LCD Module Technical Specification

First Edition
Feb. 15, 2010

Final Revision
******

Type No. **T-55040GD020JU-LW-AGN**

Customer : **OPTREX STANDARD**

Customer's Product No : **----------**

OPTREX CORPORATION

Apprroved : Yasuo Kawasaki
QUALITY ASSURANCE DIVISION

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Design G.

Prepared : Satoshi Sano
Design G.

APPROVED

By

Signature :
Date :

Please return this specification within two month with your signature.
If not returned within two month ,specification will be considered
as having been accepted.

Table of Contents

Revision History

Rev.	Date	Page	Comment

1. General Specifications

Operating Temp.	:	min. -20°C ~ max. 70°C
Storage Temp.	:	min. -30°C ~ max. 80°C
Display Format	:	240 × 3[R.G.B](W) × 320 (H) dots
Display Fonts	:	0.1275 (W) × 0.1275 (H)mm
Color Depth	:	262,144 colors
Viewing Area	:	30.6 (W) × 40.8 (H) mm （= active area）
Outline Dimensions	:	36.0 (W) ×*50.45 (H) × 2.5max.(D) mm * Without FPC and Parts area
Weight	:	8.3g max.
LCD Type	:	TFT / Normally white-mode / Transmissive
Viewing Angle	:	12:00(contrast max)
TFT Driver	:	S1D19120(EPSON)
Interface	:	8/9/16/18 bit 80 series MPU I/F, 16/18 bit RGB I/F + SPI
Backlight	:	3 chip LED Backlight / White
Drawings	:	Dimensional Outline : T-55040AF base
Lead free	:	Our product corresponds to lead free. Lead free is defined as below: 1) The solder used in the LCD module. 2) Electrical components (Terminal section) used in the LCD module. Any lead used within the electrical component does not apply to our module definition of lead free.

2. Electrical Specifications

2.1. Absolute Maximum Ratings

V_{SS}=0V

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage (Interface I/O)	V_{DDI}-V_{SS}	-	-0.3	4.6	V
Supply Voltage (Internal Logic)	V_{DD}	-	-0.3	2.5	V
Supply Voltage (LCD Drive)	V_{DD2}	-	-0.3	4.6	V
Input Voltage	V_{IN}	-	-0.3	V_{DD}+0.3	V

2.2. DC Characteristics

Ta=25°C, V_{SS}=0V

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Supply Voltage (Interface I/O)	V_{DDI}-V_{SS}	-	1.65	(2.0)	3.1	V
Supply Voltage (Internal Logic)	V_{DD}	-	1.65	-	1.95	V
Supply Voltage (LCD Drive)	V_{DD2}	-	2.4	(2.8)	3.1	V
"High" Level Input Voltage	V_{IH}		0.8×V_{DDI}	-	V_{DDI}	V
"Low" Level Input Voltage	V_{IL}		V_{SS}	-	0.2×V_{DDI}	V
"High" Level Output Voltage	V_{OH}	I_{OH}=-0.06mA V_{DD}=1.8V	V_{DDI} - 0.3	-	V_{DDI}	V
"Low" Level Output Voltage	V_{OL}	I_{OL}=0.06mA V_{DD}=1.8V	V_{SS}	-	V_{SS} + 0.3	V
Supply Current	I_{DDI}	Still Picture All Black V_{DDI}=2.0V V_{DD2}=2.8V V_{SYNC}=60Hz (RGB interface)	-	0.01	0.02	mA
	I_{DD2}		-	7.0	11.0	mA

*1 :Please always keep the condition of $V_{DD2} \geq V_{DDI}$.
*2 : All external clock timings are specified based on the 20% and 80% of V_{DDI}.
*3 : The rise and fall times (tr and tf) of the all external clock are specified for less than 10ns.

2.3.AC Characteristics

2.3.1.Parallel Interface

One time transfer mode write mode(18 bit mode and 16 bit mode) V_{DDI}=1.65~3.1V

Parameter	Symbol	Min.	Max.	Units
A0 Hold Time	t_{AH8}	5	-	ns
A0 Setup Time	t_{AS8}	5	-	ns
Write System Cycle Time	t_{CYCW8}	80		ns
WR Low Level Pulse Width	t_{CCLW}	40	-	ns
WR High Level Pulse Width	t_{CCHW}	15	-	ns
Read System Cycle Time	t_{CYCR8}	250	-	ns
RD Low Level Pulse Width	t_{CCLR}	200	-	ns
RD High Level Pulse Width	t_{CCHR}	40	-	ns
CS-WR Time	t_{CW8W}	50	-	ns
CS-RD Time	t_{CW8R}	200	-	ns
Data Setup Time	t_{DS8}	20	-	ns
Data Hold Time	t_{DH8}	5	-	ns
$\overline{RD}$ Access Time(CL=50pF)	t_{ACC8}	-	200	ns
Output Disable Time(CL=50pF)	t_{OH8}	10	100	ns

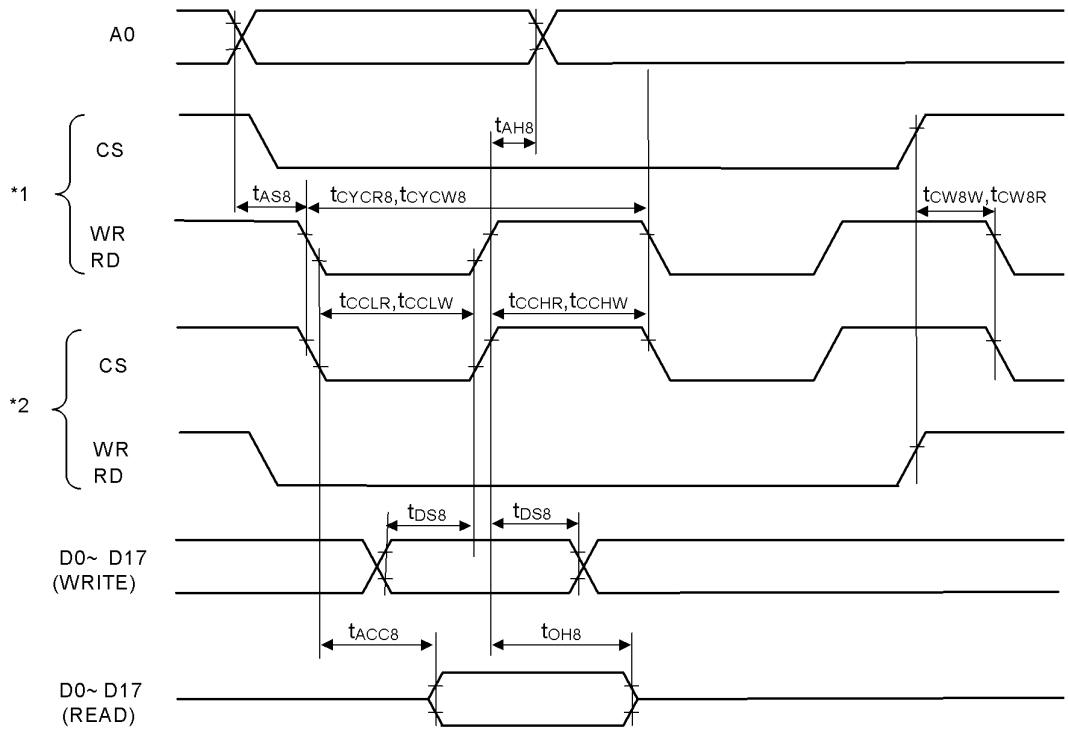
Two or three times transfer mode write mode(2+16 bit mode,16+2bit mode,8bit mode and 9 bit mode)

V_{DDI}=1.65~3.1V

Parameter	Symbol	Min.	Max.	Units
A0 Hold Time	t_{AH8}	5	-	ns
A0 Setup Time	t_{AS8}	5	-	ns
Write System Cycle Time	t_{CYCW8}	60		ns
WR Low Level Pulse Width	t_{CCLW}	40	-	ns
WR High Level Pulse Width	t_{CCHW}	15	-	ns
Read System Cycle Time	t_{CYCR8}	250	-	ns
RD Low Level Pulse Width	t_{CCLR}	200	-	ns
RD High Level Pulse Width	t_{CCHR}	40	-	ns
CS-WR Time	t_{CW8W}	50	-	ns
CS-RD Time	t_{CW8R}	200	-	ns
Data Setup Time	t_{DS8}	20	-	ns
Data Hold Time	t_{DH8}	5	-	ns
$\overline{RD}$ Access Time(CL=50pF)	t_{ACC8}	-	200	ns
Output Disable Time(CL=50pF)	t_{OH8}	10	100	ns

*1: All timings are specified based on the20% and 80 % of V_{DDI}.

*2: The rise and fall times (tr and tf) of the input signal are specified for less than 10 ns.



*1 If $\overline{CS}$=LOW and if accessed by $\overline{WR}$ or $\overline{RD}$ signal.
*2 If $\overline{WR}$=LOW and if accessed by $\overline{CS}$ signal.

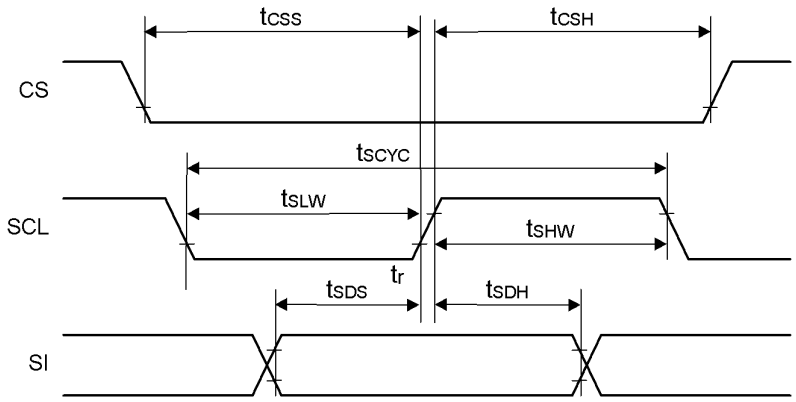
2.3.2.Serial Interface Sequence

V_{DDI}=1.65~3.1V

Parameter	Symbol	Min.	Max.	Units
SCL Cycle	t_{SCYC}	50	-	ns
SCL Low Level Pulse Width	t_{SLW}	15	-	ns
SCL High Level Pulse Width	t_{SHW}	15	-	ns
Data Setup Time	t_{SDS}	15	-	ns
Data Hold Time	t_{SDH}	10	-	ns
$\overline{CS}$ Setup Time	t_{CSS}	10	-	ns
$\overline{CS}$ Hold Time	t_{CSH}	50	-	ns

*1: All timings are specified based on the20% and 80 % of V_{DDI}.

*2: The rise and fall times (tr and tf) of the input signal are specified for less than 10 ns.



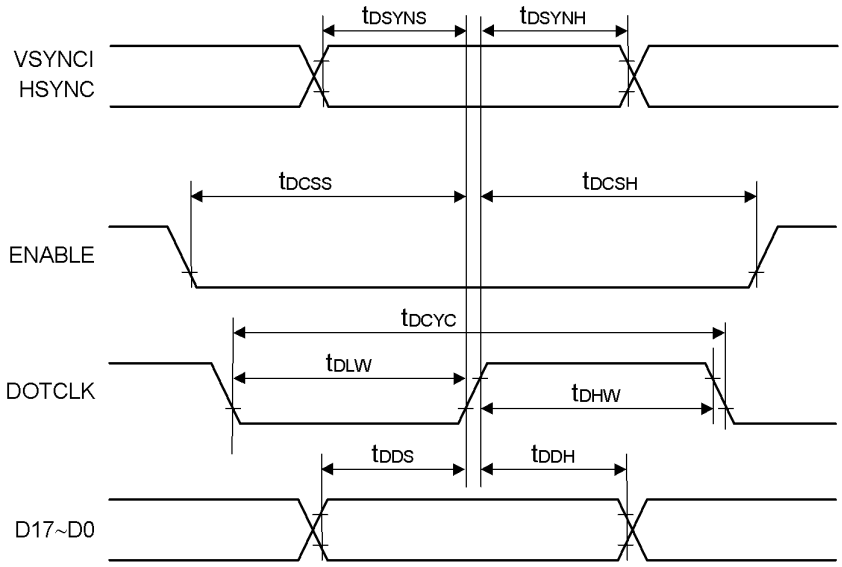
2.3.3.RGB Interface Sequence

V_{DDI}=1.65~3.1V

Parameter	Symbol	Min.	Max.	Units
DOTCLK Cycle	t_{DCYC}	70	-	ns
DOTCLK Low Level Pulse Width	t_{DLW}	30	-	ns
DOTCLK High Level Pulse Width	t_{DHW}	30	-	ns
Data Setup Time	t_{DDS}	15	-	ns
Data Hold Time	t_{DDH}	15	-	ns
ENABLE Setup Time	t_{DCSS}	15	-	ns
ENABLE Data Hold Time	t_{DCSH}	15	-	ns
SYNC Setup Time	t_{DSYNS}	15	-	ns
SYNC Hold Time	t_{DSYNH}	15	-	ns

*1: All timings are specified based on the20% and 80 % of V_{DDI}.

*2: The rise and fall times (tr and tf) of the input signal are specified for less than 10 ns.

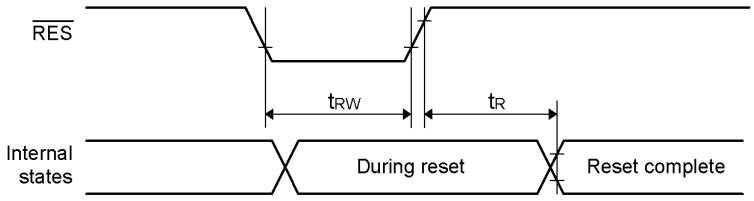


2.3.4.Display Control Timing Characteristics

Reset Input Timing V_{DDI}=1.65~3.1V

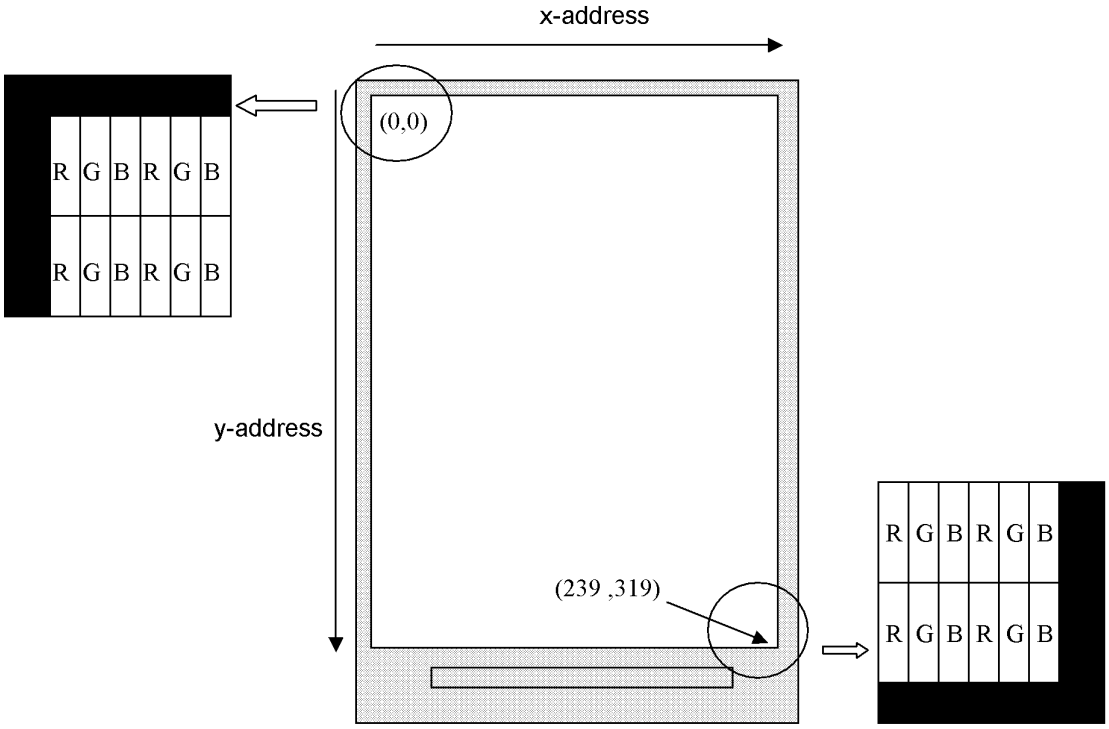
Parameter	Symbol	Min.	Typ.	Max.	Units
Reset time	t_R	-	-	1	μs
Reset "L" Pulse Width	t_{RW}	20	-	-	

*1: All timings are specified based on the20% and 80 % of V_{DDI}.
*2: The rise and fall times (tr and tf) of the input signal are specified for less than 10 ns.
*3: We recommend to hold the $\overline{RES}$ pin to LOW during power-on conditions.
*4: Applied when reseting while the power supply is stabilized.



2.4.Display screen

2.4.1.Correspondence of graphic memory data and display screen



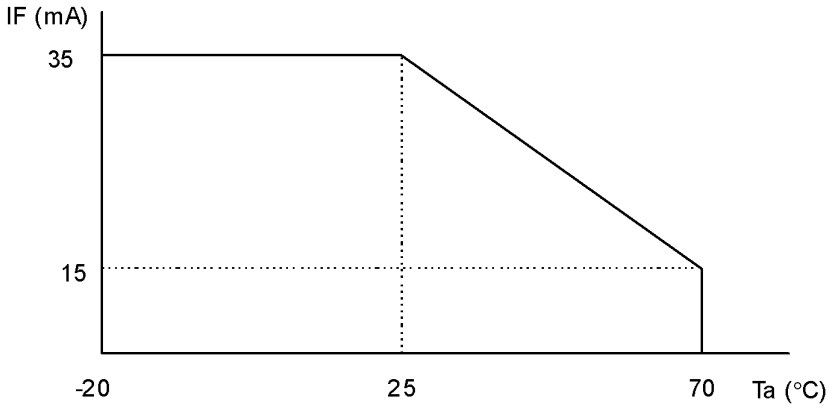
2.5.Lighting specification

2.5.1.Absolute maximum rating (for one chip)

T_a = 25 degrees C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Current	I_F	Note1	-	-	35	mA
Reverse Voltage	V_R	-	-	-	5.0	V
LED Power Dissipation	P_D	-	-	-	123	mW

Note1 : I_F max – Ta characteristics.



2.5.2.Operating characteristics

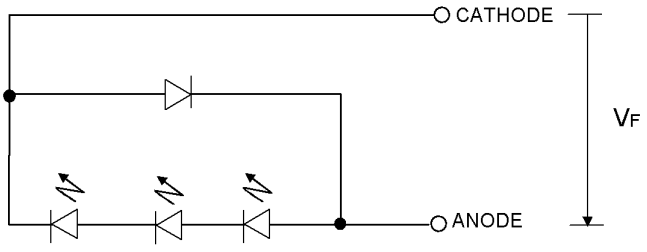
T_a = 25 degrees C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F =15mA	-	9.3	10.5	V
Luminance of Backlight Surface	L	I_F =15mA Note1	5500	5900	-	cd/m^2
Luminance Uniformity of Backlight Surface	-	I_F =15mA Note 2	75	-	-	%

Note 1: The measurement is done with backlight center.

Note 2: The measurement is done at 9 points.

LED circuit diagram



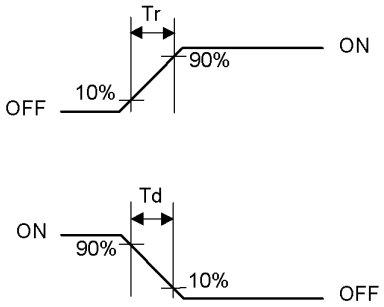
3. Optical specification

3.1. Optical Characteristic

Item		Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness			-	300	-	cd/m^2	Note 1
Transmittance			3.5	4.0	-	%	
Reflectance			0.5	1.0	-	%	
Viewing Angle			12:00 (Vertical 140°) (Horizontal 160°)				
Contrast Ratio	Transmission	25 deg. C	350	500	-	-	
Response Time	$T_r + T_d$	25 deg. C	-	28	40	ms	Note 2
		-20 deg. C	-	550	650	ms	
Color Area	Transmission		-	67	-	-	Gamut
Color / Transmission	White	x	0.25	0.30	0.35	-	
		y	0.27	0.32	0.37	-	
	Red	x	0.58	0.63	0.68	-	
		y	0.29	0.34	0.39	-	
	Green	x	0.26	0.31	0.36	-	
		y	0.56	0.61	0.66	-	
	Blue	x	0.10	0.15	0.20	-	
		y	0.02	0.07	0.12	-	

Note 1: 3 LEDs back light, 15mA/chip

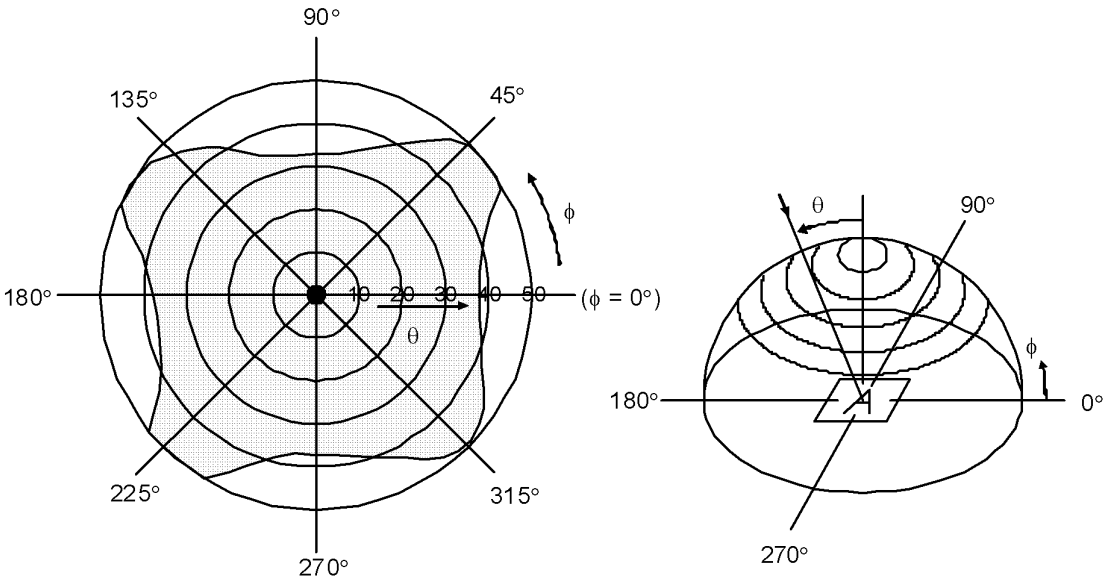
Note 2:



Note 3: Instrument CS-1000(MINOLTA) for transmissive.
Ring light(YOKOGAWA) for reflective.

3.2.Definition of Viewing Angle and Optimum Viewing Area

*Point • shows the point where contrast ratio is measured. : θ= 0°, ϕ= -°
*Driving condition: Ff=60Hz



*Area ▭ shows typ. CR≥100

4. I/O Terminal

4.1. Pin Assignment

No.	Symbol	Function
1	GND	Power Supply (0V, GND)
2	IF1	MPU Interface Switching Pin
3	IF2	MPU Interface Switching Pin
4	IF3	MPU Interface Switching Pin
5	RESEN	Reset Enabe H : XRES Signal is Active
6	XRES	Reset Signal L : Reset
7	XCS	Chip Select Signal L : Select
8	A0	H : D0~D7 are Display Data L : D0~D7 are Instructions
9	XWR	80 series CPU : Write Signal
10	XRD	80 series CPU : Read Signal
11	D0	Display Data
12	D1	Display Data
13	D2	Display Data
14	D3	Display Data
15	D4	Display Data
16	D5	Display Data
17	D6	Display Data
18	D7	Display Data
19	D8	Display Data
20	D9	Display Data
21	D10	Display Data
22	D11	Display Data
23	D12	Display Data
24	D13	Display Data
25	D14	Display Data
26	D15	Display Data
27	D16	Display Data
28	D17	Display Data
29	GND	Power Supply (0V, GND)
30	VSYNCO	Frame Synchronizing Output Signal
31	VSYNCI	Frame Synchronizing Signal
32	HSYNC	Line Synchronizing Signal
33	DOT CLOCK	Dot Clock Signal
34	ENABLE	Data Enable Signal in RGB Interface Mode

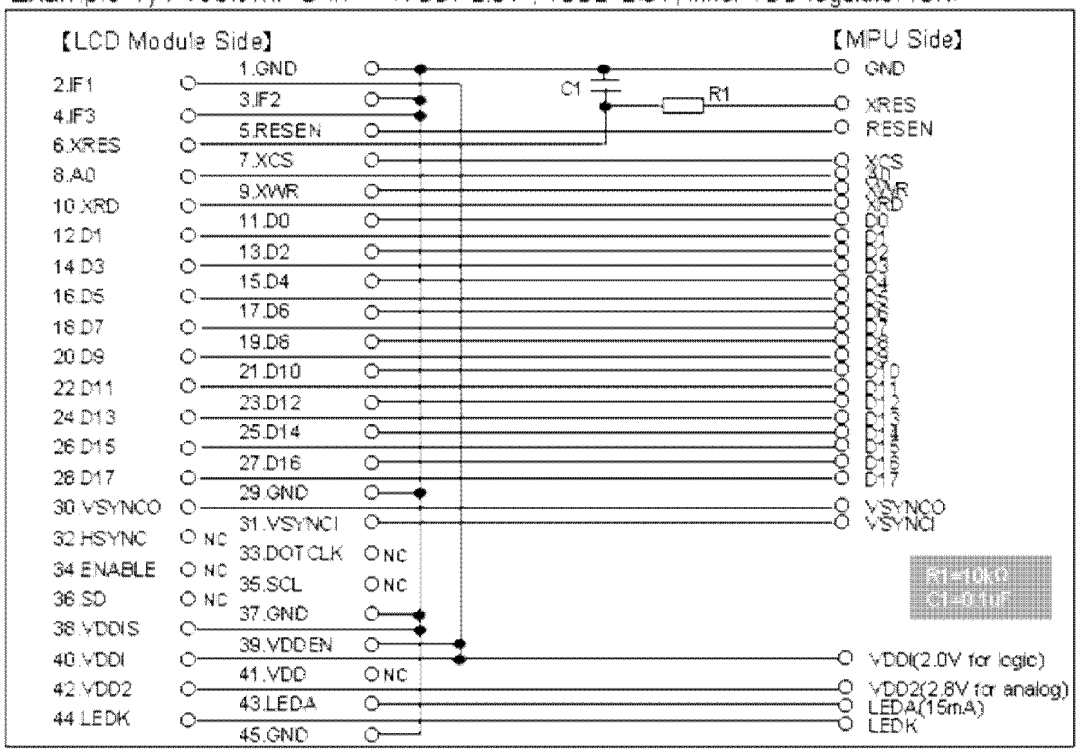
No.	Symbol	Function
35	SCL	Input for Serial Clock
36	SD	Serial Data Input Pin
37	GND	Power Supply (0V, GND)
38	VDDDIS	VDD Regulator's Disable Pin
39	VDDEN	VDD Regulator's Forced Enable Pin
40	VDDI	Power Supply (I/O)
41	VDD	Power Supply (Logic)
42	VDD2	Power Supply (Booster Circuit)
43	LED A	LED Anode Terminal
44	LED K	LED Cathode Terminal
45	GND	Power Supply (0V, GND)

[MPU Interface Switching Pin]

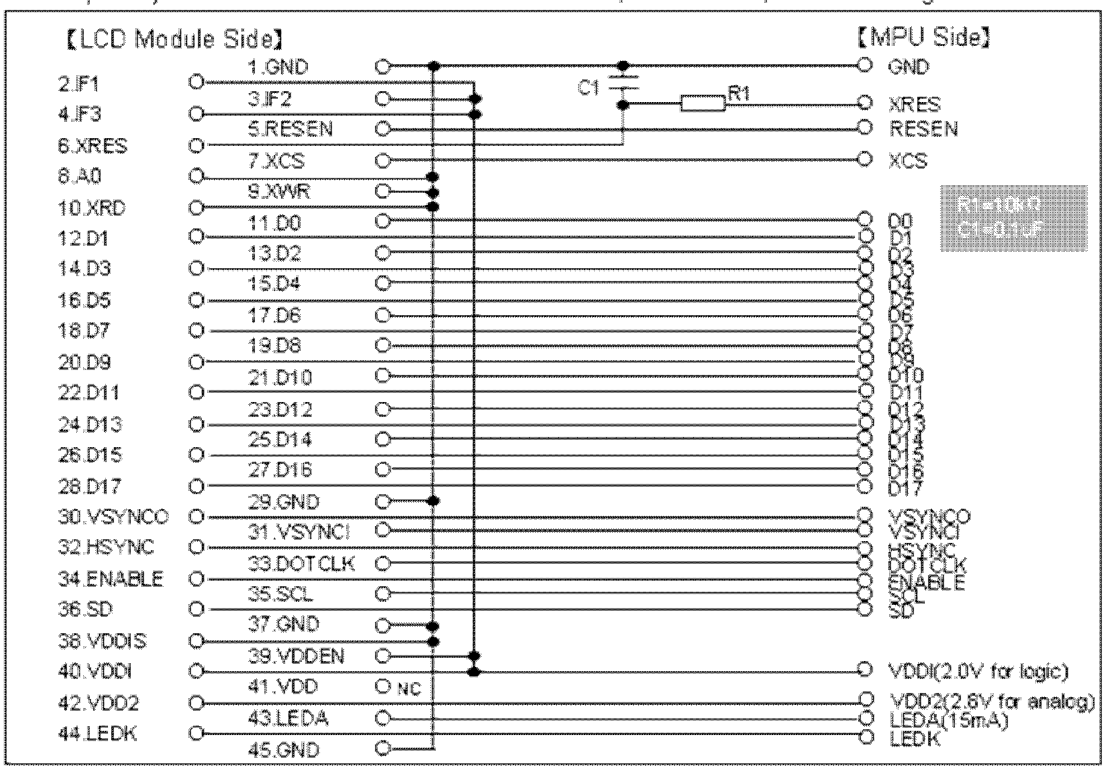
IF3	IF2	IF1	MPU Interface
L	L	L	16bit parallel
L	L	H	18bit parallel
L	H	L	8bit parallel
L	H	H	9bit parallel
H	H	H	9bit serial

4.2.Recommended External Circuit

Example 1) : 18bit MPU I/F <VDDI=2.0V , VDD2=2.8V, Inner VDD regulator :ON>



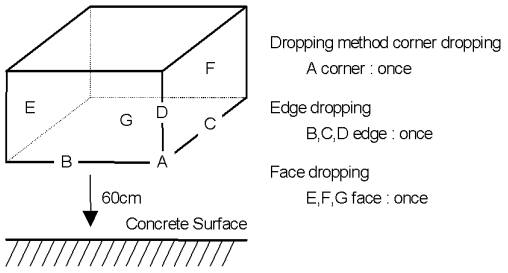
Example 2) : 18bit RGB I/F +SPI <VDDI=2.0V , VDD2=2.8V, Inner VDD regulator :ON>



5. Test

No abnormal function and appearance are found after following tests.

Conditions: Unless otherwise specified, tests will be conducted under the following condition.
Temperature : 25 +/- 5 degrees C
Humidity : 65 +/- 5 %RH
Tests will be not conducted under operating state unless specified.

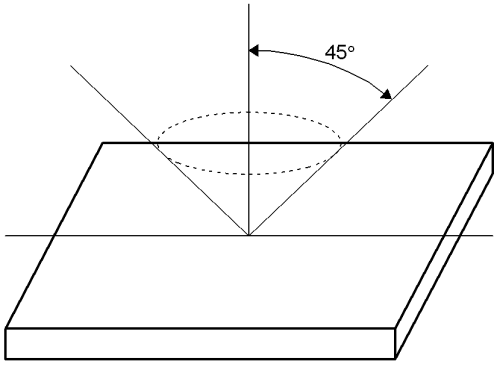
Test No.	Parameter	Conditions	Notes
1	High temperature operating	70 deg. C, 240 hours (operating state)	1
2	Low temperature operating	-20 deg. C, 240 hours (operating state)	2
3	High temperature storage	80 deg. C, 240 hours	3
4	Low temperature storage	-30 deg. C, 240 hours	2, 3
5	Humidity test	40 deg. C, 90 %RH, 240Hours	2, 3
6	Vibration test	Total fixed amplitude: 1.5mm Vibration frequency: 10–55Hz (60 sec. sweep) Time duration: 15 minutes for each x, y, z direction	4
7	Shock test	To be measured after dropping from 60cm height on the concrete surface in packing state. 	

Note 1: It should be checked at the actual driving condition under the high temperature.
Note 2: No dew condensation is to be observed.
Note 3: The functional test shall be conducted after 4 hours storage at the room temperature and humidity after removed from the test chamber.
Note 4: Vibration test will be conducted to the product itself without putting it in a container.

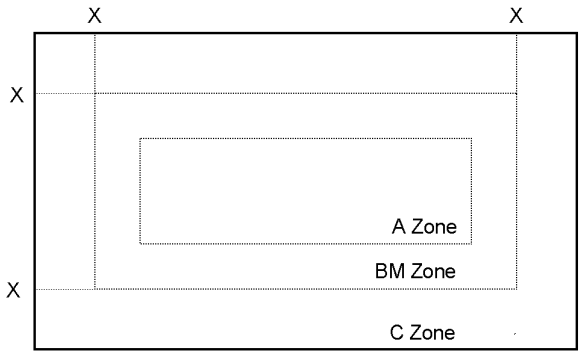
6. Appearance Standards

6.1. Inspection

The distance between the eyes and the sample shall be more than 30cm.
All directions for inspecting the sample should be within 45°against perpendicular line.



6.2. Definition of applicable Zones

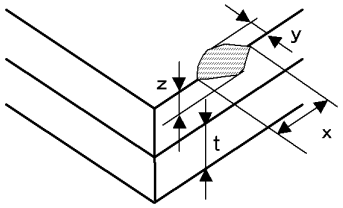


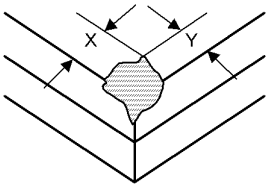
X : Maximum Seal Line

A Zone : Active display area
BM Zone : Black mask area
C Zone : Rest parts

6.3.Standards

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>G Line</td><td>Nothing</td></tr>
<tr><td>2</td><td>S Line</td><td>Nothing</td></tr>
<tr><td>3</td><td>Bright and
Dark dot</td><td>The definition of bright pixel
Uneven Luminous , which is Single Color Display of Black, White, Halftone R,G,B, is brighter than circumstance Pixel.
The definition of dark pixel
Uneven Luminous , which is Single Color Display of Black, White, Halftone R,G,B, is darker than circumstance Pixel.
Continuous bright spot
Vertical Continuous bright spot 3 horizontal continuous bright spot or equivalent is NG. 2 horizontal continuous bright spot or equivalent of uneven luminous are considered as 1 bright spot.
<table><tr><th>Zone</th><th colspan="2">Acceptable Number</th></tr><tr><td rowspan="2">A</td><td>Bright Dot</td><td>1</td></tr><tr><td>Dark Dot</td><td>3</td></tr><tr><td>BM</td><td>Bright Dot</td><td>1</td></tr></table></td></tr>
<tr><td>4</td><td>Polarizer foreign material
Assemble foreign material
Surface defective
CF foreign material
B/L foreign material other
(defective, which can not see at lighting inspection)</td><td>(1) Round Shape
<table><tr><th>Zone / Dimension (mm)</th><th colspan="2">Acceptable Number</th></tr><tr><th></th><th>A</th><th>BM</th></tr><tr><td>D ≤ 0.10</td><td colspan="2">Disregard</td></tr><tr><td>0.10 < D ≤ 0.15</td><td colspan="2">2</td></tr><tr><td>0.15 < D ≤ 0.20</td><td colspan="2">1</td></tr><tr><td>0.20 < D</td><td colspan="2">0</td></tr></table>D = (Long + Short) / 2
(2) Line Shape
<table><tr><th>X(mm) / Y(mm) / Zone</th><th colspan="2">Acceptable Number</th></tr><tr><th></th><th>A</th><th>BM</th></tr><tr><td>—</td><td>W≤0.01</td><td colspan="2">Disregard</td></tr><tr><td>L≤2.0</td><td>W≤0.02</td><td colspan="2">2</td></tr><tr><td>L≤1.0</td><td>W≤0.03</td><td colspan="2">1</td></tr><tr><td>L>2.0</td><td>-</td><td colspan="2">0</td></tr><tr><td>—</td><td>W>0.03</td><td colspan="2">-</td></tr></table>X : Length Y : Width
Limit sample shall be determined by the arising demand.</td></tr>
</table>

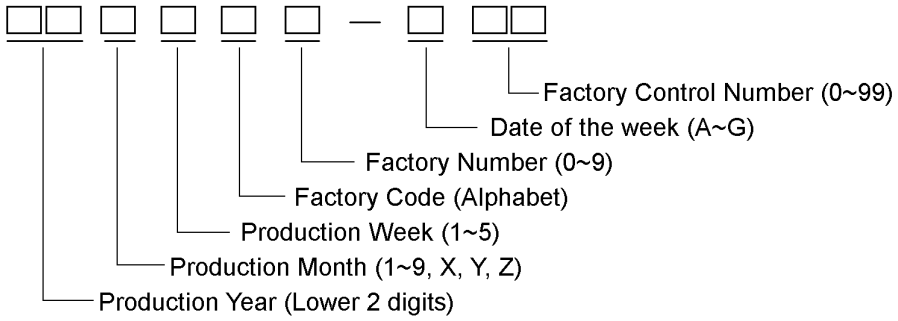
<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>5</td><td>Contrast Variation</td><td>Not to be conspicuous defects.
Limit sample shall be determined by the arising demand.</td></tr>
<tr><td>6</td><td>Color Variation</td><td>Not to be conspicuous defects.
Limit sample shall be determined by the arising demand.
However,about the Color patches shall be two pieces or less which are same level as the limit sample.</td></tr>
<tr><td>7</td><td>Air Bubbles
(between glass and polarizer)</td><td>
<table>
<tr><th>Zone
Dimension (mm)</th><th colspan="2">Acceptable Number</th></tr>
<tr><th></th><th>A</th><th>BM</th></tr>
<tr><td>D ≤0.10</td><td colspan="2">Disregard</td></tr>
<tr><td>0.10 < D ≤0.15</td><td colspan="2">1</td></tr>
<tr><td>0.15 < D ≤0.20</td><td colspan="2">1</td></tr>
<tr><td>< D ≤0.20</td><td colspan="2">0</td></tr>
</table>
The polarizer edge has not floated.
Limit sample shall be determined by the arising demand.
</td></tr>
<tr><td>8</td><td>Polarizer Scratches,
Stroke marks</td><td>Not to be conspicuous defects.
Limit sample shall be determined by the arising demand.</td></tr>
<tr><td>9</td><td>Polarizer Dirts</td><td>If the stains are removed easily from LCDP surface, the module is not defective.</td></tr>
<tr><td>10</td><td>Chipped Glass</td><td>(1) Other than electrode pad areas and corner areas
 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤5.0</td><td>≤0.5</td><td>≤1/2t</td></tr>
</table>
(2)Other than electrode pad Areas
 

X≤1.5 & Y≤0.5 or X≤0.5 & Y≤1.5
*The direction of board thickness is disregarded.
*For LCD module with holder
It is disregarded. When it has no problem for appearance, reliability and progressiveness.
*For LCD module without holder
The back side is disregard. When it has no problem for reliability and progressiveness.
*It is not approved when a glass chip occurs with the part of the seal, wiring and terminal.</td></tr>
</table>

7. Code System of Production Lot

The production lot of module is specified as follows.



8. Type Number

The type number of module is specified as follows.

355040AG

9. Applying Precautions

Please contact us when questions and/or new problems not specified in this Specifications arise.

10. Precautions Relating Product Handling

The Following precautions will guide you in handling our product correctly.

1) Liquid crystal display devices
   (1) The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.
   (2) The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.

2) Care of the liquid crystal display module against static electricity discharge.
   (1) When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.
   (2) Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
   (3) Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.

3) When the LCD module alone must be stored for long periods of time:
   (1) Protect the modules from high temperature and humidity.
   (2) Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
   (3) Protect the modules from excessive external forces.

4) Use the module with a power supply that is equipped with an overcurrent protector circuit,since the module is not provided with this protective feature.

5) Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6) Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

7) For models which use CFL:
   (1) High voltage of 1000V or greater is applied to the CFL cable connector area. Care should be taken not to touch connection areas to avoid burns.
   (2) Protect CFL cables from rubbing against the unit and thus causing the wire jacket to become worn.
   (3) The use of CFLs for extended periods of time at low temperatures will significantly shorten their service life.

8) For models which use touch panels:
   (1) Do not stack up modules since they can be damaged by components on neighboring modules.
   (2) Do not place heavy objects on top of the product. This could cause glass breakage.

9) For models which use COG,TAB,or COF:
   (1) The mechanical strength of the product is low since the IC chip faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces.
   (2) Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact.

10) Models which use flexible cable, heat seal, or TAB:
(1) In order to maintain reliability, do not touch or hold by the connector area.
(2) Avoid any bending, pulling, or other excessive force, which can result in broken connections.

11) In case of buffer material such as cushion / gasket is assembled into LCD module, it may have an adverse effect on connecting parts (LCD panel-TCP / HEAT SEAL / FPC / etc., PCB-TCP / HEAT SEAL / FPC etc., TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC, etc.,) depending on its materials.
Please check and evaluate these materials carefully before use.

12) In case of acrylic plate is attached to front side of LCD panel, cloudiness (very small cracks) can occur on acrylic plate, being influenced by some components generated from polarizer film..
Please check and evaluate those acrylic materials carefully before use.

13) Flickering due to optical interference may occur by combination of a) LCD driving frame frequency decided by either internal oscillator in driver IC or external clock input by the customer and b) lighting frequency of either backlight or other light sources. Please evaluate enough at the environment of actual use, and decide the driving condition that does not cause flickering.

14) Please be advised that do not apply DC voltage to the LCD.
If DC voltage is applied to the LCD, then it may cause poor display quality.

11. Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1) We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.

2) We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

3) We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.

4) When the product is in CFL models, CFL service life and brightness will vary According to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.

5) We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.

6) Optrex will not be held responsible for any quality guarantee issue for defect products judged as Optrex-origin longer than 2 (two) years from Optrex production or 1(one) year from Optrex, Optrex America, Optrex Europe delivery which ever comes later.