To : Data Modul AG

SPECIFICATIONS

Product Name	GCX074AKT-E

Approval Signature

Accepted by : _____

Date : _____

Japan Display Inc.

Proposed by : _M. Ikegami_____

Revision History

	Revision	2012JDWTTR-139
	Product Name	**GCX074AKT-E** (L5S30978P02)
	Customer Part No.	—

Date/Rev.			Contents of change	Reasons	Remarks
Feb..03, 2012 Rev. 00	(C) (C) (C)	Revision History Revision History 8.0	-Initial release **Sony product name** GCX074AKP-E to GCX074AKS-E **Sony internal product name** L5S30978P00 to L5S30978P01 **Packing drawing** Change Tray thickness Add Buffer board under the Tray	Change Module Factory Japan to China	 Index header Index header Page 34 Page 35
Sep.. 03, 2012 Rev.01	(C) (C) (C) (A)	9.2, 9.5 8.0 1.2 9.5. 8)	**Company name** Sony Mobile Display to Japan Display Inc. **Packing label format** **Outer Drawing number** **Caution comment**	Change Company name	 Page 31,38,41 Page 36 Page 1 Page 41
March 20.2013 Rev.02	 (C) (C)	 8.0 1.2	JDI product name GCX074AKS-E to GCX074AKT-E L5S30978P01 to L5S30978P02 Packing label format Outer Drawing number	Logistic system change Change Module parts	 Page 36 Page 1

(C): Changed   (A): Appended   (D): Deleted   (F): Filled in

CONTENTS

CONTENTS

1 BASIC SPECIFICATIONS

This document gives the characteristics of the active matrix 8.0 inch TFT LCD.

1.1 STRUCTURE

| No.	FACTOR	SPECIFICATIONS	UNIT	REMARKS
1	LCD structure	a-TFT LCD	-	
2	Module size (W x H x T)	187.5(W) x 120(H) x 9.9(T)	mm	Note1
3	Weight	275	g	
4	Active area (W x H)	174.0(W) x 104.4(H)	mm	
5	Screen size	8.0 inch	-	
6	Number of dots	800 x RGB (W) x 480 (H)	-	
7	Dot pitch (Horizontal x Vertical)	0.2175(W) x 0.2175(H)	mm	
8	Dot layout	RGB stripe	-	
9	Liquid crystal mode	Vistarich Technology Normally Black Transmissive type	-	
10	Polarization plate	Hard Coat	-	
11	Operating Temperature	- 30 to +85	deg. C	
12	Storage Temperature	- 40 to +90	deg. C	

Note1: The module size(W) doesn't contain the Fixing boss.

1.2 MECHANICAL DRAWING

Please refer to the outline drawing (P087485-11-00) of this LCD module.

1.3   BLOCK DIAGRAM
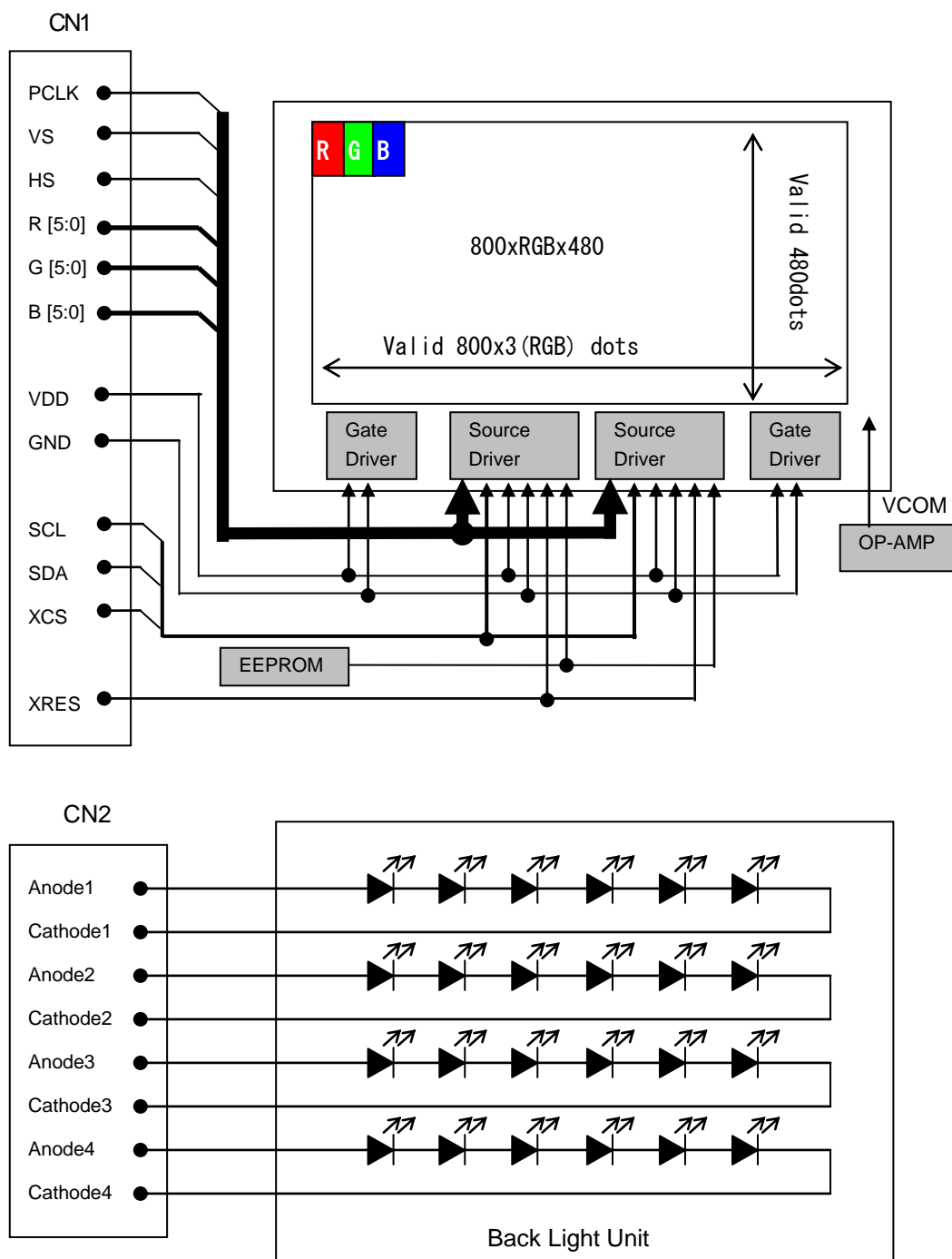
1.4 I/O TERMINALS

CN1: Display interface
  Pin assignment (50pin) ; Suitable connector : Iriso / 9686 (Au-plating)

Pin No.	Symbol	Function	I/O	Remarks
1	GND	Ground	P	
2	GND	Ground	P	
3	R[0]	Display Data (Red)	I	(LSB)
4	R[1]	Display Data (Red)	I	
5	R[2]	Display Data (Red)	I	
6	R[3]	Display Data (Red)	I	
7	R[4]	Display Data (Red)	I	
8	R[5]	Display Data (Red)	I	(MSB)
9	GND	Ground	P	
10	GND	Ground	P	
11	GND	Ground	P	
12	G[0]	Display Data (Green)	I	(LSB)
13	G[1]	Display Data (Green)	I	
14	G[2]	Display Data (Green)	I	
15	G[3]	Display Data (Green)	I	
16	G[4]	Display Data (Green)	I	
17	G[5]	Display Data (Green)	I	(MSB)
18	GND	Ground	P	
19	GND	Ground	P	
20	GND	Ground	P	
21	B[0]	Display Data (Blue)	I	(LSB)
22	B[1]	Display Data (Blue)	I	
23	B[2]	Display Data (Blue)	I	
24	B[3]	Display Data (Blue)	I	
25	B[4]	Display Data (Blue)	I	
26	B[5]	Display Data (Blue)	I	(MSB)
27	GND	Ground	P	
28	GND	Ground	P	
29	GND	Ground	P	
30	GND	Ground	P	

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Pin No.	Symbol	Function	I/O	Remarks
31	PCLK	Clock for display data	I	Latched at rising edge
32	GND	Ground	P	
33	GND	Ground	P	
34	VS	Vertical synchronous signal	I	Low active
35	GND	Ground	P	
36	GND	Ground	P	
37	GND	Ground	P	
38	HS	Horizontal synchronous signal	I	Low active
39	GND	Ground	P	
40	VDD	Power supply	P	
41	VDD	Power supply	P	
42	GND	Ground	P	
43	GND	Ground	P	
44	XRES	Reset	I	Low active
45	GND	Ground	P	
46	XCS	Chip select for serial data	I	Low active
47	SCL	Serial clock	I	Latched at rising edge
48	SDA	Serial data	I	Pin No.48 and No.49 are internally connected in the LCD module.
49	SDA	Serial data	I	
50	GND	Ground	P	

CN2 : Backlight Interface

Pin assignment (8pin)   ;   Suitable connector : Iriso / 9686   (Au-plating)

| Pin No.	Symbol	Function	I/O	Description
1	Anode1	LED anode terminal1	P	
2	Cathode 1	LED cathode terminal1	P	
3	Anode 2	LED anode terminal 2	P	
4	Cathode 2	LED cathode terminal2	P	
5	Anode 3	LED anode terminal3	P	
6	Cathode 3	LED cathode terminal3	P	
7	Anode 4	LED anode terminal4	P	
8	Cathode 4	LED cathode terminal4	P	

I/O : Input / Output terminal, I : Input terminal, O : Output terminal, P : Power line terminal

1.5   LIGHTING SYSTEM

LED type for lighting

Items	Description
LED Type	NS2W123
Color rank	a93,a94a,b91,b92a,b93,b94a
Luminous intensity rank	Pv5, Pv6, Pv7

LED schematic
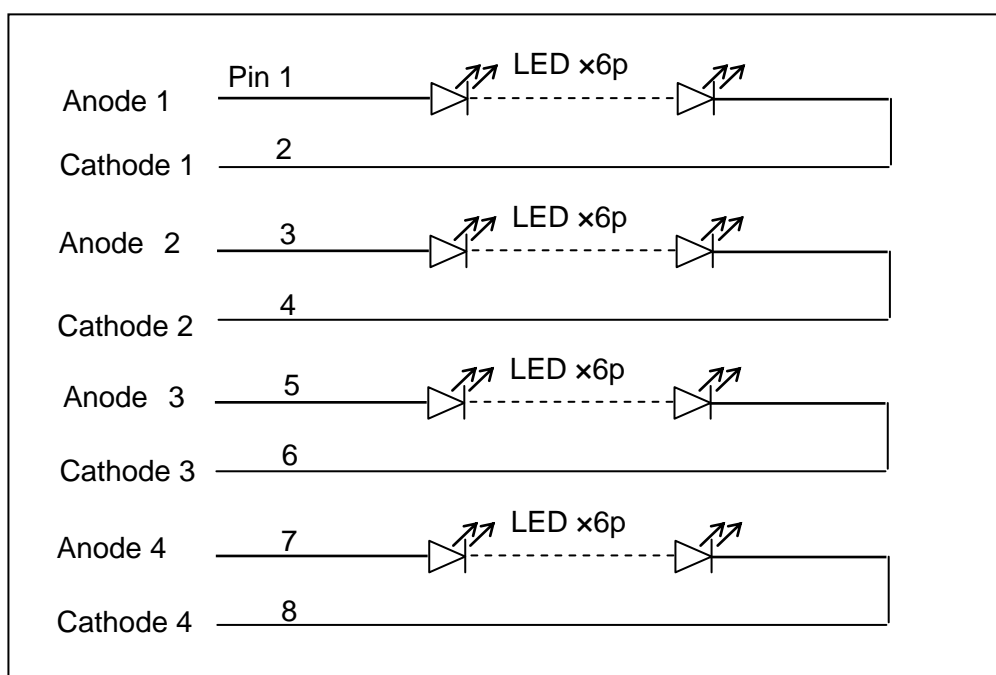
2   FUNCTIONS

2.1   OVERVIEW

This LCD module has two types of used for transferring of command and pixel data.

1) RGB interface

    - 18bit parallel bus for transferring of pixel data.

    - VS, HS and PCLK terminals for synchronous signals of display timing.

2) MPU serial interface

    Serial bus with MPU controls for transferring of command data and parameter data.

2.2   RGB INTERFACE

2.2.1 General Description for RGB interface
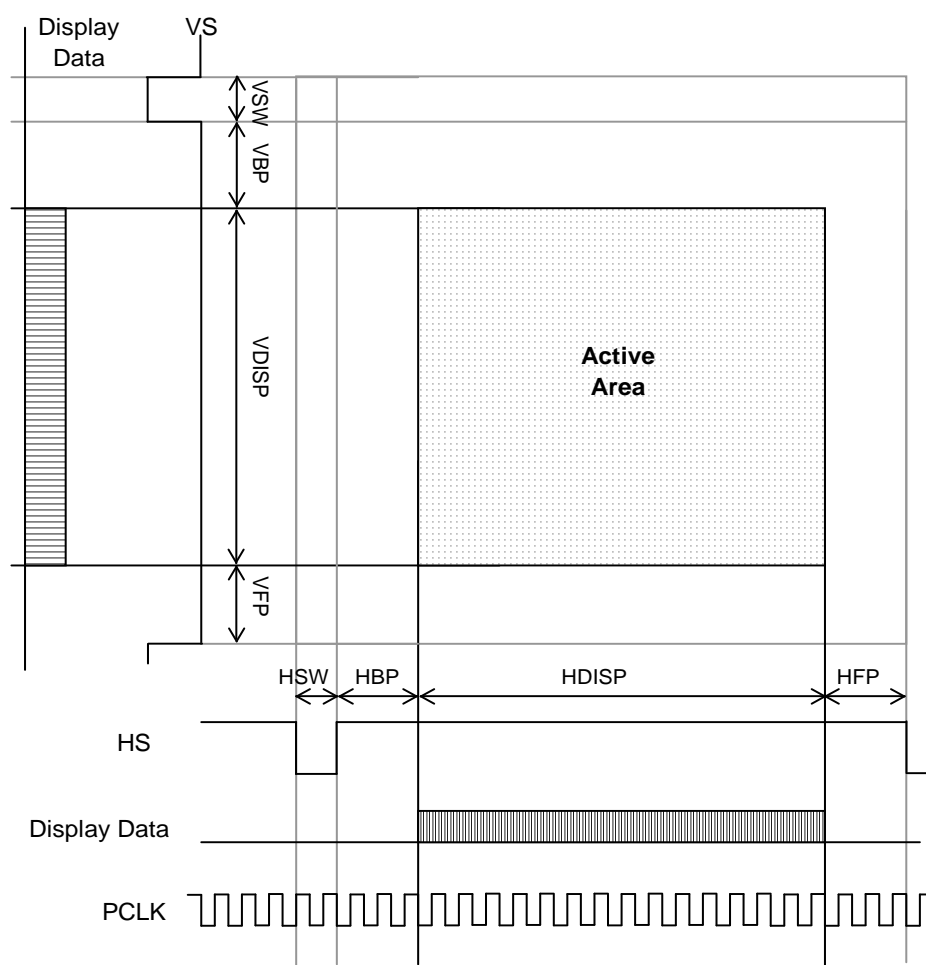
Condition	Description
VSW	Vertical Sync time (VS=Low)
VBP	Vertical Back Porch
VDISP	Vertical Display Active Area
VFP	Vertical Front Porch
HSW	Horizontal Sync time (HS=Low)
HBP	Horizontal Back Porch
HDISP	Horizontal Display Active Area
HFP	Horizontal Front Porch

2.2.2　Display Data format

Relationship between input data and display color

Input data / Display color		Red Data						Green Data						Blue Data					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Standard Color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	Red(63)	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L
	Green(63)	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L
	Blue(63)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H
	Cyan	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H
	Magenta	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	Red(1)	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
	Red(2)	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
	:	:			:			:			:			:			:		
	:	:			:			:			:			:			:		
	Red(61)	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L
	Red(62)	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L
	Red(63)	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L
Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	Green(1)	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L
	Green(2)	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L
	:	:			:			:			:			:			:		
	:	:			:			:			:			:			:		
	Green(61)	L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L
	Green(62)	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L
	Green(63)	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L
Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	Blue(1)	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H
	Blue(2)	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L
	:	:			:			:			:			:			:		
	:	:			:			:			:			:			:		
	Blue(61)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H
	Blue(62)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L
	Blue(63)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H

2.3   MPU SERIAL INTERFACE
2.3.1 General description

The display module uses 3-wire 9-bit serial interface, which is used as command interface.

XCS	Chip select signal (active low)
SCL	Serial transfer clock signal
SDA	Serial input data signal (latched by rising edge of SCL)

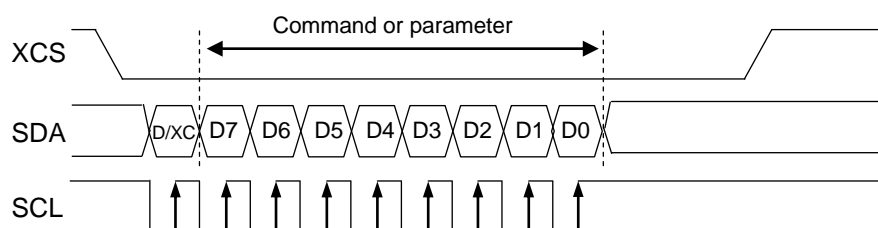9-bit shows the serial input data and it is composed D/XC bit + D[7:0] bits.
The mean of D/XC + D[7:0] describe following table.

D/XC	D[7:0]
0	Command
1	Parameter

2.3.2 Command write

It is necessary to keep XCS=Low during data transferring operation. After finishing transfer the data, then XCS need pull high.

These data bits have been transmitted as shown in the following figure.

2.4   COMMAND SET

No.	Command	Hex	D7	D6	D5	D4	D3	D2	D1	D0	functions	Parameter
1	NOP	00h	0	0	0	0	0	0	0	0	No operation	No
2	SWRESET	01h	0	0	0	0	0	0	0	1	software reset	No
3	SLPIN	10h	0	0	0	1	0	0	0	0	sleep state	No
4	SLPOUT	11h	0	0	0	1	0	0	0	1	sleep state release	No
5	NORON	13h	0	0	0	1	0	0	1	1	test mode release	No
6	DISPON	29h	0	0	1	0	1	0	0	1	display on	No
7	MADCTL	36h	0	0	1	1	0	1	1	0	Memory access control	Yes
	Parameter 1	00h	B7	B6	0	0	0	0	0	0	scanning direction of the panel	(1byte)
8	COLMOD	3Ah	0	0	1	1	1	0	1	0	I/F color format setting	Yes
	Parameter 1	60h	0	1	1	0	0	0	0	0	262k colors	(1byte)
9	MSSET	D0h	1	1	0	1	0	0	0	0	forced auto refresh on	Yes
	Parameter1	03h	0	0	0	0	0	0	1	1		(1byte)
10	DISCTL	C0h	1	1	0	0	0	0	0	0		Yes
	Parameter1	11h	0	0	0	1	0	0	0	1		(3byte)
	Parameter2	11h	0	0	0	1	0	0	0	1		
	Parameter3	01h	0	0	0	0	0	0	0	1		

Note : Please don't enter the commands except for the above command list.

2.5 COMMAND DESCRIPTION

(1) NOP

This command is an empty command. It does not have any effect to the display module.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
NOP	0	0	0	0	0	0	0	0	0	00h

(2) SWRESET

This command resets LCD module by software. Make a Hardware reset, after power on.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
SWRESET	0	0	0	0	0	0	0	0	1	01h

(3) SLPIN

This command sets the sleep state of the LCD module.

See 4.5 RECOMMENDED SEQUENCE to design a command sequence and intervals.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
SLPIN	0	0	0	0	1	0	0	0	0	10h

(4) SLPOUT

This command turns off sleep state. In this mode the DC/DC converter is enabled.

See 4.5 RECOMMENDED SEQUENCE to design a command sequence and intervals.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
SLPOUT	0	0	0	0	1	0	0	0	1	11h

(5) NORON

This command returns the display to normal mode.

This command turns test mode off.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
NORON	0	0	0	0	1	0	0	1	1	13h

(6) DISPON

This command turns on the display.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
DISPON	0	0	0	1	0	1	0	0	1	29h

(7) MADCTL

This command and subsequent parameter are used to settle the display direction.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
MADCTL	0	0	0	1	1	0	1	1	0	36h
1st parameter	1	B7	B6	0	0	0	0	0	0	xx

B7	B6	Display Direction
0	0	Case1
1	1	Case2
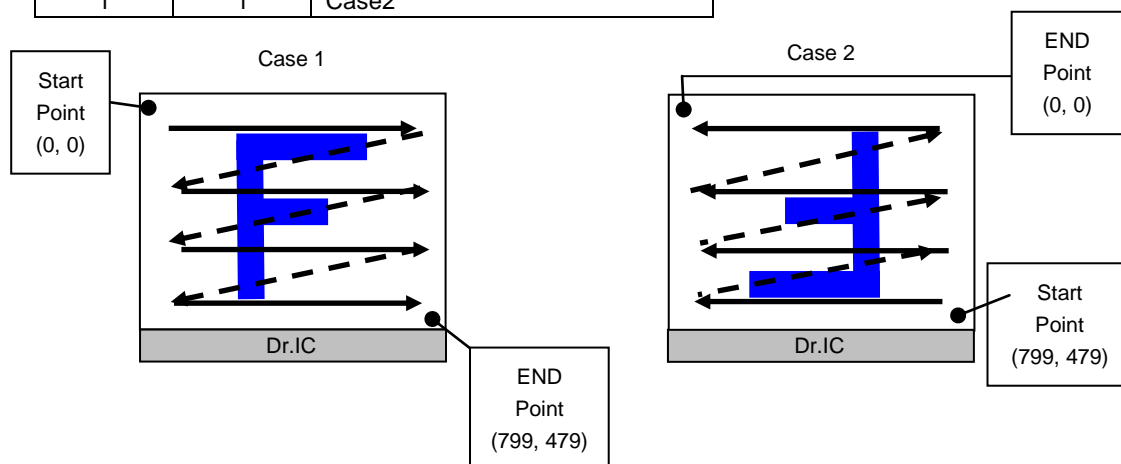
(8) COLMOD

This command and subsequent parameter define the format of RGB image data.

This command is used for refresh sequence.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
COLMOD	0	0	0	1	1	1	0	1	0	3Ah
1st parameter	1	0	1	1	0	0	0	0	0	60h

(9) MSSET

This command uses force auto refresh on.

See 4.5 RECOMMENDED SEQUENCE to design a command sequence and intervals.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
MSSET	0	1	1	0	1	0	0	0	0	D0h
1st parameter	1	0	0	0	0	0	0	1	1	03h

(10)DISCTL

This command uses force auto refresh on.

See 4.5 RECOMMENDED SEQUENCE to design a command sequence and intervals.

Command	D/XC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
DISCTL	0	1	1	0	0	0	0	0	0	C0h
1st parameter	1	0	0	0	1	0	0	0	1	11h
2nd parameter	1	0	0	0	1	0	0	0	1	11h
3rd parameter	1	0	0	0	0	0	0	0	1	01h

3 ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE MAXIMUM RATING

LCD Module

Parameter	Symbol	Rating	Unit
Power supply voltage	VDD	-0.3 to +4.2	V
Logic signal input voltage	VI	-0.3 to VDD+0.3	V

LED (Backlight unit)

Parameter	Symbol	Rating	Unit
Forward Current	IF	120	mA
Pulse Forward Current	IFP	200	mA
Allowable Reverse Current	IR	85	mA
Power Dissipation	PD	480	mW
Dice Temperature	Tj	130	deg.C

IFP Conditions: Pulse Width =< 10msec. and Duty= < 1/10

Note: Ta = 25 deg.C (from Nichia's one LED specification)

Environment Maximum Rating

Parameter	CONDITION	Symbol	RATING		UNIT	REMARKS
			Min	Max		
Ambient temperature	Operation	TOP	- 30	85	deg.C	No dew condition Note 1, 2
	Storage	TST	- 40	90		

Note 1: Care should be taken so that the LCD module may not be subjected to the temperature beyond this specification.

Note2: Ambient temperature means the temperature at LCD surface. Module temperature is apt to increase while it's driving due to the heat of backlight etc. Design carefully not to exceed + 90 deg. C at every point of LCD surface that should come to contact with any other equipment. In operation temperature range, only LCD operation is assured.

4 ELECTRICAL SPECIFICATION

4.1 DC CHARACTERISTICS

Parameter	Symbol	Condition	Specification			Unit
			Min.	Typ.	Max.	
Power supply voltage	VDD		3.0	3.3	3.6	V
Logic high level input voltage	VIH		0.7VDD	-	VDD	V
Logic low level input voltage	VIL		VSS	-	0.3VDD	V
Logic high level input current	IIH	VIN = VSS to VDD Ta = 25 deg.C	-	-	2	uA
Power supply current	IDD	Note 1,4	-	140	200	mA

Note 1: Typ. VDD=3.3V, Ta = 25 deg.C, Display : All white

Max. VDD=3.0V to 3.6V, Ta = -30 to +85 deg.C, Display : All white

Note2: VSS= 0 [V]

Note3: Rated values indicate operating range of electrical functions.

Note4: In-rush current is excluded.

4.2 CHARACTERISTICS OF LED AND LED DRIVING

Item	Value			Unit
	Min.	Typ.	Max.	
Forward current (IF)	-	80		mA
Forward voltage (VF) at IF=80mA		(3.6)	4.0	V
Life time (Note 2)	-	60,000		Hr
Number of LED components	24 pcs. / One LCD Module			

Note 1: Ta = 25 deg.C (from Nichia's one LED specification)

Note 2: A reference mention   (from Nichia's technical information)
This is presumption of life time.
It is not a performance guarantee.

Note 3: Ambient temperature vs. Forward Voltage (from Nichia's one LED specification)

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■ Ambient Temperature vs.
Forward Voltage
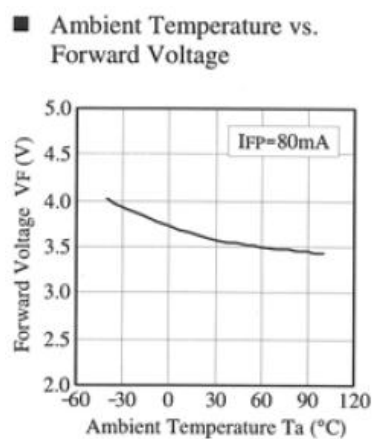
Note 4: [Reference］ Ambient Temperature vs. Allowable Forward Current for TFT module
It is a derating curve in a module simple substance.
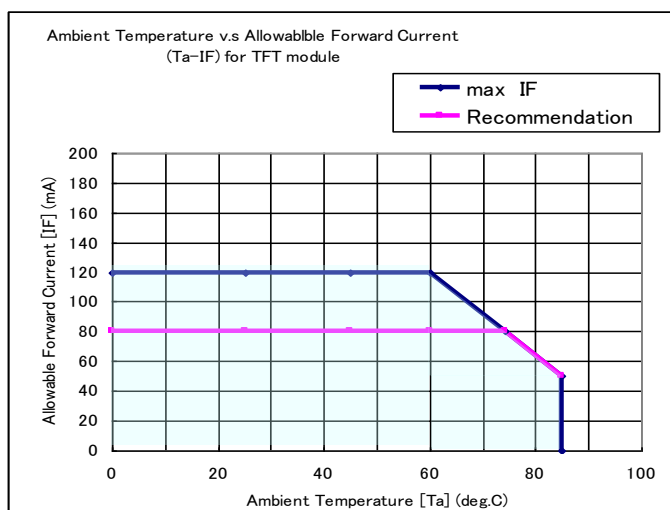
4.3 AC CHARACTERISTICS
4.3.1 RGB interface
4.3.1.1 Vertical timing of RGB interface
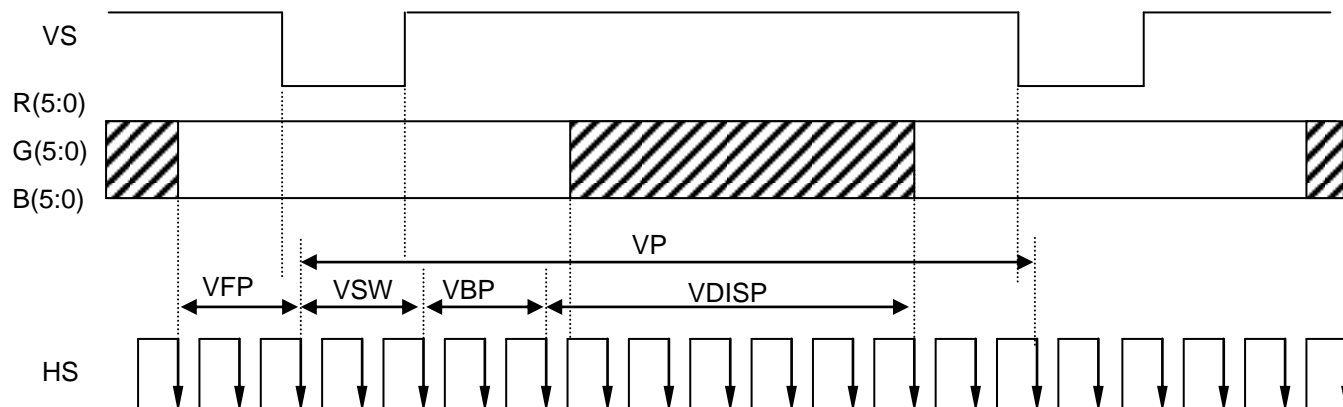
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP		525	525	525	Line
Vertical low pulse width	VSW		2	2	2	Line
Vertical front porch	VFP		13	13	13	Line
Vertical back porch	VBP		30	30	30	Line
Vertical active area	VDISP		480	480	480	Line

Voltage of VDD is in ranges of 4.1 DC CHARACTERISTICS, ambient temperature is in a range of operating temperature.

Note1: VP, VSW, VFP, VBP and VDISP are fixed to one value.
Note2: VP, VSW, VFP, VBP and VDISP are counted by the next falling of HS after transition of VS.

4.3.1.2 Horizontal timing of RGB interface
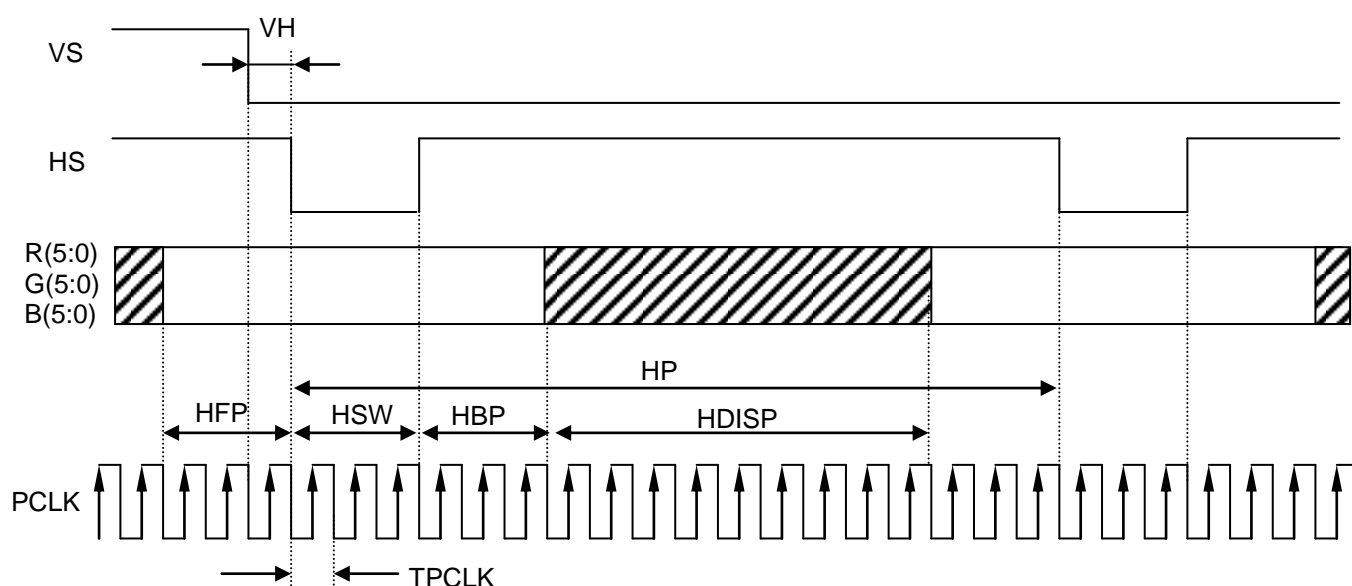
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Phase difference of VS-HS	VH	Note 2	0	-	HP-62	PCLK
Horizontal cycle	HP		1048	1048	1048	dot
Horizontal low pulse width	HSW		13	13	13	dot
Horizontal back porch	HBP		203	203	203	dot
Horizontal front porch	HFP		32	32	32	dot
Horizontal active area	HDISP		800	800	800	dot
Pixel clock frequency when	TPCLK		28.9	30.3	33.6	ns
RGB is running	fPCLK		29.7	33.0	34.6	MHz

Voltage of VDD is in ranges of 4.1 DC CHARACTERISTICS, ambient temperature is in a range of operating temperature.

Note1: HP, HSW, HFP, HBP and HDISP are fixed to one value.
Note2: VH max value is HP(Horizontal cycle) – 62.

4.3.1.3 General timing of RGB interface
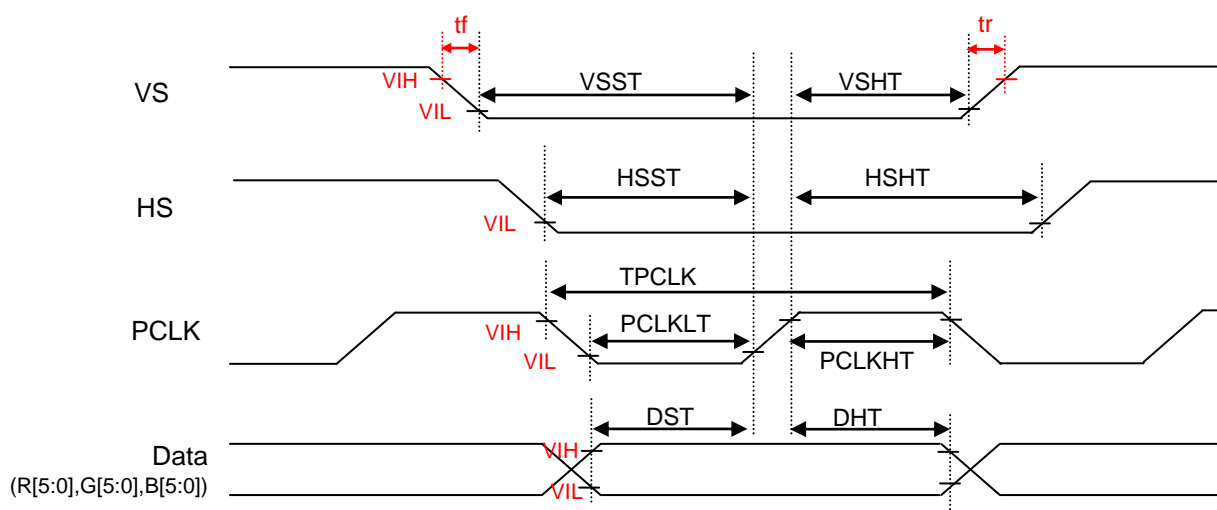
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
VS setup time	VSST		8	-	-	ns
VS hold time	VSHT		8	-	-	ns
HS setup time	HSST		8	-	-	ns
HS hold time	HSHT		8	-	-	ns
Pixel clock cycle	TPCLK	Note3				ns
Pixel clock low time	PCLKLT		12	-	-	ns
Pixel clock high time	PCLKHT		12	-	-	ns
Data setup time	DST		8	-	-	ns
Data hold time	DHT		8	-	-	ns

Voltage of VDD is in ranges of 4.1 DC CHARACTERISTICS, ambient temperature is in a range of operating temperature.

Note1: Signal rise and fall times of all input signals (tr, tf) are equal or less than 3ns.
Note2: For timing of input signals, they are set using 30% and 70% of VDD as the base reference.
Note3: Refer to 4.3.1.2 Horizontal timing of RGB interface about rated value of pixel clock cycle.

4.3.2 Serial interface
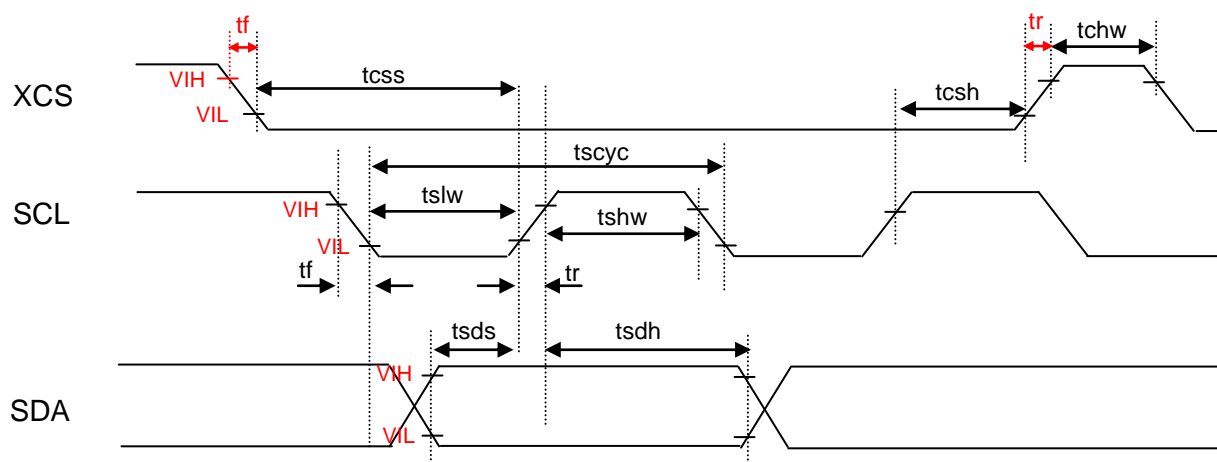
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Serial clock cycle	tscyc		160	-	-	ns
SCL high pulse width	tshw		65	-	-	ns
SCL low pulse width	tslw		65	-	-	ns
Data setup time	tsds		40	-	-	ns
Data hold time	tsdh		40	-	-	ns
XCS high pulse width	tchw		60	-	-	ns
XCS– SCL time	tcss		60	-	-	ns
	tcsh		60	-	-	ns

Voltage of VDD is in ranges of 4.1 DC CHARACTERISTICS, ambient temperature is in a range of operating temperature.

Note 1: Signal rise and fall times of all input signals (tr, tf) should be equal or less than 15 ns.
Note 2: For timing of input signals, they are set using 30% and 70% of VDD as the base reference.
Note 3: Please use the level shifter not voltage divider (drop by resistor) if customer need to change the voltage level. If customer uses the voltage divider, we can not guarantee the serial function.

4.3.3 RESET TIMING
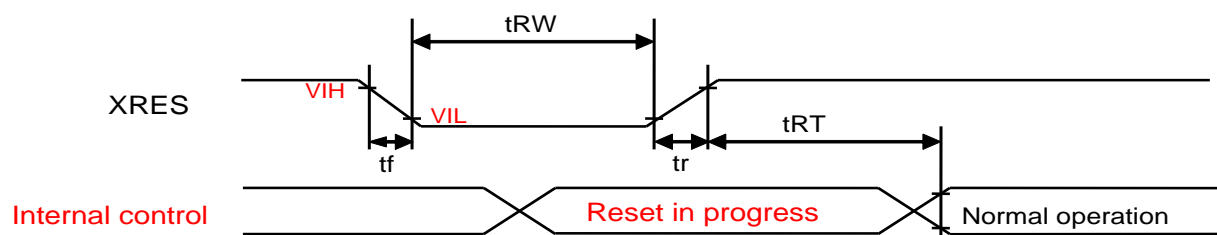
Item	Symbol	Condition	Min	Max	Unit
Reset pulse width	tRW		50		us
Reset complete time	tRT			5	ms

Voltage of VDD is in ranges of 4.1 DC CHARACTERISTICS, ambient temperature is in a range of operating temperature.

Note1: Signal rise and fall times of all input signals (tr, tf) should be equal or less than 15 ns.
Note2: For timing of input signals, they are set using 30% and 70% of VDD as the base reference.
Note3: Follow it about regulations 4.5 RECOMMENDED SEQUENCE about reset Low pulse width
        when power supply turns on.

4.4 POWER MODES
4.4.1 DISPLAY ON MODE
In this mode, the display is able to show maximum 262 144 color from RGB interface. PCLK, HS and VS are always activated by the host. Image data from RGB interface is displayed on panel.

4.4.2 POWER OFF
In this mode, VDD is able to be removed.

4.4.3 State transition diagram of power modes

```
        ┌─────────────────────────┐
        │        POWER OFF         │
        └─────────────────────────┘
          ▲                     │
  ┌──────────────┐       ┌──────────────┐
  │ Power OFF    │       │ Power ON     │
  │ Sequence     │       │ Sequence     │
  └──────────────┘       └──────────────┘
          │                     ▼
        ┌─────────────────────────┐
        │      DISPLAY ON MODE     │
        └─────────────────────────┘
```
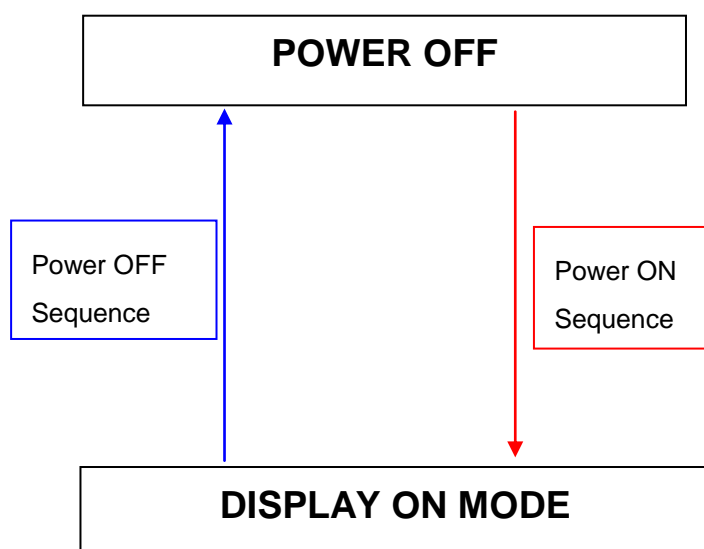
4.5 RECOMMENDED SEQUENCE

(1) Start to supply system power (VDD).

(2) Make a device reset after starting to supply the system power.

(XRES must be kept Low for more than 50us.)

(3) Wait more than 5ms after releasing the system reset

(4) Start to input control signals and transfer commands for initial setting and turning on.

See 4.5.1 Power on sequence.

(Display is started.)

(5) Transfer commands to turn off. See 4.5.2 Power off sequence.

(6) Wait more than 50ms

(7) Stop to input control signals.

(8) Wait more than 300ms from the end of power off sequence commands.

(8) Stop to supply system power (VDD).

Required intervals are described in the following chart and the table of "4.5.1" to "4.5.2".
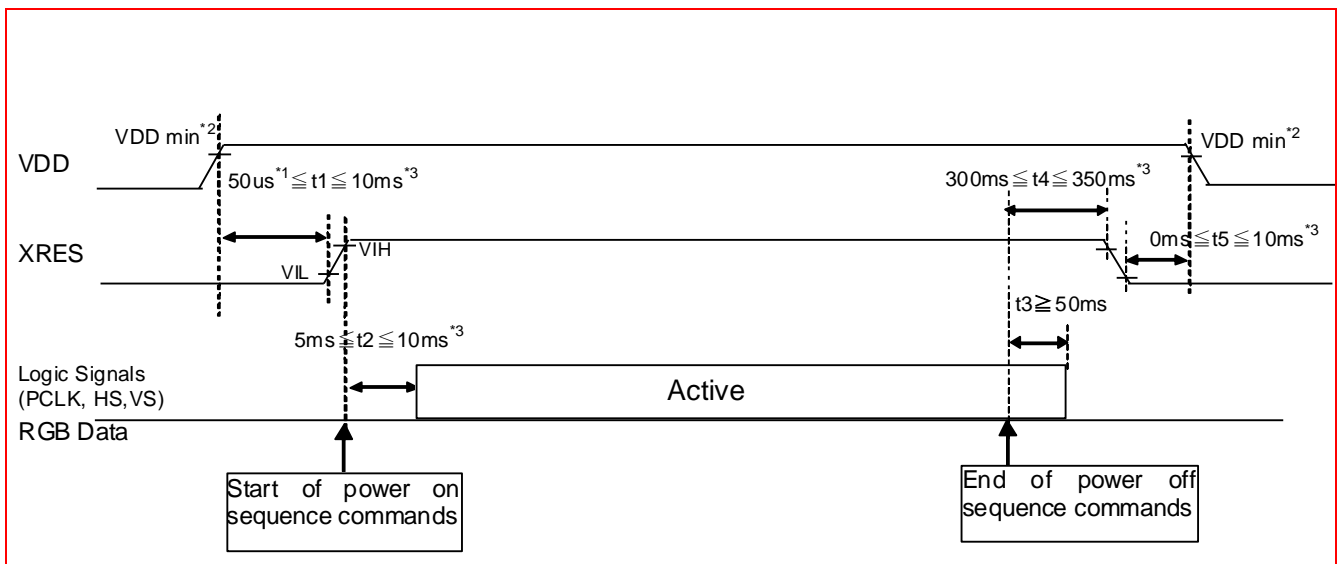
Note1: Reset must be maintained to low level (VIL) more than 50us after turning on the system power(VDD).

Note2: VDD(min.) is minimum voltage of VDD. Please refer to 4.1 DC CHARACTERISTICS.

Note3: The maximum values are defined for t1, t2, t4 and t5 because a few DC voltage is applied for LCD panel. If they are above the maximum values, there is possibility to decrease the display quality (e.g. increasing flicker).

Note4: The rising speed of VDD should be less than 2V/100us.

4.5.1 Power on sequence

Signals	Commands		Hex Data	Remarks
Power on (VDD)				-
XRES = Low (VIL) between 50us to 10ms (t1)				-
XRES = High (VIH) reset release				-
Wait more than 5ms (t2)				
Start to input control signals (PCLK, VS, HS, R[5:0], G[5:0], B[5:0])	MSSET	CMD	D0h	Total time should be less than 10ms.
		P1	03h	
	DISCTL	CMD	C0h	
		P1	11h	
		P2	11h	
		P3	01h	
	SLPOUT	CMD	11h	
Wait more than 100ms				-
DISON	CMD		29h	-

4.5.2 Power off sequence

Signals	Command		Hex Data	Remarks
Input control signals are active. (PCLK, VS, HS, R[5:0], G[5:0], B[5:0])	SLPIN	CMD	10h	-
Wait time more than 50ms (t3)				
Stop to input control signals (PCLK, VS, HS, R[5:0], G[5:0], B[5:0])				-
Wait time (t4)				
XRES = Low (VIL) enter reset				-
Wait between 0ms to 10ms (t5)				-
Power off (VDD)				-

4.5.3   Refresh sequence

The refresh sequence recovers normal displaying when the display becomes unexpected status because of temporary external factors like ESD, et al.

It is recommended to run this sequence periodically at display in.

Command		Hex Data	Remarks
COLMOD	CMD	3Ah	-
	P1	60h	-
NORON	CMD	13h	-
MSSET	CMD	D0h	Auto Refresh ON
	P1	03h	-
DISCTL	CMD	C0h	-
	P1	11h	-
	P2	11h	-
	P3	01h	-
DISON	CMD	29h	-
SLPOUT	CMD	11h	-
Wait more than 5ms Until entering next command			-

4.5.4   INTERVAL POWER ON AND OFF
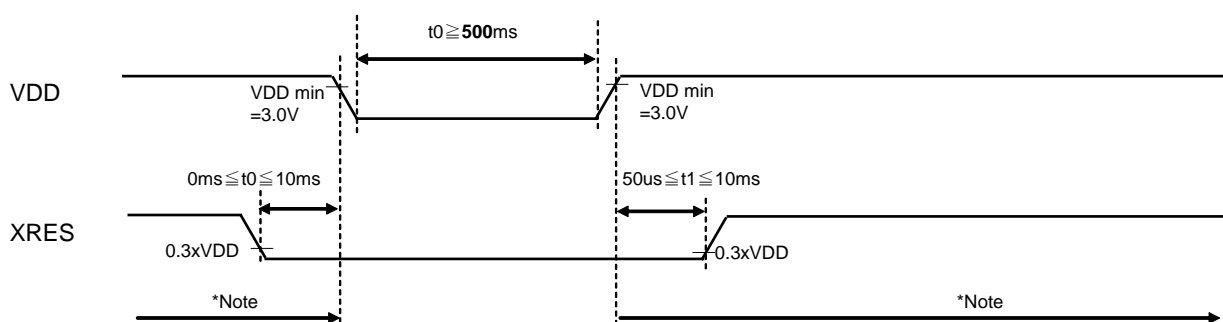
Note:

Please refer to 4.5 RECOMMENDED SEQUENCE when system power(VDD) is stopped and when system power(VDD) is running.

5 OPTICAL SPECIFICATION

5.1 OPTICAL CHARACTERISTICS

Ta=25deg. C

PARAMETERS	CONDITION	SYMBOL	RATINGS			UNIT	REMARKS
			Min.	Typ.	Max.		
Contrast ratio	θ= 0 deg.	CR	400	700	-	-	Note 1, 4, 5
Response time	θ= 0 deg.	tr + tf	-	30	40	msec.	Note 1, 3, 5
Brightness	θ= 0 deg.	B	450	650	-	cd/m^2	Note 1, 5
NTSC ratio	θ= 0 deg.	-	50	56	-	%	Note 1, 5
Viewing angle	CR$\geqq$100	θB	70	80	-	deg	Note 1, 2, 4, 5
		θR	70	80	-		
		θT	70	80	-		
		θL	70	80	-		
Luminance homogeneity	Max brightness	U	75	80		%	Note 1, 7
White chromaticity	Max brightness	Wx	Note.8	0.332	Note.8	-	Note 1, 5
	Max brightness	Wy	Note.8	0.348	Note.8	-	Note 1, 5
Red chromaticity	Max brightness	Rx	0.570	0.607	0.644	-	Note 1, 5
	Max brightness	Ry	0.318	0.342	0.365	-	Note 1, 5
Green chromaticity	Max brightness	Gx	0.292	0.326	0.360	-	Note 1, 5
	Max brightness	Gy	0.524	0.568	0.612	-	Note 1, 5
Blue chromaticity	Max brightness	Bx	0.132	0.161	0.190	-	Note 1, 5
	Max brightness	By	0.054	0.093	0.132	-	Note 1, 5

5.2 DEFINITION AND CONDITION OF OPTICAL CHARACTERISTICS

Note1) Measurement condition

- (1) Measurement equipment: DMS 301 / DMS 803
- (2) Ambient temperature Ta: 25 ± 3 deg. C
- (3) LCD: All pixels are WHITE, VDD=3.3V, fclk=33MHz, fV=60Hz
- (4) Measure after 15 minutes of LED warm up.
- (5) IF=320(80x4)mA for LED.
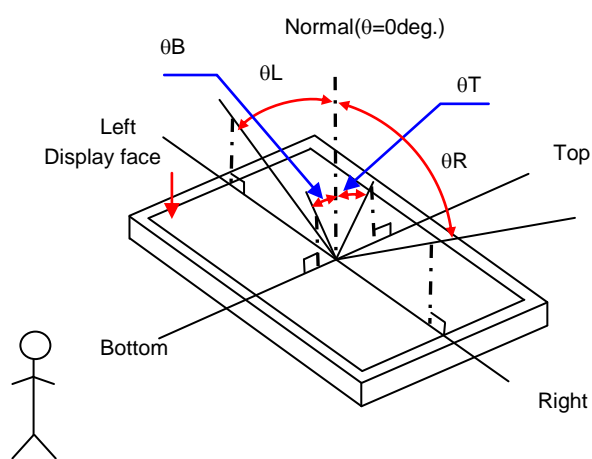
Note 2) Definition of viewing angle   Note 3) Response time
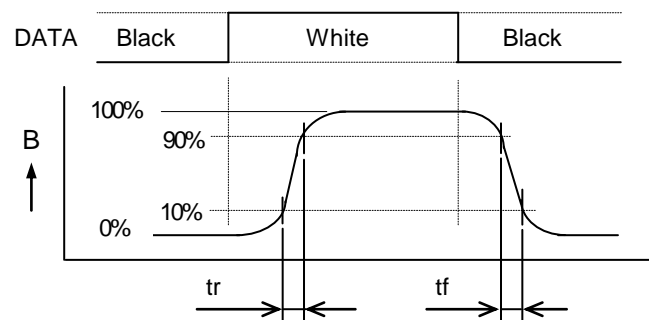
Note 4) Contrast ratio "CR":

$$CR = \frac{\text{Brightness at White}}{\text{Brightness at Black}}$$

Note 5) These parameters shall be measured at center of active area. (refer to Note 6)

Note 6) Measurement points

Vp: Total number of vertical pixel
Hp: Total number of horizontal pixel
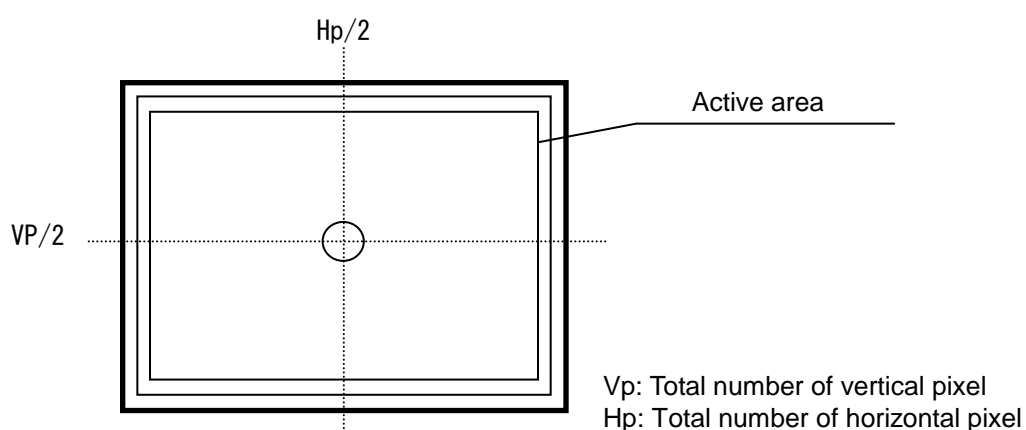
Note 7) Luminance homogeneity
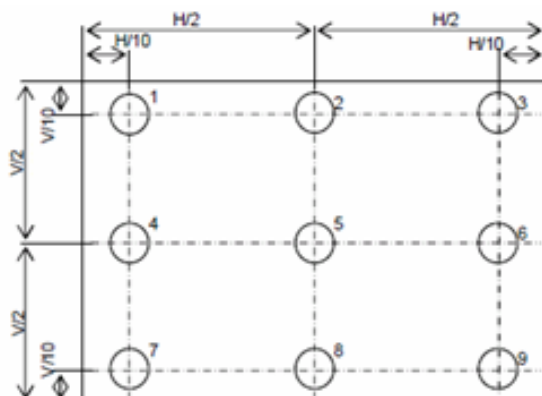
$$\textit{Luminance homogeneity} = \frac{\textit{B min.}}{\textit{B max.}} \; \textit{X 100} \qquad \textit{[\%]}$$

Note 8) White chromaticity
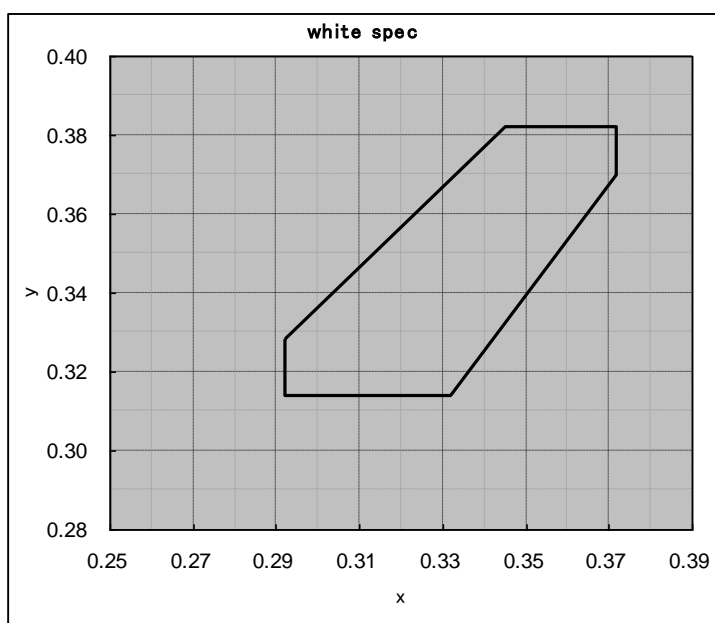
	x	y
a	0.292	0.328
b	0.292	0.314
c	0.332	0.314
d	0.372	0.370
e	0.372	0.382
f	0.345	0.382

6   INSPECTION STANDARD

6.1   QUALITY STANDARD
6.1.1   Standards

Each lot should satisfy the quality standards as shown below.

* Inspection method: Compliant with ANSI/ASQC Z1.4-1993, Normal inspection level II, inspection by single sampling.

* AQL

Defect type	AQL	Definition
Major defects	0.4%	Accompanied with functional abnormalities
Minor defects	0.65%	out of the range of "5.2 APPEARANCE STANDARDS", but no functional abnormalities

6.1.2   Lot

Lot means the unit includes all products delivered to your company at one time.

6.1.3   Inspection condition

1) Enviromental conditions :

   1. Temperature/humidity condtion :   Normal temprature (25+- 5 degrees)

                                       Normal humidity   （60+-20%RH）

   2. Iluminance environment :   Not lighted appearance   800～2000Lx

                               Lighted appearance :   Transmissive type   100～ 400Lx

                                          Semi-Transmissive   800～2000Lx

                               * Some specified patterns : 50Lx or the less

2) Inspection method : Inspection by naked eye

Inspect the screen by naked eye from a distance of about 30 cm and the angle shall be 30 degrees
from the vertical direction to the product.

Veiwing angle is 30 degrees from the vertical direction as shown in the picture below.
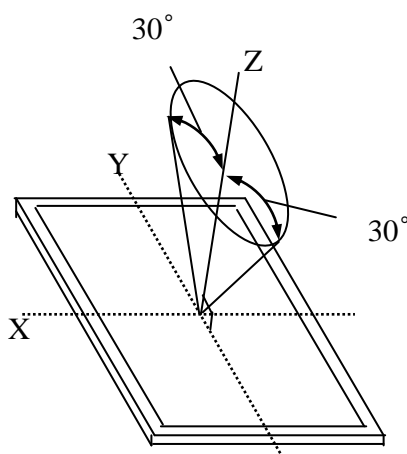
3) Drive condition :   It is done pursuant to product specification.

6.1.4   treatment of other problems

If any troubles should occur concerns our products that have been assembled at your company's manufacturing processes, both companies shall jointly investigate and resolve the causes.

6.2   APPEARANCE STANDARD
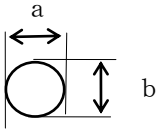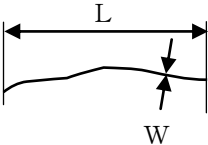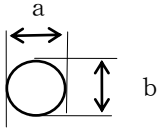
6.2.1   Application scope

The application scope is limited to the viewing area.
The product should be judged non-defective if all defects are outside of the viewing area and do not interfere with product quality or the assembly process.
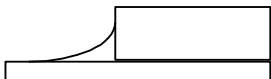
Note：Viewing area = Bezel opening area.

6.2.2   Display appearance standard

No.	Items	Judgment criteria	Class
1	Abnormal display	Must not be abnormal function such as not function or not to get normal pattern for input signal, etc.	Major
2	Line defect (Open, Short)	No line defect	Major
3	Dot defect (Dot failure)	(see table below)	Minor
4	Dot type defect $d = (a + b) / 2$	(see table below)	Minor
5	Line type defect (Black/ White)	(see table below)	Minor
6	Unevenness Display	Should not be remarkable.	Minor
7	Bubble in Polarizer $d = (a + b) / 2$	(see table below)	Minor

No. 3 Dot defect (Dot failure)

No.	Item	Bright dot	Dark dot	Total
1	Defect in screen	2	5	5
2	Combined defect	2		2

Distance between dots : D   D>=5mm
The smallest one unit R,G or B is defined as one dot.

Less than 60 % of one dot area is acceptable.

No. 4 Dot type defect

Size d (mm)	Tolerance
d =< 0.15	ignored
0.15 < d =< 0.4	3
0.4 < d	0

Distance between defects : D D>=5mm

No. 5 Line type defect

Length L (mm)	Width W (mm)	Tolerance
ignored	W=<0.05	ignored
L =< 10.0	0.05 < W=<0.1	3
	0.1 < W	Dot type defect

Distance between defects : D D>=5mm

No. 7 Bubble in Polarizer

Diameter d(mm)	Tolerance
d =< 0.3	ignored
0.3 < d =< 0.5	3
0.5 < d =< 1.0	1
1.0 < d	0

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6.2.3 General Appearance Specifications

No.	Items	Judgment criteria	Class
1	different specifications	Not permitted.	Major
2	Damaged resist on FPC	Copper patterns on FPC must not be visible.	Minor
3	Circuit pattern	Must not be peeled or separated from FPC.	Major
4	Conductive refuses	No solder refuses or solder balls easily moving. Fixed particle which has no functional affect can be ignored.	Minor
5	Dirt	Should not be prominent. Dirt on backside is permitted.	Minor
6	I/F terminal scratch / dirt	Should not be prominent.	Minor
7	Plating	Must not be peeled, no rust and no discoloration.	Minor
8	Soldering defect	Solder omissions is not permitted at any solder point. Solder bridges is not permitted. Cold soldering is not permitted.	Major Major Minor
9	Parts soldering	There must be fillet.	Minor
10	Metal frame Scratch / discoloration	Scratch out of viewing area and discoloration shall be ignored.	Minor

6.3 WARRANTY

Japan Display Inc. warrants this product for a period of 14 months from the date of delivery.

We replace or compensate for the defective product which is judged as our responsibility within the term of warranty.

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7   RELIABILITY

7.1   STANDARD TEST ITEM AND CONDITON / METHOD

Test item	Test condition	Confirm method / Judgment
Dry heat Operating	85 deg.C (surface temperature of polarizer), 240Hr	After 240 hours, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.
Low temperature Operating	-30 deg.C, 240Hr	After 240 hours, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.
Dry heat Storage	85 deg.C, 240Hr	After 240 hours, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.
Low temperature Storage	-40 deg.C, 240Hr	After 240 hours, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.
High temperature High humidity Operating	60 deg.C, 90%RH, 240Hr	After 240 hours, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.
Thermal shock	-40 deg.C(30min.) +85 deg.C(30min.),200 cycles	After 200 cycles, product will be left in normal temperature and normal humidity for two hours. It should work without fail mechanically and electrically, and standard in 6.2 has to be met.

Vibration (Non-operating)	Vibration frequency: 8~33.3Hz, Amplitude 1.3mm Vibration frequency: 33.3~400Hz, Acceleration:3G, Cycle 15min. Direction of XZ: 2Hr, Direction of Y: 4Hr	Product should work without fail mechanically and electrically and standard in 6.2 has to be met.
Impact (Non-operating)	100G, 6ms, half sin wave,±XYZ One time for every direction.	Product should work without fail mechanically and electrically and standard in 6.2 has to be met.
ESD (Non-operating)	Conduct Discharge 100pF, 1500ohm, ±15k Panel center 3 times (intervals of 1s) Non-operating	No abnormality like abnormal display. Current consumption should be less than twice of initial value.
ESD (Non-operating)	Air Discharge 100pF, 1500ohm, ±15k 4 points to metal frame 3 times for each, (intervals of 1s) Non-operating	No abnormality like abnormal display. Current consumption should be less than twice of initial value.

7.2 FAILURE JUDGMENT STANDARD

After reliability test, inspection is executed in the normal temperature / humidity environment
1) There should be no remarkable deterioration in display quality and appearance.
2) Contrast ratio should be over 50% of initial value.
3) Brightness should be over 50% of initial value.
4) There should be no abnormal function.
5) Current consumption should be less than twice of initial value.

8   PACKING

Japan Display Inc. make packaging as shown below to protect the products
from shock and vibration during transportation.

The print of static protective
sack is the back of the module.

Static electric
protective sack

TFT-LCD

Static protective
sack is bent

Board 1 (185x115) ×3pcs

Upper tray

Silicagel 1pcs

Bottom tray

Module 10pcs is put in tray 1set.

Poly bag

Air cushion1(PE)
Set air dome
direction outside.

Air cushion2(PE)
Set air dome
direction outside.

Upper tray
(PS conductive)

Silicagel(1P)

Bottom tray(10p)
(PS conductive)

TFT-LCD module 2P

Upper/Bottom tray 2set
(PS conductive)

Upper cushion (PE)

Bottom cushion(PE)

Corrugated fibreboard

Carton box

Lot Label

Care mark

PP adhesive tape

Carton　label

9   LCD MODULE USAGE AND PRECAUTIONS

9.1   HANDLING

1) Broken glass:

Be careful to broken glass of display surface. When the display surface is damaged, be careful enough not to cut hands by a piece of glass. The surface of a LCD Module is covered by plastic film, and glass is hard to be scattered, but there can be the hurt when touching a broken portion.

2) Broken panel:

Do not touch the liquid which flowed out of a panel. When a panel is damaged, and liquid flow, do not breathe in the liquid or drink it or touch it. When liquid stuck to a hand or clothes, wipe it off in soap or alcohol immediately, then wash in water. When liquid touched to eyes, wash eyes with washing water more than 15 minutes, and undergo a medical treatment of a doctor.

3) Preventing of stain and dust:

Handle a LCD module as much as possible in a room with a few dusts. In addition, when in acceptance inspection or installing process, wear a finger case or the soft gloves which do not make a dust to prevent stain of display surface of a module.

4) Protection film of display surface:

Remove a protection film of display surface in the latest possible assembly process to prevent from dust or scratch on display surface.

5) Wiping off of stain on display surface:

When display surface of a LCD module was stained, please wipe it off lightly with clean cotton or soft cloth.

6) Water drops on display surface:

Do not leave the water drops on the display surface. When water drops are stuck on the surface, wipe it off with cotton or soft cloth immediately. Display surface may change color and get a stain of water. In addition, when water drops flow into the LCD module inside, it may cause a trouble or damage.

7) Disassemble or modify of LCD module:

Do not attempt to disassemble, rework or modify the LCD module by any means. There is the possibility of electric shock, destruction of electronic parts, scratch on a display surface, or dust passing into a LCD module. And if using disassembled, reworked or modified LCD module, electronic parts might emit smoke or outbreak a fire by dust or malfunction of electronic parts. A product guarantee becomes not available for a LCD module which disassembled, reworked or modified by the user.

8) Countermeasures to static electricity:

C-MOS LSI and an electronic part of the LCD module inside can be destroyed by static electricity. In order not to apply static electricity to a LCD module, spread a conductive mat to a floor and a work desk. In addition, worker should wear a wrist strap. Pay attention not to apply static electricity while at work. It is recommended to use anti-static electricity air gun in assembly line for LCD.

9) How to insert the connector:

When inserting a FPC or take it off, make attention so that strong external force is not added to a FPC the LCD module. The inside connection of LCD driver can be damaged by a strong external force. When installing a LCD module to a target, make attention not to put these FPC between the case of target and the LCD module. A connector of a parent application and an input FPC of target should not be inserted slantways or

half-ways. And confirm it by all means. When it is not inserted correctly, a circuit and a part might be damaged.

10) Handling of FPC:
Be careful not to pull or damage a FPC. Damage of a FPC may cause troubles to the LCD module unit.

9.2 DESIGN

1) Absolute maximum ratings:
Follow the absolute maximum ratings specified in this document by all means. The absolute maximum rating is the rating which LCD module must not be violated. When using a LCD module at the condition beyond those, a burning/destruction of electronic parts or a permanent damage of characteristics may be caused. Therefore, make appropriate design not to violate the absolute maximum ratings with consideration of environmental temperature, deviation of input signals, and electronic parts tolerances.

2) Torsion and bending while in the process of installing:
Make attention that no torsion or bending stress is applied on a LCD module in the installing process to a target frame. Even if the stresses are temporarily, they might be the cause of trouble of a LCD module.

3) Preventing of a mechanical shock:
Be careful not to give a strong mechanical shock such as drops or shocks. There can be a cause of trouble such as a scratch of display surface or a malfunction of LCD module. Especially when FPC is bent strongly, FPC will be cut and LCD will be broken.

4) Preventing of a pressure on display surface:
Make attention that no strong external force such as pushing strongly on display surface of a LCD module. Because there can be a scratch on display surface or a cause of trouble of a LCD module.

5) Preventing of a scratch on display surface:
Make attention not to rub or push a display surface of a LCD module by a rigid thing such as tools. In addition, be sure not to put a heavy thing such as a tool on display surface and not to pile up LCD modules each other. A polarizer used for display surface is easy to get a scratch or traces and it might be damaged.

6) Installation holes, torsion, bending:
Japan Display Inc. recommends use of all installation holes shown in this document. In addition, a screw to use should be of proper dimensions according to specifications. In addition, Installation portions of a LCD module should be designed not to be applied excess torsion or bending. There might be a display unevenness by application of a stress during installation even if the LCD module has an evenness for display itself.

7) Power supply sequence:
The power supply and the input signals of the users' product unit and the inspection circuit, etc., connecting to LCD module, which satisfy the power supply sequence of the recommended operating condition, must be used.

8) Power supply circuit protection device:
Please examine and apply the power supply circuit protection device if necessary when the LCD module breaks down in accordance with the use condition.

9) Recommendation for use of a protection cover and a UV cut filter:
Japan Display Inc. recommends use of a transparent protection cover on a liquid crystal display aperture to prevent scratch and dust of display surface and invasion of water, when using under a too cruel condition in

such as outdoors. Furthermore, Japan Display Inc. recommends use of a U.V. cut filter (cuts 390nm or less wave length) when it is exposed to direct rays of the sun for a long time. Please consider it so that dew condensation does not occur in the cover.

10) Temperature dependence of display:
The response (optical response) of display varies with temperature. The response becomes slow at low temperature. In addition, brightness and chromaticity vary with temperature, too.

11) Dew condensation:
In an environment of sudden temperature change, there might be a dew condensation on surface or inside of a LCD module. Because it causes a degradation of display or malfunction, be sure to make consideration for design that dew condensation does not occur.

12) Image sticking:
It is recommended to avoid display same image for long term in order to prevent causing image sticking. Also even at displaying moving image, displaying in trimmed image such as pillar-box or letterbox for long term, or repeated frequently, could cause image sticking due to the characteristics of LCD. Displaying in full screen is recommended. Interlace driving will cause image sticking on the display. Please apply non-interlace driving.
In case a image sticking occurred, applying full gray image may work for recovery of sticking image for some, however if severe image sticking occurred by stationary image for more long stretch of time, this recovery measure does not work Please pay attention on these notes at designing

13) Caution about INTERLACE and FRC driving:
Do not input driving signal which apply different voltage in each frame alternately.
These driving may cause abnormal image such as image sticking by DC imbalance.

Please avoid using following driving method basically.
Interlace signal (PAL, NTSC) and FRC (Frame Rate Control)
Because it is leads inappropriate DC apply to LC, and avoidance method is complicated.

The countermeasures written in this section have possibility of some image degradation

♦　INTERLACE
The following driving cause some abnormal display.
Resize (expand / shrink) of interlace signal source. (50/ 60 FPS)
Complement of interlace signal source

Ex. Display NTSC signal source (480 vertical lines) is shrank to WQVGA (240 vertical lines) LCD.

Progressive Data

Odd Frame

Even Frame

1
2
3
4
5

Original Data

Frame for transmission of
Odd number line only (1/60s)

Frame for transmission of
Even number line only (1/60s)

White

DC Imbarance

Average of LC Applied
Voltage

VCOM

Black

LC Applied Voltage

Time
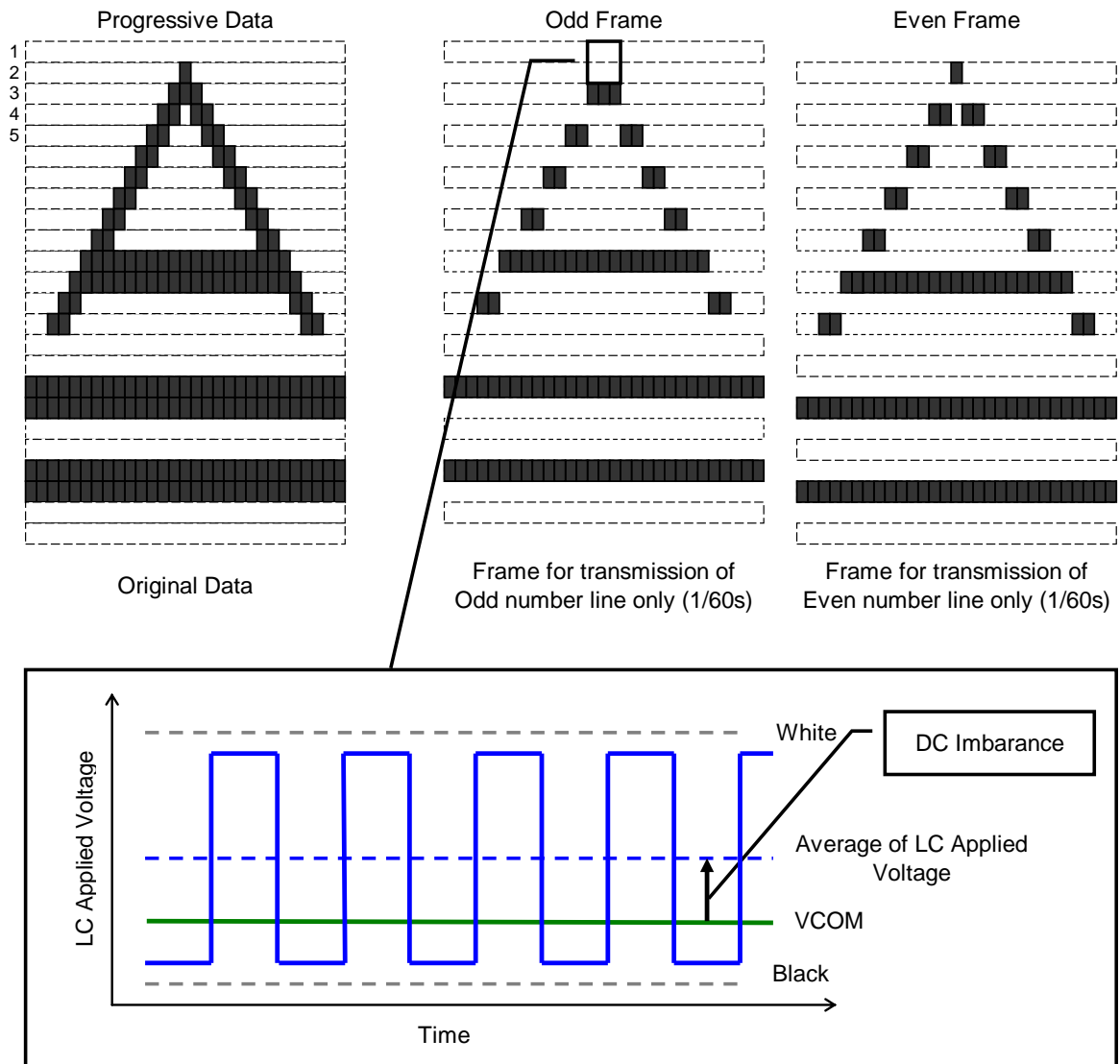
Countermeasure

Following driving method by frame memory in your system improves DC imbalance.

1. Store an odd frame data to the frame memory.

2. Drive with data in frame memory in steps of 2 frames. It means an even frame data is not used.

♦ FRC

Also the different voltage is applied to LC in each frame caused by the frame rate control.

Display Data

Odd Frame

Odd Frame

=

+
-
+
-

-
+
-
+
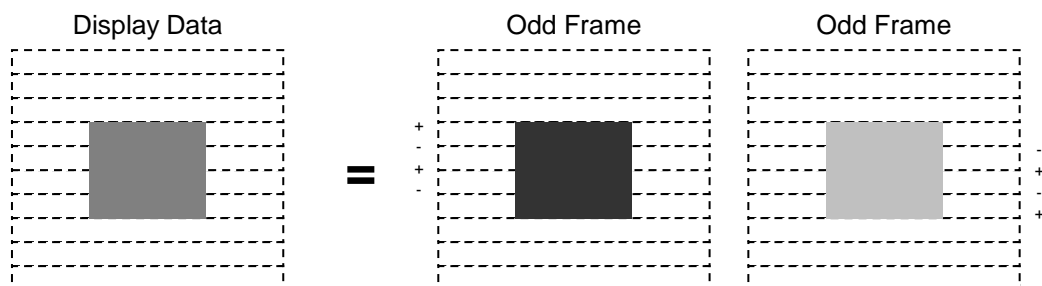
Figure 23 FRC driving

9.3 STORAGE

1) Storage and transport:

Keep a LCD module with a packing form of shipment in a dark room which direct rays of the sun does not irradiate with low temperature, with low humidity, and with no dew condensation. In addition, keep it in an environment with little temperature change because there is the possibility that dew condensation occurs by a sudden temperature change. When dew condensation occurs, it may be a cause of operation abnormality or trouble.

The shipping carton must not be stacked up over 2m in height.

2) Transport:

Because the master carton may be damaged or shape transformed by an excessive load applied, store and transport with piled up in lower than the number which recorded in a master carton label.

Trays are used to package LCD modules for shipment. If LCD modules scratch the tray during shipment, material of the scratched tray may be left onto LCD modules. In such case, clean up LCD modules after removal from trays.

3) Handling:

Because a LCD module is a product having precision electronic parts (FPC etc.) and glass products, it might be damaged by an excessive shock or a dropping, for example, stress by hand. Although a LCD module does protected with master carton, handle it carefully to reduce a shock in transshipping, transporting and loading.

9.4 DISPOSAL

Disposing LCD modules:

When disposing LCD modules, consult a company specialized in industrial waste treatment which is permitted by the government or the local authority.

9.5 OTHER PRECAUTIONS

1) This product is developed and manufactured for the usage of general AV equipments and is not suitable for devices that require high reliability and safety (aircraft/space use equipments, nuclear control apparatus, life maintenance equipments, etc).

2) Use this product correctly according to the operating conditions and precautions that are stated in this specification. Design carefully to prevent accidents, fire hazards, and social damage because of this product.

3) Radiation proof design is not applied to this product.

4) Contents in this specification shall not guarantee any third party's intellectual property right or concession of other rights. Japan Display Inc. will not take responsibility for the industrial property issue arising between the user and a third party.

5) This specification includes copyright-related contents. It is strictly prohibited to make partial/full reprints or duplicate copies of this specification without the approval of Japan Display Inc.

6) Damages caused by the using beyond conditions or notices or precautions as mentions in this specifications, are responsible for the users.

7) The thickness of the LCD Module was measured while had suppressed.

8) This specification may be changed without a preliminary announcement to a customer.

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7)Module total height is measured except FPC and SMT components.
6)CN FPC float condition is outside of gurantee range.
5)All FPC terminal connecter : Iriso 9686, Au-plating
4)Do not scale this drawing.
3)():Reference dimension.
2)Cosmetic imperfection will be allowed outside the V.A..
Note1)This part should not contain any substances which are specified in Japan Display's
green-procurement guideline.

⟨Enlarged view of A⟩
(2 : 1)

⟨Enlarged view of B⟩
(2 : 1)

⟨Front view⟩

120
106.4(Bezel opening)
104.4(Active Area)
(63)
9.8
10.8
6.75
5.75
(93.75)
174(Active Area)
176(Bezel opening)
187.5

9.9
(Except FPC and components)

⟨Rear view⟩

(177.75)
(111.75)
6.2
7
35
6.2
53
(47)
(25.5)
158
(14.75)

Cut out in metal frame
CN2 : LED B/L terminal
CN1 : Module I/F terminal

Ni-Au plating
26.5
0.3
3
6.5 (Stiffener)

Detail view of CN1
(2:1)

Ni-Au plating
5.5
0.3
6.5 (Stiffener)
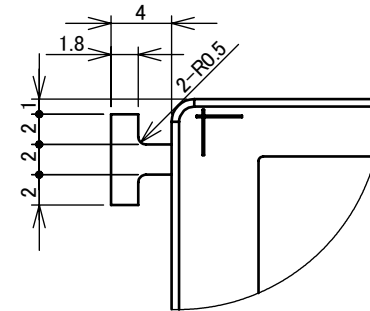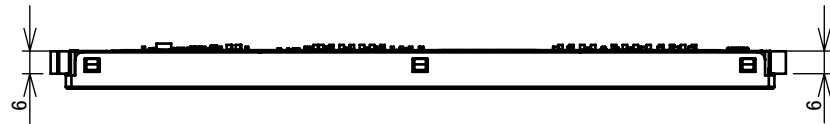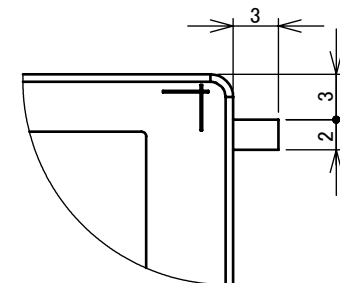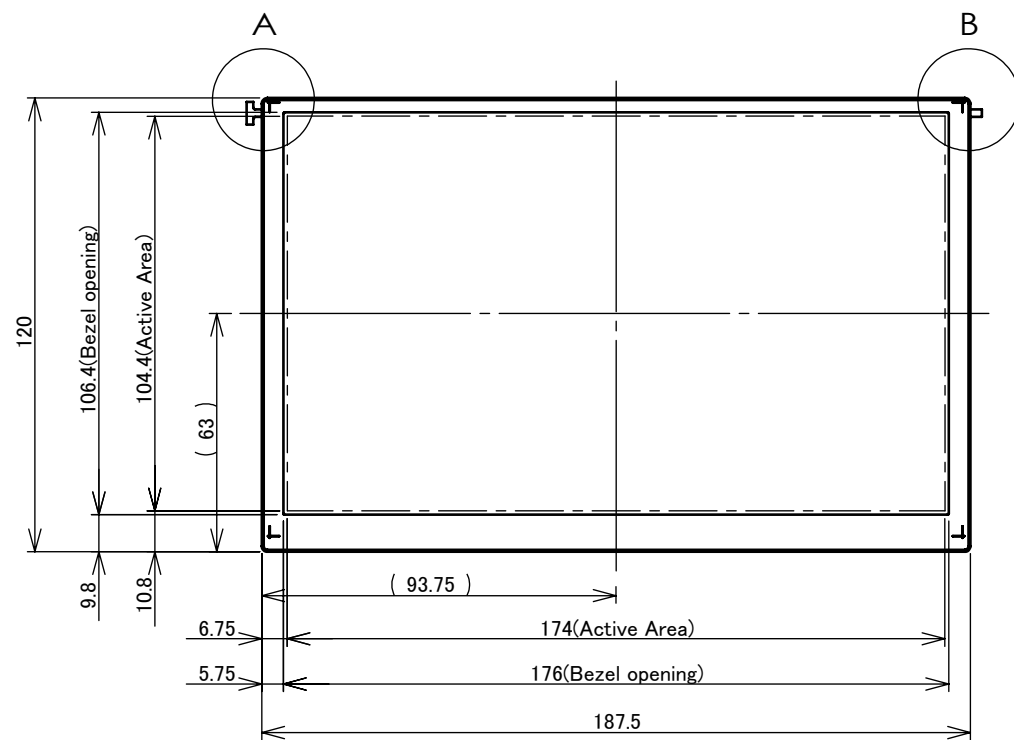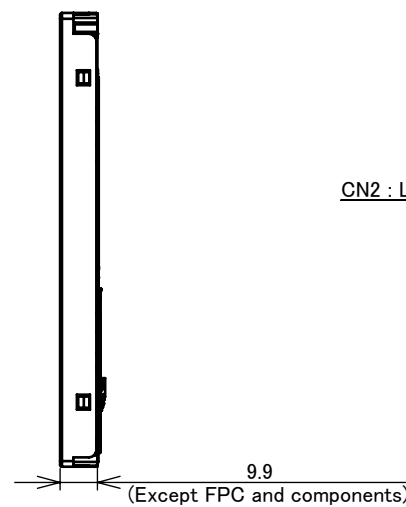
Detail view of CN2
(2:1)
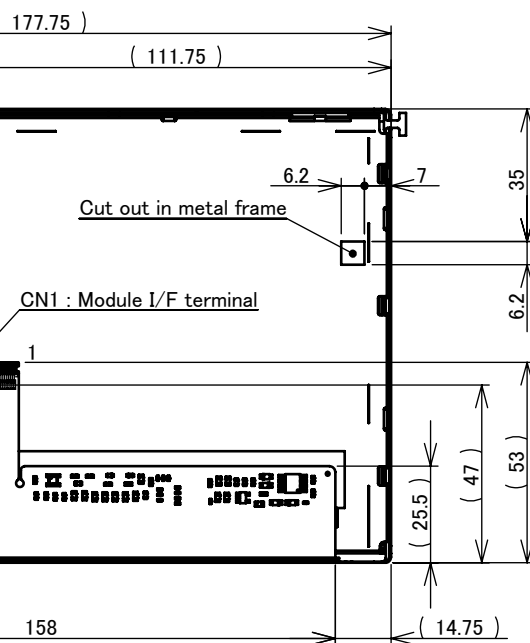
E CODE
M : L5S30978P02
P :
D : P087485-11-00
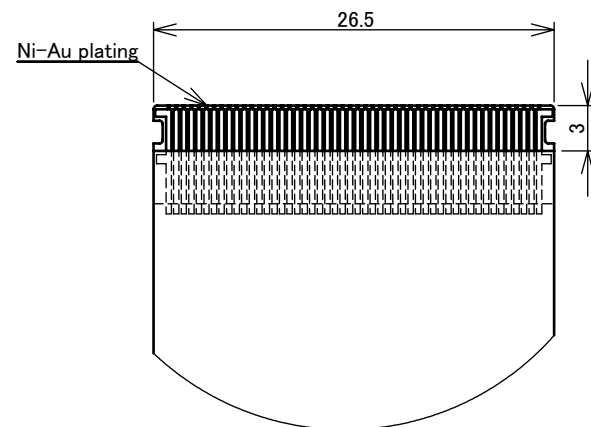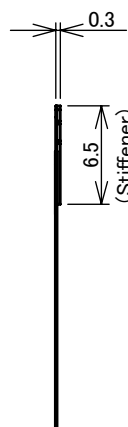
UNIT: mm
TOLERANCE
ANGLE: ±0.5
SCALE: 1 : 2
MATERIAL(COLOR)
FINISH(COLOR)
ORIGINAL MODEL: GCX074AKT-E

USED NO
RANK
FAMILY

HISTORY
SUFFIX
ECN-NO.
DATE
REVISION
SIGN
X COUNT
REPL

'13. **. **
P/N RELEASE
(*****)

DRAWN BY
車M設第2G
'13. **. **
池内

PLANNED BY
車M設第2G
'13. **. **
橋野

CHECKED BY
APPROVED BY
MODEL
GCX074AKT
PART NO.
TENTATIVE

TITLE/DESCRIPTION
(E) Outline drawing
(J) 外形図

PART NO.
SHEET
1 / 1

A3
'12.4

ISSUED '13. **. **

F spec - D32