



# Universal Display LTD

## SPECIFICATION FOR LCD MODULE

Customer : \_\_\_\_\_

Product Model: KD035G6-54NT-A1

Sample code: \_\_\_\_\_

Designed by	Checked by	Approved by

### Final Approval by Customer

<input type="checkbox"/> LCM Machinery OK  Checked By _____  <input type="checkbox"/> LCM Display OK  Checked By _____	<input type="checkbox"/> LCM OK  <input type="checkbox"/> NG, Problem survey:  Approved By _____
--	--

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

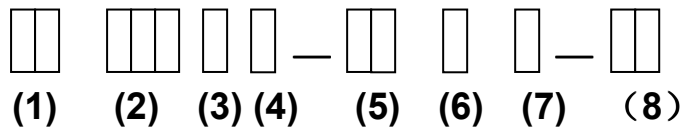
## Revision History

[illegible]

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## 1 Numbering System



No	Definition	Specifications
(1)	TFT LCM Productor No.	KD
(2)	Display monitor opposite angle line size	Unit :mm or mmm (size <10 inch: takes two integers ; size >=10 inch: takes three integers )
(3)	Productor Types	D ---- Digital photo frame / DVD G ----GPS M ----MP P ----Mobil-Phone o o o
(4)	Productor Development Series No.	By two figures characters expression from 01 to 99
(5)	Interface PIN Number	By two figures characters expression from 01 to 99
(6)	With Touch Panel Or Not	T----With T/P ; N----Without T/P
(7)	LCD Type	A----AUO ; M----CMO ; C----CPT; P----PVI; L----LG; W----Wintek; H----HSD; T----Topply; Y----Hydis; I----Hitach; S----Sharp。。。
(8)	Productor Development edition No.	By The English litters : A 1~ Z9

## 2 Scope

It is capable of using 262k colors mode 24bit parallel bi-directional interface.

## 3 Normative Reference

GB/T4619-1996 《Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

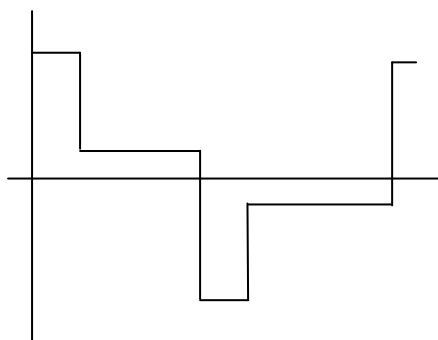
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PART GB2828`2829-87 《National Standard of PRC》

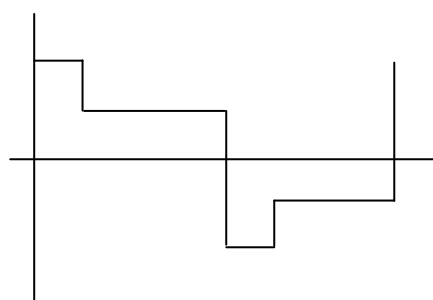
## 4 Definitions

### 4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.



【 selected waveform 】



【 non-selected waveform 】

① Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform  
( $f_i=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

② Vth2: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform  
( $f_i=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

③ Vop:  $(V_{th1}(50\%)+V_{th2}(50\%))/2$  ( $f_i=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

### 4.2 Definition of Response Time Tr, Td

① Tr: The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. ( $f_i=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

② Td: The time required which the brightness of segment

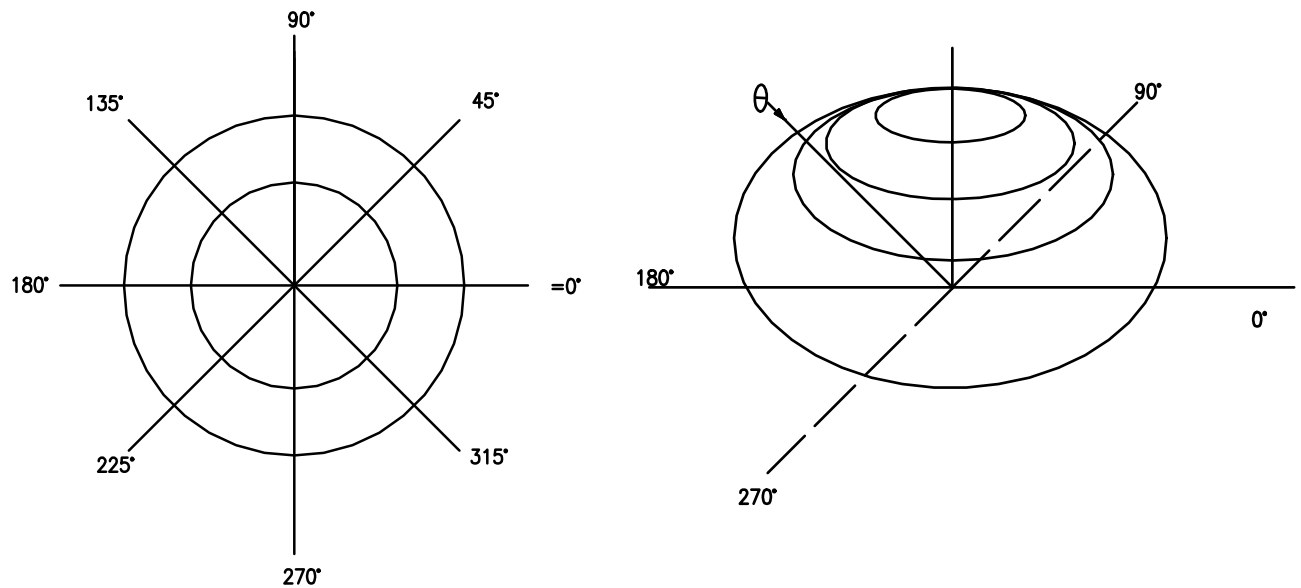
becomes 90% from 10% when waveform is switched to selected one from selected one. ( $f_f=80\text{Hz}$ ,  $\Phi=10^\circ$ ,  $\theta=270^\circ$  at  $25^\circ\text{C}$ )

### 4.3 Definition of Contrast Ratio Cr

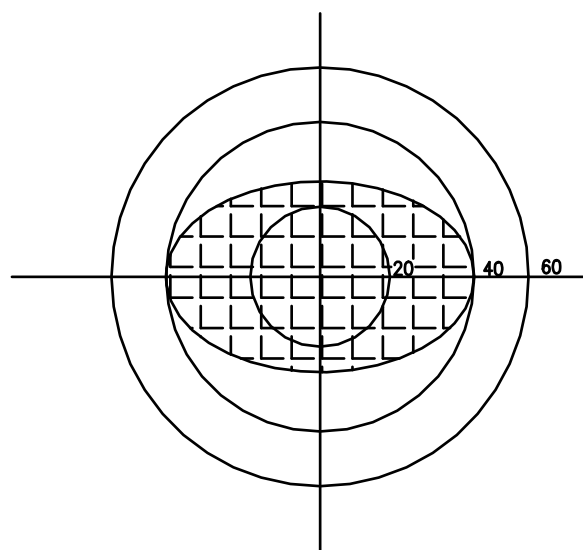
$$\text{Cr} = A/B$$

- ① A: Segments brightness in case of non-selected waveform
- ② B: Segments brightness in case of selected waveform

### 4.4 Definition of Angle and Viewing Range



Angular Graph: Contrast Ratio



Such as:  
Viewing Angle Range:  
80( $\text{Cr} > 2$ ) Horizontal  
70( $\text{Cr} > 2$ ) Vertical

## 5 Technology Specifications

### 5.1 Feature

This single-display module is suitable for use in Multimedia Player products.

The LCD adopts one backlight with High brightness 6-lamps white LED.

- 1) Construction: 3.5" a-Si color TFT-LCD ,White LED backlight, FPC.
- 2) LCD:
  - 2.1 Amorphous-TFT 3.5-inch display, transmissive, normally white type.
  - 2.2 320(RGB)×240dots Matrix.
  - 2.3 Narrow-contact ledge technique.
  - 2.4 LCD Driver IC: NT39016D× 1.
- 3) Low cross talk by frame rate modulation.
- 4) 262K Color ,24bit RGB interface.
- 5) Video signal interface: Parallel RGB .

## 5.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional outline	76.9(W) ×63.9(H)×3.2 (T)	mm
TP outline		mm
TP(V.A)		mm
TP(A.A)		mm
Active area	70.08(W) ×52.56 (H)	mm
Pixel size	219(W) ×219(H)	um
Resolution	320(RGB) × 240	pixel
Luminance	310 (TYP)	cd/m <sup>2</sup>

## 5.3 Absolute Max. Rating

### 5.3 Absolute Max. Rating

Item	Symbol	Value			Unit	Remark
		Min	typ	Max		
Supply voltage	VDD	-0.3	3.3	5.0	V	-
Operating temperature	T <sub>OPR</sub>	-20	-	+70	°C	-
Storage temperature	T <sub>STG</sub>	-30	-	+80	°C	-

## 5.4 Electrical Characteristics

### DC Electrical Characteristics

### DC Electrical Characteristics

(For the digital circuit: Test Condition: VDD=VDDP=3.3V, VDDA=5.0V, GND=GNDA=GNDP= 0V, TA=25°C)

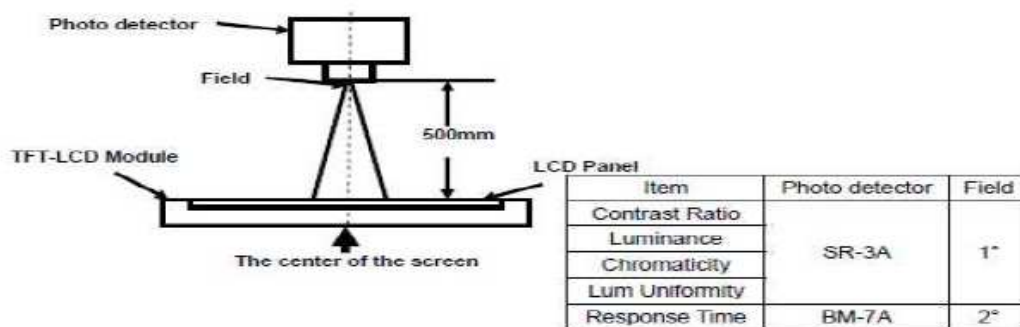
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>Digital Block Circuit</b>						
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	Digital power
Low Level Input Voltage	Vil	GND	-	0.2×VDD	V	Digital input pins TA=85°C
High Level Input Voltage	Vih	0.8×VDD	-	VDD	V	Digital input pins TA=85°C
Low Level Input Voltage	Vil	GND	-	0.2×VDD	V	Digital input pins TA=25°C
High Level Input Voltage	Vih	0.8×VDD	-	VDD	V	Digital input pins TA=25°C
Low Level Input Voltage	Vil	GND	-	0.1×VDD	V	Digital input pins TA=-20°C
High Level Input Voltage	Vih	0.9×VDD	-	VDD	V	Digital input pins TA=-20°C
Input Leakage Current	Ii	-	-	±1	μA	Digital input pins
Pull-high/low Impedance	Rin	-	200K	-	ohm	Digital control input pins
High Level Output Voltage	Voh	VDD-0.4	-	VDD	V	Digital output pins; Ioh = 400 uA
Low Level Output Voltage	Vol	GND	-	GND+0.4	V	Digital output pins; Iol = -400 uA
Digital Stand-by Current	Iddst	-	(50)	(100)	μA	No load, CLKIN/VSD/HSD stopped
Digital Operating Current	Idd1	-	2	-	mA	CLKIN = 27 MHz (CCIR601 mode)
<b>Power Circuit</b>						
Charge Pump Supply Voltage	VDDP	3.0	3.3	3.6	V	For VGH/VGL power and Source Driver power, <b>must in this range</b>
VCOMAC output level	VCOMAC	4.6	-	6.1	V	By VCSL[2:0] setting VCOMAC = V(VCSL[2:0]) + 100mV
VCOMDC output level	VCOMDC	1.0	-	2.26	V	By VDCSL[5:0] setting VCOMDC = V(VDCSL[5:0]) + 50mV
Positive power supply	VGH	14.5	15	15.5	V	Gate driver load + procard load
Negative power supply	VGL	-9	-10	-11	V	Gate driver load + procard load
Base drive current	IDRV	-	-	10	mA	VDDP=3.3V, DRV=0.7 V
DRV output voltage	VDRV	GND +0.1	-	VDD -0.1	V	
Feed back voltage	VFB	0.55	0.6	0.65	V	DC/DC operating, VBL current= 20 mA



## 5.5 Optical specifications

Item	Symbol	Condition	Min	Typ.	Max.	Unit
View Angles	$\theta T$	$CR \geq 10$	30	40	-	Degree
	$\theta B$		50	60	-	
	$\theta L$		50	60	-	
	$\theta R$		50	60	-	
Contrast Ratio	CR	$\theta=0^\circ$	200	350	-	
Response Time	$T_{ON}$	25°C	-	25	40	ms
	$T_{OFF}$					
Chromaticity	White	x	0.260	0.310	0.360	
		y	0.283	0.333	0.383	
	RED	x	0.574	0.624	0.674	
		y	0.318	0.368	0.418	
	GREEN	x	0.300	0.350	0.400	
		y	0.500	0.550	0.600	
	BLUE	x	0.093	0.143	0.193	
		y	0.069	0.119	0.169	
Uniformity	U		75	80	-	%
NTSC			-	50	-	%
Luminance	L		240	300	-	cd/m <sup>2</sup>

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be grounded when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

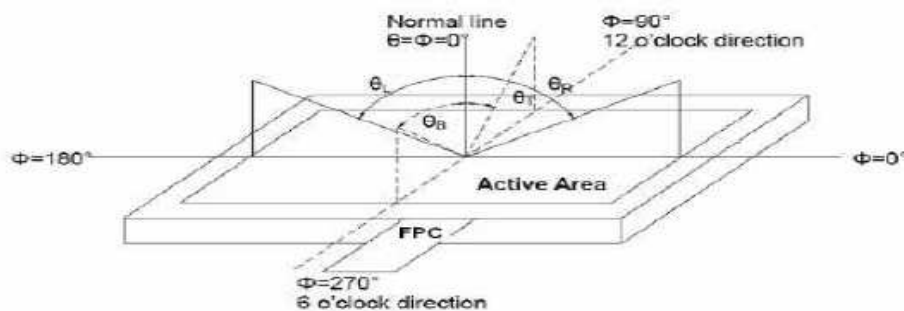


Fig. 1 Definition of viewing angle

**Note 3: Definition of contrast ratio**

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

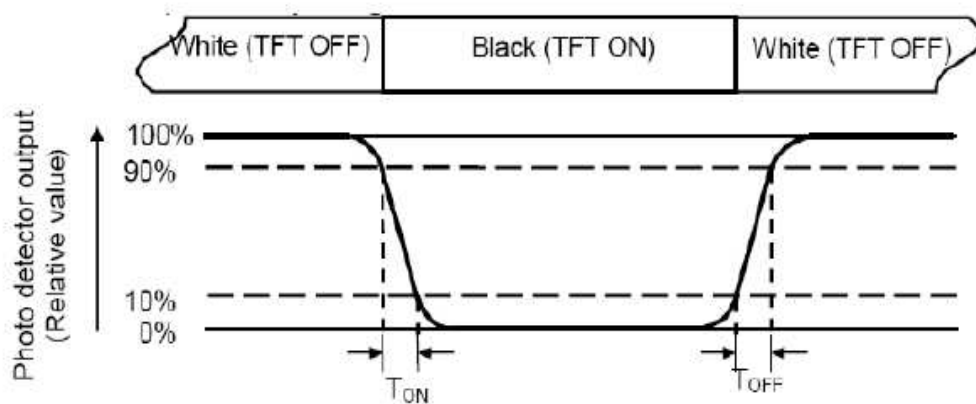
"White state": The state is that the LCD is driven by  $V_{\text{white}}$ .

"Black state": The state is that the LCD is driven by  $V_{\text{black}}$ .

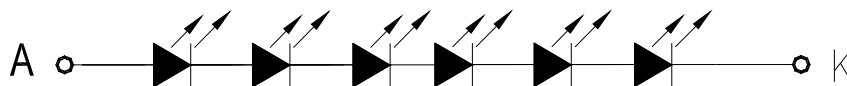
$V_{\text{white}}$ : To be determined       $V_{\text{black}}$ : To be determined.

**Note 4: Definition of Response time**

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ( $T_{\text{ON}}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{\text{OFF}}$ ) is the time between photo detector output intensity changed from 10% to 90%.

**5.6 LED back light specification (6 White Chips)**

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	$V_f$	$I_f=20\text{mA}$	-	19.2	-	V
Uniformity (with L/G)	$\Delta B_p$	$I_f=20\text{mA}$	80	-	-	%
Luminance for LCD	$L_v$	$I_f=20\text{mA}$		3600	-	$\text{cd/m}^2$

**LED CIRCUIT**

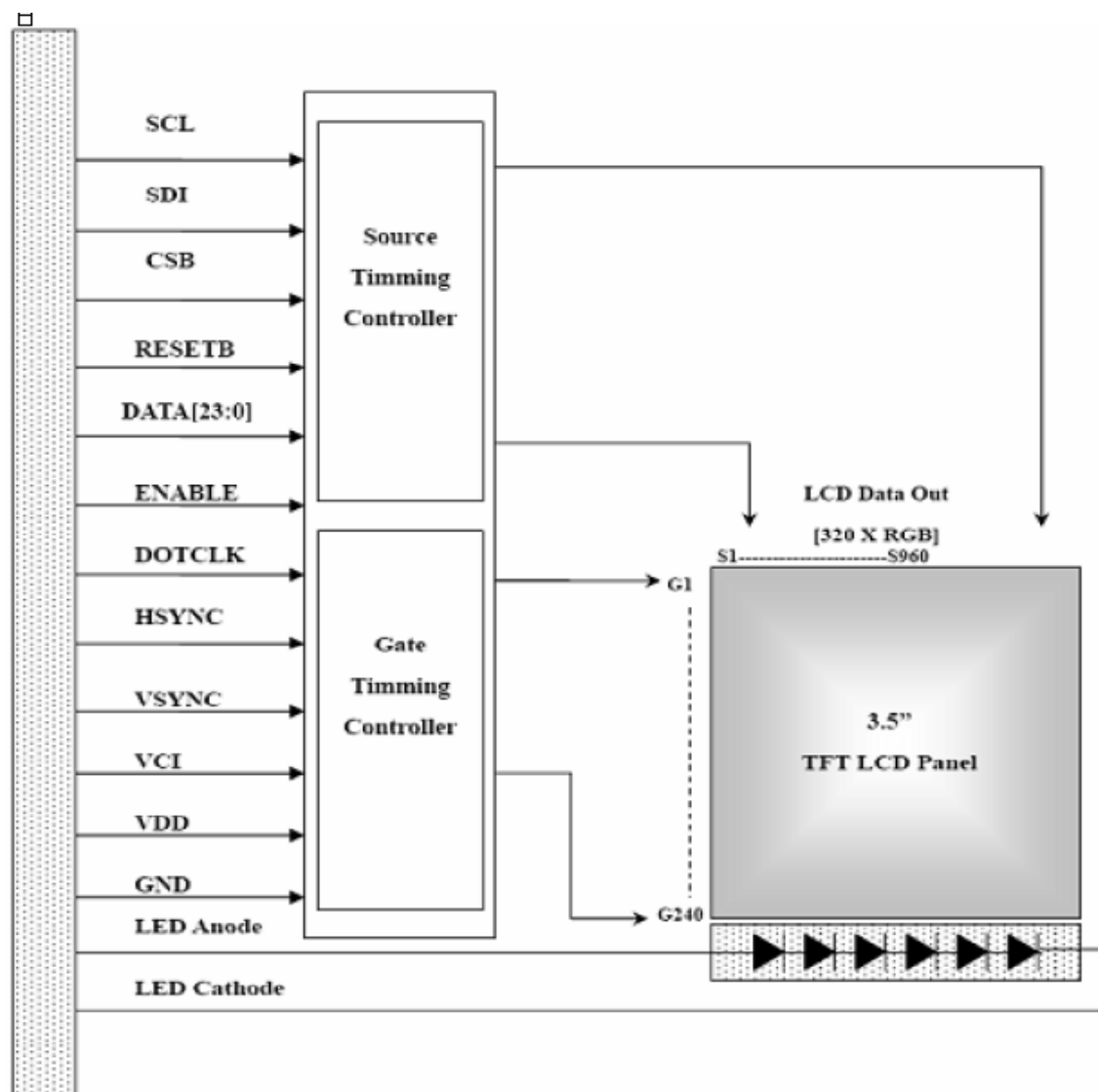
## 5.7 Interface Pin Connections

PIN NO.	Symbol	Description
1-2	LED-K	LED Cathode(-)
3-4	LED-A	LED Cathode(+)
5	NC	Non Connection
6	NC	Non Connection
7	NC	Non Connection
8	/RESET	Reset
9	CS	Serial data enable
10	SCK	Serial clock
11	SDI	Serial data
12-19	B0- B7	Blue Data 0-7
20-27	G0- G7	Green Data 0-7
28-35	R0- R7	Red Data 0-7
36	HSYNC	Horizontal sync
37	VSNC	Vertical sync
38	DCLK	Dot(data) Colck
39-40	AVDD	NC
41-42	VDD	Power Supply(3.3V)
43	NC	Non Connection
44-45	VGL	NC
46	NC	Non Connection
47	VGH	NC

48	NC(XR)	Non Connection
49	NC(YD)	Non Connection
50	NC(XL)	Non Connection
51	NC(YU)	Non Connection
52	ENB	Data Enable signal
53	GND	GND
54	GND	GND

## 6 Signal timing diagram and Circuit block diagram

### 6.1 Circuit block diagram



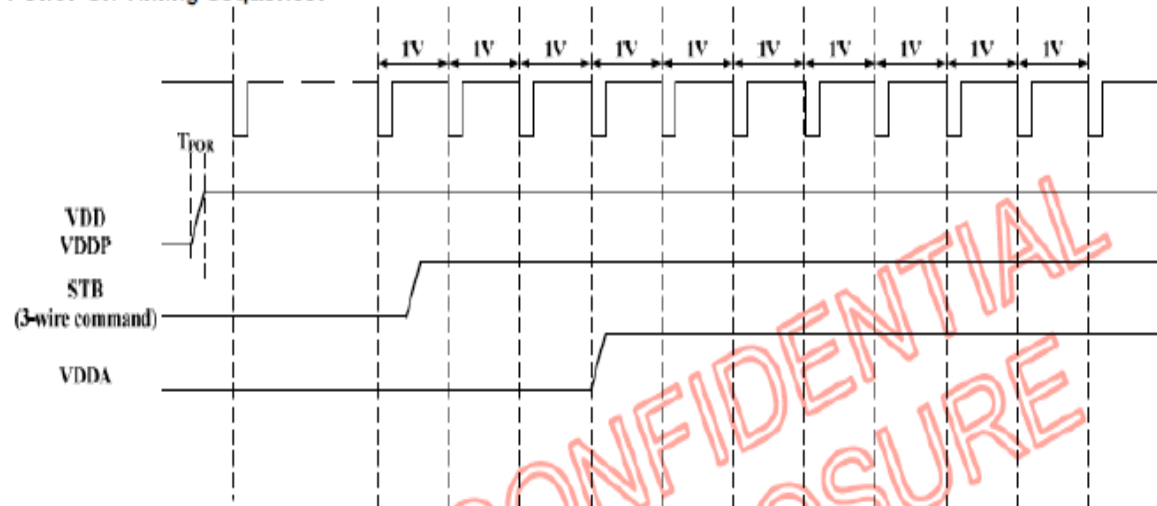
## 6.2 Signal Timing Diagram

### 6.2.1 Power ON Sequence

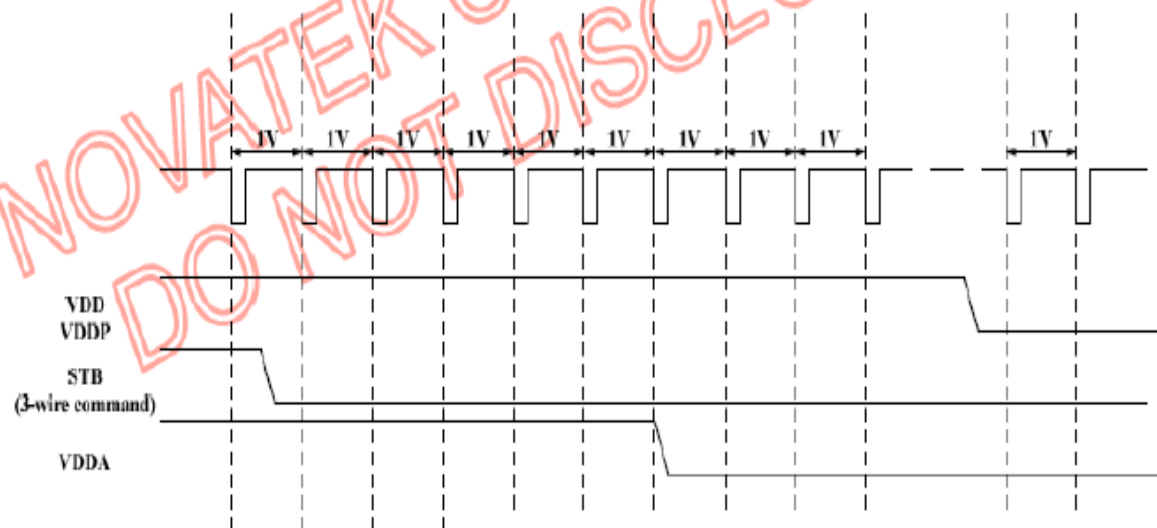
#### Power On/Off Sequence

To prevent IC from power on reset fail, the rising time ( $T_{POR}$ ) of digital power supply VDD, should be control within the specification. Refer to the "AC Characteristic" for the detail timing, please.

Power-On Timing Sequence:

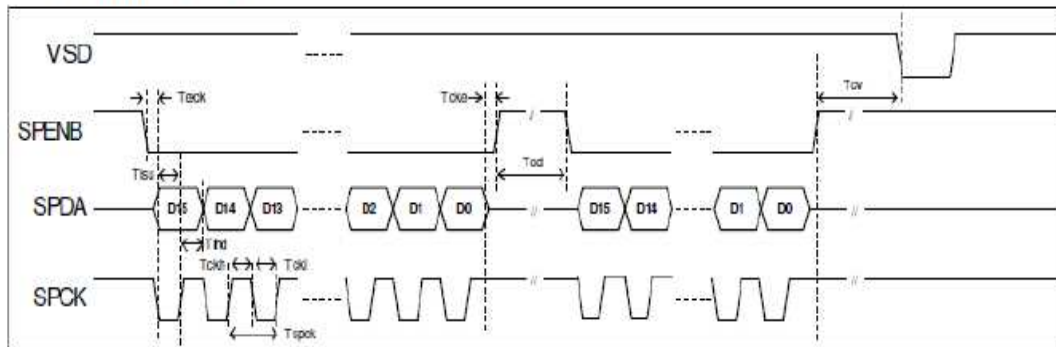


Power-off Timing Sequence:



## 6.2.2 Serial mode timing & clock

### 3-Wire Timing Diagram



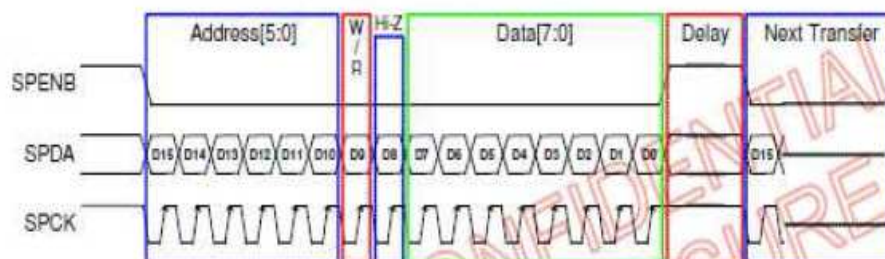
3-wire serial communication AC timing						
Serial clock	Tspck	320	-	-	ns	
SPCK pulse duty	Tsdut	40	50	60	%	
Serial data setup time	Tisu	120	-	-	ns	
Serial data hold time	Tihd	120	-	-	ns	
Serial clock high/low	Tssw	120	-	-	ns	
Chip select distinguish	Tcd	1	-	-	us	
SPENA to VSD	Tcv	1	-	-	us	

## 6.2.3 Serial Transmission mode

### 3-Wire Serial Port Interface (Default Register Map)

#### 3-Wire Command Format

NT39016 uses the 3-wire serial port as communication interface for all the function and parameter setting. 3-Wire communication can be bi-directional controlled by the "R/W" bit in address field. NT39016 3-Wire engine act as a "slave mode" for all the time, and will not issue any command to the 3-Wire bus itself. Under read mode, 3-Wire engine will return the data during "Data phase". The returned data should be latched at the rising edge of SPCK by external controller. Data in the "Hi-Z phase" will be ignored by 3-Wire engine during write operation, and should be ignored during read operation also. During read operation, external controller should float SPDA pin under "Hi-Z phase" and "Data phase". Refer to the section of "3-Wire Timing Diagram" for the detail timing, please.





## 3-Wire Command Format:

Bit	Description
D15-D10	Register Address [5:0].
D9	W/R control bit. "1" for Write; "0" for Read
D8	Hi-Z bit during read mode. Any data within this bits will be ignored during write mode
D7-D0	Data for the W/R operation to the address indicated by Address phase

## 3-Wire Writer Format:

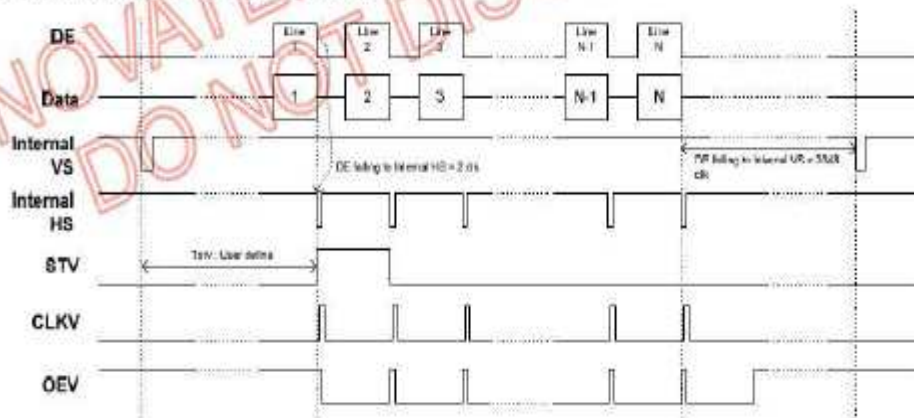
MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Register Address [5:0]						1	X	DATA (Issue by external controller)							

## 3-Wire Read Format:

MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Register Address [5:0]						0	Hi-Z	DATA (Issue by NT39016)							

## 6.2.3 DEMode Timing

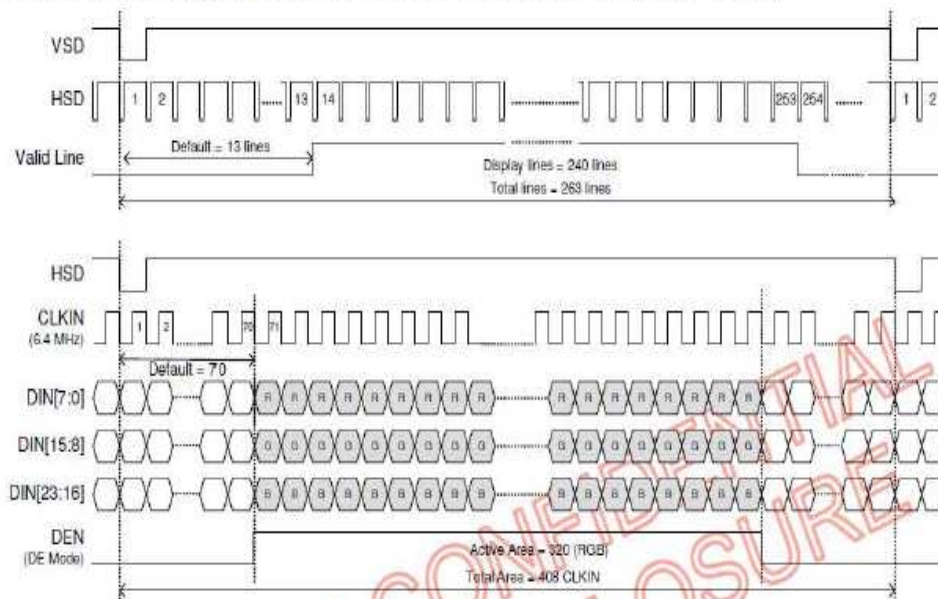
## Vertical Timing Diagram (DE Mode)



Input Output Timing						
CLKIN clock time	Tclk	-	-	35.7	ns	CLKIN = 28MHz
HSD to CLKIN	Thc	-	-	1	CLKIN	
HSD width	Thwh	1	-	-	CLKIN	
VSD width	Tvwh	1	-	-	Th	
HSD period time	Th	60	63.56	67	us	
VSD setup time	Tvst	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
HSD setup time	Thst	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
Data set-up time	Tdsu	12	-	-	ns	DIN[23:0] to CLKIN
Data hold time	Tdhd	12	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	Tesd	12	-	-	ns	DEN to CLKIN

## 6.2.4 24bit RGB Interface Timing

Input Data Timing (24 bit RGB mode for 960 x 240 @ SEL[3:0] = 1100b)



## 24 Bit RGB Mode (@ SEL[3:0] = 1100 or 1101)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN frequency	Fclk	-	6.4	-	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	Tclk	-	156	-	ns	
CLKIN pulse duty	Tcwh	40	50	60	%	Tclk
Time from HSD to VCOMOUT	Thvcm	-	30	-	CLKIN	
Time from HSD to DATSEQ	Thseq	-	20	-	CLKIN	
Time from HSD to Gate output n line	Thgz	-	5	-	CLKIN	
Time from HSD to Gate output n+1 line	Thgo	-	45	-	CLKIN	
Time that HSD to 1'st data input(NTSC)	Ths	40	70	255	CLKIN	DDLY = 70, Offset = 0 (fixed)

## 7 Initial code



## 8 AC Chatacteristics

Test Condition: (VDD=VDDP=3.3V, VDDA=5.0V, GND=GNDA=GNDP=0V, TA= 25℃)

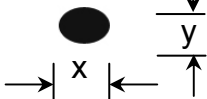
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>System Operation Timing</b>						
VDD power source slew time	T <sub>POR</sub>			1000	us	From 0V to 90% VDD
RSTB active pulse width	T <sub>RSTB</sub>	40			us	VDD = 3.3V

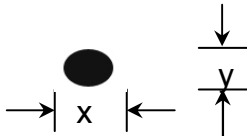
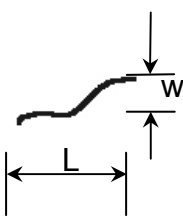
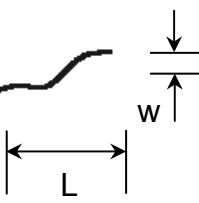
## 9 Reliability Test Conditions And Methods

NO	Item	Condition	Method
1	High / Low Temperature Storage	80℃/-30℃ 120hrs	Check and record every 48Hrs
2	High / Low Temperature Life	70℃/-20℃ 120hrs (operating mode)	Check and record every 48Hrs
3	High Temperature、High Humidity Operating	60℃,90% RH, 96Hrs	Check and record every 48hrs
4	Thermal Shock	-30℃(30Min) → 25℃(5Min) → 80℃(30Min) (conversion time, : 5 sec ) 20 cycles	Each 10 cycles end , check
5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction(X,Y,Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Static Electricity	Gap mood: ±1KV~±8KV (10 times air discharge with positive/negative voltage voltage gap : 1kv) Touch mood: ±1KV~±4KV	Each discharge end, Check the Electrical Characteristics

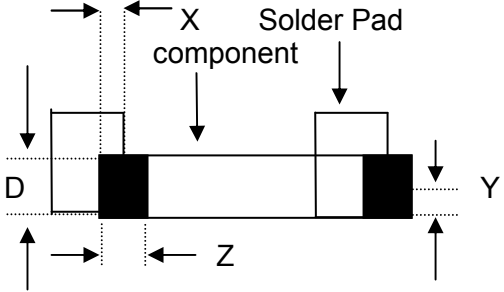
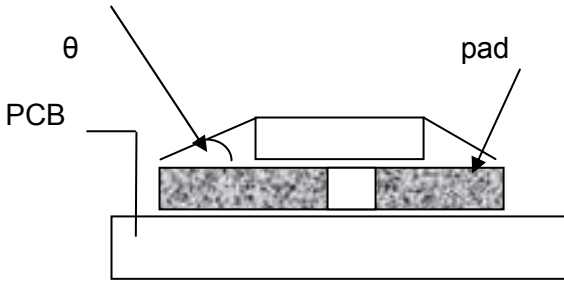
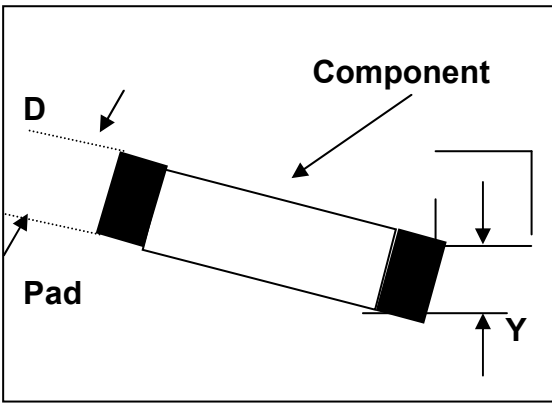
7	Curve	60 Thousand times, 40 times/min 150° ( according to die if exist)	Check and record every 2~4 thousand times
8	Slump	Free faller movement for each side、cording、 angle (75cm High、 6 sides、 2 angle、 2 cording)	End

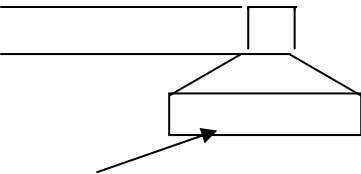
## 10. Inspection standard

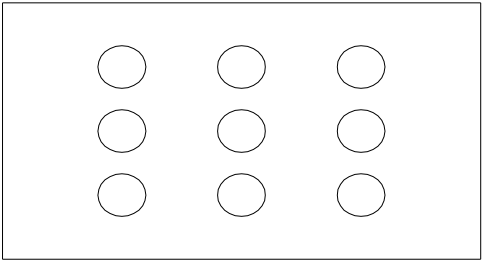
No	Item	Criterion									
01	Outline Dimension	In accord with drawing									
02	Position-finding Dimension Assemble Dimension	In accord with drawing									
03	LCD black spots, white spots (Round type)	<div>Round type: non display</div> <div>3.1 Small area LCD</div> <div></div> <div>Unit : mm</div> <table><thead><tr><th>Dimension</th><th>Qualified Quantity</th></tr></thead><tbody><tr><td><math>D \leq 0.1</math></td><td>Ignore</td></tr><tr><td><math>0.1 &lt; D \leq 0.15</math></td><td>2</td></tr><tr><td><math>D &gt; 0.15</math></td><td>0</td></tr></tbody></table>	Dimension	Qualified Quantity	$D \leq 0.1$	Ignore	$0.1 < D \leq 0.15$	2	$D > 0.15$	0	
Dimension	Qualified Quantity										
$D \leq 0.1$	Ignore										
$0.1 < D \leq 0.15$	2										
$D > 0.15$	0										

		<div>3.2Large area LCD</div> <div></div> <table><tr><th>Dimension</th><th>Qualified Quantity</th></tr><tr><td><math>D\leq 0.1</math></td><td>Ignore</td></tr><tr><td><math>0.1 &lt; D\leq 0.15</math></td><td>2</td></tr><tr><td><math>0.15 &lt; D\leq 0.20</math></td><td>1</td></tr><tr><td><math>D &gt; 0.20</math></td><td>0</td></tr></table> <div>C-STN : if <math>D &gt; 0.1</math> , unqualified</div>	Dimension	Qualified Quantity	$D\leq 0.1$	Ignore	$0.1 < D\leq 0.15$	2	$0.15 < D\leq 0.20$	1	$D > 0.20$	0																							
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$D > 0.20$	0																																		
04	LCD black spots, white spots (Line Style)	<div>Unit : mm</div> <div>4.1 Small area LCD</div> <div></div> <table><tr><th>Length</th><th>Width</th><th>Qualified Quantity</th></tr><tr><td>-</td><td><math>\leq 0.015</math></td><td>Ignore</td></tr><tr><td><math>\leq 1.0</math></td><td rowspan="2"><math>0.015 &lt; W\leq 0.025</math></td><td>2</td></tr><tr><td><math>\leq 2.0</math></td><td>1</td></tr><tr><td><math>\leq 1.0</math></td><td><math>0.025 &lt; W\leq 0.05</math></td><td>1</td></tr><tr><td>-</td><td><math>D &gt; 0.05</math></td><td>According to circle</td></tr></table> <div>4.2Large area LCD</div> <div></div> <table><tr><th>Length</th><th>Width</th><th>Qualified Quantity</th></tr><tr><td>-</td><td><math>\leq 0.015</math></td><td>Ignore</td></tr><tr><td><math>\leq 2.0</math></td><td><math>0.015 &lt; W\leq 0.025</math></td><td>2</td></tr><tr><td><math>\leq 1.0</math></td><td><math>0.025 &lt; W\leq 0.05</math></td><td>1</td></tr><tr><td>-</td><td><math>D &gt; 0.05</math></td><td>According to circle</td></tr></table> <div>CSTN : If <math>W \geq 0.015</math> , unqualified Ignore beyond viewing area</div>	Length	Width	Qualified Quantity	-	$\leq 0.015$	Ignore	$\leq 1.0$	$0.015 < W\leq 0.025$	2	$\leq 2.0$	1	$\leq 1.0$	$0.025 < W\leq 0.05$	1	-	$D > 0.05$	According to circle	Length	Width	Qualified Quantity	-	$\leq 0.015$	Ignore	$\leq 2.0$	$0.015 < W\leq 0.025$	2	$\leq 1.0$	$0.025 < W\leq 0.05$	1	-	$D > 0.05$	According to circle	
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05	LCD Scratch 、 Threadlike Fiber	Same to NO.3 circle sightline and surface of LCD is vertical (2)Same to NO.3 line style		
06	POL	It is not admissible that POL is beyond the edge of glass, else, unqualified. It is essential that POL is over the 50 percent of width of frame , else ,unqualified. According to the drawing in case of special definition.		
07	IC/FPC Bonding	Scratch	Reject	
		Intensity Of Adhesion	If lower than specification, reject	
		Gold Fold Twist	Reject	
07	IC/FPC Bonding	Silicon	According to outline, no gold outside, seal can not be higher than LCD	
		FPC Gold Sever	Reject	
08	SMT	Lack of Component、Polarity Inverse	If exist, reject	
		Leak Solder、Virtual Solder	If exist, reject	
		Short Circuit In Solder Point	If exist, reject	
		Tin Ball	If exist, reject	
		Tin Acumination	If visual, reject	
		Height Solder Point	If higher 0.5mm than component. reject	

08	SMT	Height of component	Either side higher 0.5mm than component, reject	
		Component Shift	 <p><math>X &lt; 3/4Z</math> <math>y &gt; 1/3D</math></p> <p>reject reject</p>	
		Few Tin	 <p>If <math>\theta \leq 20^\circ</math> reject</p>	
		Component Deflection	 <p>If <math>Y &gt; 1/3D</math> reject</p>	
		Component Carcass Sideways	Reject	

		Component Carcass Sideways	If exist with visual inspection , reject	
		Lot Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: Tin accrete the solder side completely , full circle arc , ok C: Jointing include whole solder side, height of tin>50 percent of height of component, reject	
		Few Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: height of tin > 1/3 of solder side of component , ok C: height of tin $\leq$ 1/3 of solder side of component, reject	
08	SMT	<p>Normal</p>  <p>Jointing side</p>		
09	Light	Short circuit 、 Open circuit	Forbid	
		Quality of CSTN Display	1、 Rolling strake with visual inspection, forbid 2、 Differentness of color in viewing area with visual inspection ( full white、 red、 green、 blue), forbid 3 、 Display change with visual inspection , forbid	

10	Color Of CIE Coordinate				Drive LCD under normal condition, 25℃ $\Phi=0$ $\theta=0$ Test white、red、green blue with DMS Record	
			x	y		
		white	$\pm 0.05$	$\pm 0.05$		
		Red	$\pm 0.05$	$\pm 0.05$		
		Green	$\pm 0.05$	$\pm 0.05$		
		Blue	$\pm 0.05$	$\pm 0.05$		
		According to the specification or sample customer have approved				
11	Brightness	In accord with product specification	Drive condition is according to specification Measure location is in Follow Picture 3、Adjust brightness instrument to zero , burrow against the surface of LCD , press “measure” , record when the display is steady. (YOKOGAWA-3298)			
			 <p>Measure location</p>			
12	CR (Max)	According to specification	According to product specification Measure instrument ( DMS-501 )			
13	Response time	According to specification	According to product specification Measure instrument ( DMS-501 )			
14	Viewing angle	According to specification	According to product specification Measure instrument ( DMS-501 )			
15	Vibration、Ring	Compare with the sample customer supply	Compare with the sample customer supply when assemble			
16	Frequency Of FPC Bend	According to the use of product ( main FPC of foldaway cell phone $\geq 6$ thousand )	Measure instrument Bend angle : 150° Fix FPC in the casement when customer supply			

## 11 Handling Precautions

### 11.1 Mounting method

The LCD panel of Daxian LCD module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 11.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl), Sulfur (S)

If goods were sent without being silicide coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 11.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### 11.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

### 11.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified



operation temperature.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

## 11.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

## 11.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

## 12 Precaution for use

### 12.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 12.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to Daxian , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

REV.A