)

\* System Buses Read/Write Characteristics (for 8080 Series MPU)



(VDD = 2.7 ~ 3.6V, Ta = -40 ~ +85°C)

				(		
Symbol	Parameter	Min.	Тур.	Max.	Unit	Condition
Таня	Address hold time	0	-	-	ns	40
Tas8	Address setup time	0	-	-	ns	AU
tcyc8	System cycle time	240	-	-	ns	
tcc∟w	Control low pulse width (write)	90	-	_	ns	/WR
tcclr	Control low pulse width (read)	120	-	-	ns	/RD
tсснw	Control high pulse width (write)	100	-	-	ns	/WR
tcchr	Control high pulse width (read)	60	-	-	ns	/RD
TDS8	Data setup time	40	-	-	ns	D0- D7
Тона	Data hold time	0	-	-	ns	
tacc8	/RD access time	-	-	140	ns	$D_{0} = D_{7} = 100 = $
Тсна	Output disable time	5	-	50	ns	

					(VDD = 1.8 ~ 2.7V, Ta = -40 ~ +85°C)		
Symbol	Parameter	Min.	Тур.	Max.	Unit	Condition	
tahs	Address hold time	0	-	-	ns	40	
tas8	Address setup time	0	-	-	ns	AU	
tcyc8	System cycle time	400	-	-	ns		
tcc∟w	Control low pulse width (write)	150	-	-	ns	/WR	
tcclr	Control low pulse width (read)	150	-	-	ns	/RD	
tсснw	Control high pulse width (write)	120	-	-	ns	/WR	
tcchr Control high pulse width (read)		120	-	-	ns	/RD	
tDS8	Data setup time	80	-	-	ns	D0-D7	
tdня	Data hold time	0	-	-	ns	00~07	
tACC8	/RD access time	-	-	240	ns	D0- D7 CL = 100=E	
tсня	Output disable time	10	-	100	ns	D0~D7, CL = 100pF	

### 8. Reliability:

#### 8.1 MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25°C in the room without sunlight; not include lifetime of backlight and Touch Panel).

#### 8.2 Test Condition

No.	Item	Condition	Criterion
1	High Temperature Operating	+70°C 240hrs	。No defect of operational function in
2	Low Temperature Operating	-20°C 240hrs	room temperature are allowable(23±5°C).
3	High Temperature Non-Operating	+80°C 240hrs	should be below double of initial value.
4	Low Temperature Non-Operating	-30°C 240hrs	
5	High Temperature / Humidity Non-Operating	60°C ; 90%RH ; 240hrs	
6	Temperature Shock Operating	-20°C ←→ 70°C (30min) (5min) (30min) 50 Cycles	
7	Electro-Static Discharge	HBM : ±2kv	

Note 1: Test after 24 hours in room temperature(23±5°C).

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:1.0 MΩ-cm)

Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

### 9. Inspection Criteria:

#### 9.1 Inspection Conditions

9.1.1 Environmental conditions

The environmental conditions for inspection shall be as follows Room temperature: 23±5°C, Humidity: 50±20%RH

9.1.2 The external visual inspection

With  $1000\pm200$  lux fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes .

#### 9.2 Light Method

9.2.1 Inspection is implemented over 30cm vertical distance and  $30^{\circ}$  incidence under  $1000\pm200$  lux. (As showed below)

9.2.2 Viewing direction for inspection over 30cm far and is 45° against from LCD ( As showed

below)



#### 9.3 Classification of Defects

#### 9.3.1 Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

#### 9.3.2 Minor defect

A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

Notes: If the LCD/LCM's cosmetic and display performance do not specify in "inspection criterion", it should be based on these delivered samples.

#### 9.4 Sampling & Acceptable Quality Level

Inspection Item	Major Defect	Minor Defect
Cosmetic	1.0%	1.5%
Electrical Test	0.4%	0.65%

#### 9.5 Definition of Inspection Area

V.A: Viewing Area A.A: Active Area



#### 9.6 Items and Criteria

### 9.6.1 Visual inspection criterion in cosmetic

#### (1) Glass Defect

	Glass Defect					
No	Defect	Criteria	Remark			
1	Dimension (Minor)	By engineering diagram				
2	Cracks (Major)	Extensive crack				

#### (2) FPC

No	Defect	Criteria		Remark
1	Copper peeling	Copper peeling	[Reject]	
	(Minor)			

#### (3) Black Tape

No	Defect	Criteria		Remark
1	Shift	IC exposed	[Reject]	
	(Minor)			
2	No black tape	No black tape	[Reject]	
	(Minor)			

(4) Silicon

No	Defect	Criteria		Remark
1	Amount of silicon	ITO exposed	[Reject]	
	(Minor)			

#### 9.6.2 Visual inspection criterion in electrical display

No	Defect	Crit	eria	Remark
1	No display (Minor)	Not allowed		
2	Missing line (Minor)	Not allowed		
3	Darker or lighter line (Major)	Not allowed		
4	Weak line (Minor)	By limited sample		
5	Bright/Dark point	Spec	Permissible Q'ty	1:1 sub-pixel:1R or 1G or
	(Minor)	Bright point	1	1B 2:Point defect area $\geq 1/2$
		Dark point	2	sub pixel
6	Round type	Spec	Permissible Q'ty	$-1 \Phi - (I + W)$ I · I ength
	(Minor)	$\Phi \leq 0.10$ mm	Disregard	W:Width - 2. Disregard if out of A.A
		$0.10 \text{mm} < \Phi \le 0.20 \text{mm}$	3	
		0.20mm < Φ	0	<b>↓</b> W
7	Line type	Spec	Permissible Q'ty	1. L:Length, W:Width
	(Minor)	W≤0.03mm	Disregard	2. Disregard if out of A/A
	(ivinior)	L≤3.0mm and 0.03mm < W≤0.05mm	2	
		L≤3.0mm and 0.05mm < W≤0.10mm	1	
		W>0.10mm or L> 3.0mm	0	W
8	Mura (Minor)	By 5% ND filter invisib	le	

#### 9.6.3 Others

- 1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
- 2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

#### **10. Precautions for Use:**

#### 10.1 Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

#### 10.2 Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is 23±5°C and the humidity is below 50±20%RH.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

### 10.3 Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be  $\pm 0.1$ mm.

#### 10.4 Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.

- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply water or any liquid on product which composed of T/P.

#### **10.5 Handling Precautions**

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. so, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal .
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

#### 10.6 Warranty

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be avoided in case of defect induced by customer.