BATRON

Specification
12002380
BTFT063C-01

Doc. No.: GCX119AKM-E

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Note: This specification is subject to change without prior notice

Data Modul AG | Landsberger Str. 322 | 80687 München | Tel. +49-89-56017-0 | Fax +49-89-56017-119 | www.data-modul.com

Date/Rev.	Contents of change			Reasons	Remarks
Apr.25.2012 Rev.00			-Initial release ("Rev.00" is issued for MP)		
Jan.29.2013 Rev.01	(A)	P9	4.ELECTRICAL SPECIFICATIONS 4.1.1 DC spec. of general pins - Input voltage column. 'IIH','IIL' - Input leak current column. - Notes *4,*5 added.	Mention of Conditions.	
	(C)	P13	4.2.3 Reset timing - Note *1: Value 15ns -> 5us	Deal with timing issue.	
	(A)	P13	4.2.3 Reset timing - Added sentences (refer below) Technically working if the rise and fall time of the input signal (tr, tf) is longer than 5us, but this case a noise endurance etc. be getting weak and has to be care by customers.	Deal with timing issue.	
	(C)	P24	9. PACKING SPECIFICATIONS - New label spec. added. (Running change)	Reflection of InfoNote.	
	(C)	-	Drawing (Module outline) - B/L lot location change added. => Running change	Reflection of InfoNote.	
	(A)	-	Drawing - Circuit diagram with BOM added.	Request from customer.	

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

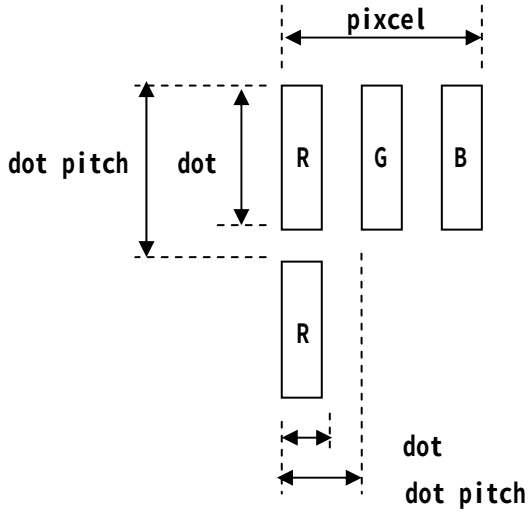
1. BASIC SPECIFICATIONS

This document gives the characteristics of the active matrix 6.3 inch color TFT LCD.

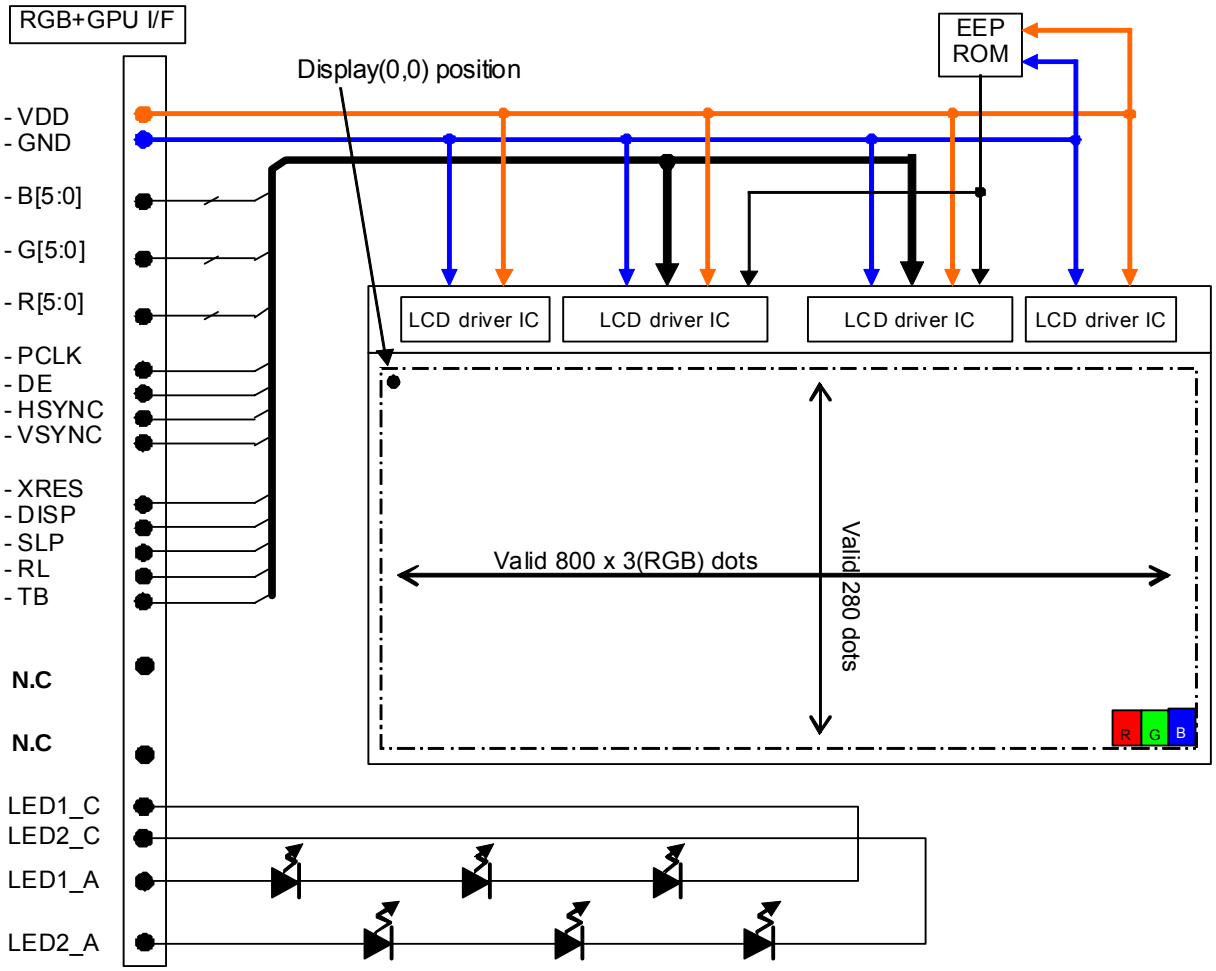
1.1 STRUCTURES

No.	FACTOR	SPECIFICATIONS	UNIT
1	LCD structure	a-TFT LCD	-
2	Module size	167(W) x 69(H) x 11(D) (Max)	mm
3	Weight	119 (without protective film)	g
4	Active Area [Screen Dimension]	150(W)×52.5(H) 〔6.3 inch〕	mm
5	Viewing Area	152.9(W)×55.4(H)	mm
6	Number of dots	800 x RGB(W) X 280(H) dots	-
7	Dot pitch	0.0625(W) × 0.1875(H)	mm
8	Dot layout	Square	-
9	Viewing direction	all-round view	-
10	Liquid crystal mode	Vistarich, normally black, transmissive type	-
11	Polarization plate	Anti glare	-

*1) See attached drawing for details.



1.2 BLOCK DIAGRAM



1.3 I/O TERMINALS

Pin No.	Name	I/O	Remarks
1	VDD	P	Power supply
2	VDD	P	Power supply
3	GND	P	Ground
4	GND	P	Ground
5	B5	I	Blue data(MSB)
6	B4	I	Blue data
7	B3	I	Blue data
8	B2	I	Blue data
9	B1	I	Blue data
10	B0	I	Blue data(LSB)
11	GND	P	Ground
12	G5	I	Green data(MSB)
13	G4	I	Green data
14	G3	I	Green data
15	G2	I	Green data
16	G1	I	Green data
17	G0	I	Green data(LSB)
18	GND	P	Ground
19	R5	I	Red data(MSB)
20	R4	I	Red data
21	R3	I	Red data
22	R2	I	Red data
23	R1	I	Red data
24	R0	I	Red data(LSB)
25	GND	P	Ground
26	GND	P	Ground
27	PCLK	I	Pixel clock signal. The data is latched this signals' rising edge.
28	GND	P	Ground
29	GND	P	Ground
30	DE	I	Data enable signal. This signal is active "H".
31	HSYNC	I	Horizontal synchronous signal. This signal is active "L".
32	VSYNC	I	Vertical synchronous signal. This signal is active "L".
33	GND	P	Ground
34	XRES	I	Display is Initialized when XRES is set to "L".
35	GND	P	Ground
36	DISP	I	Display on and off control. "H" Display on. "L" Display off.
37	SLP	I	Booster on and off control. "H" LCD internal power on, "L" LCD internal power off Please do not change input level for this terminal while operating.
38	RL	I	Horizontal scanning direction selection pin. "H" Left to Right. "L" Right to Left.
39	TB	I	Vertical scanning direction selection pin. "H" Top to Bottom. "L" Bottom to Top.

P: power supply, I: input O: output

Pin No.	Name	I/O	Remarks
40	N.C.	-	Non connection
41	N.C.	-	Non connection
42	GND	P	Ground
43	N.C.	-	Non connection
44	LED1_C	P	LED cathode 1
45	N.C.	-	Non connection
46	LED2_C	P	LED cathode 2
47	N.C.	-	Non connection
48	LED1_A	P	LED anode 1
49	N.C.	-	Non connection
50	LED2_A	P	LED anode 2

P: power supply, I: input O: output

2. FUNCTIONS

2.1 OVERVIEW

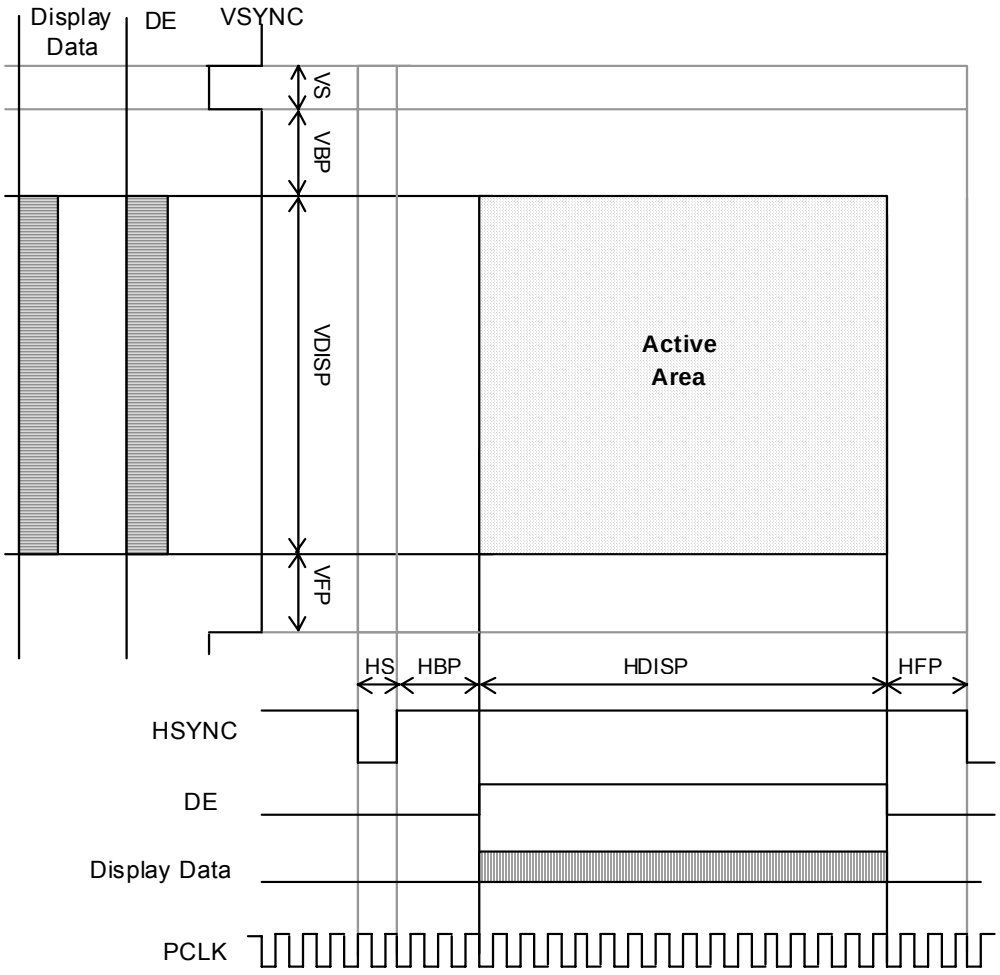
This LCD module has RGB Interface and GPU Interface used for transferring of pixel data and controlling display

1) RGB interface
   - 18 bit parallel bus for transferring of RGB data.
   - 4 wire for synchronous signals of display timing.

2) GPU interface
   - 2 wire for controlling of display scanning direction.
   - 2 wire for controlling of display on and off.

2.2 RGB INTERFACE

2.2.1 General Timing Diagram



Condition	Description
VS	Vertical Sync time (VSYNC=L)
VBP	Vertical Back Porch
VDISP	Vertical Display Active Area
VFP	Vertical Front Porch
HS	Horizontal Sync time (HSYNC=L)
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

Display color \ Input data		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

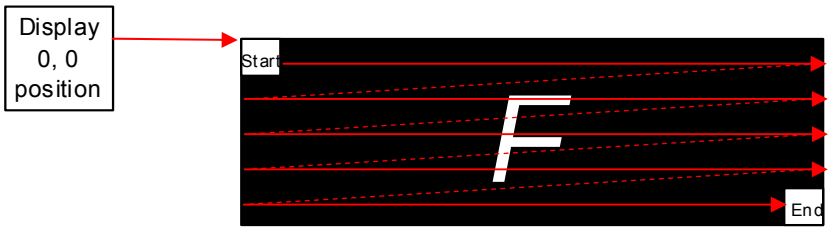
2.3 GPU INTERFACE

Display control is possible by using the following 4 terminals: DISP, SLP, TB and RL.

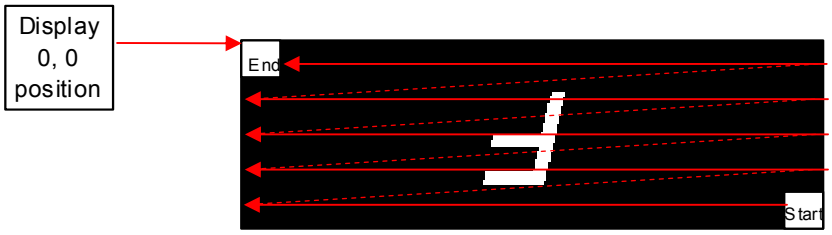
Terminal	Description
DISP	Display on and off control. H : display on. L : display off.
SLP	Booster on and off control. H : LCD internal power on. L : LCD internal power off.
TB	Vertical scanning direction selection pin. H : Top to bottom L : Bottom to top
RL	Horizontal scanning direction selection pin. H : Left to right L : Right to left.

See 4.3 RECOMMENDED SEQUENCE to design a sequence and intervals.

(1) TB=1 and RL=1. (Default setting)



(2) TB=0 and RL=0.



3. ABSOLUTE MAXIUM RATINGS

Stress beyond those listed under "ABSOLUTE MAXIMUM RATINGS" may cause permanent damage to the device.

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Power supply voltage	VDD	-0.3 to +4.0	V
Signal input voltage	VIN	-0.3 to VDD+0.3	V

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	STMBOL	CONDITION	RATING		UNIT	REMARKS
			Min	Max		
Ambient temperature	TOP	Operation	- 30	85	℃	No dew condition
	TST	Storage	- 40	90		

The absolute maximum ratings represent the rated values which LCD module can not exceed.
When LCD modules are used beyond this rated value, the operating characteristics may be adversely affected.

4. ELECTRICAL SPECIFICATION

4.1 DC CHARACTERISTICS

4.1.1 DC specifications of general pins

GND=0V

PARAMETER	Symbol	Rating			Unit	Remarks
		Min.	Typ.	Max.		
Power Supply voltage	VDD	3.0	3.3	3.6	V	*1
Power Supply current	IDD	-	-	105	mA	Image: All pixels White *1, *2
		-	-	0.5	mA	Sleep mode *3
Input voltage	High	0.7VDD	-	VDD	V	IIH=10uA(Max),IIL=-10uA(Max) *4 IIH=20uA(Max),IIL=-20uA(Max) *5
	Low	0	-	0.3VDD	V	
Input leak current	ILI1	-10	-	10	uA	Except VDD pin *4
	ILI2	-20	-	20	uA	Except VDD pin *5

*1: Rated values indicate operating range of electrical functions.
*2: In-rush current is excluded.
*3: At the condition of RGB interface signals, TB and RL are fixed to "H" or "L", backlight is turned off, VDD=3.3V and Ta=25 degree.
*4 Applicable for the following input pins
R5..R0, G5..G0, B5..B0, PCLK, DE, HSYNC, VSYNC, XRES, SLP, RL, TB
*5 Applicable for DISP pin.

4.1.2 Characteristics of LED and LED driving

PARAMETER	Symbol	Value			Unit	Remarks
		Min.	Typ.	Max.		
LED forward voltage	Vf	-	3.0	3.4	V	Per LED *1
LED forward current	If	-	80	280	mA	*2

*1: If=80mA, Ta=25℃(from Nichia's only one LED specification)
*2: LED allowable forward current is decremented by the ambient temperature. (Refer to Fig.1)

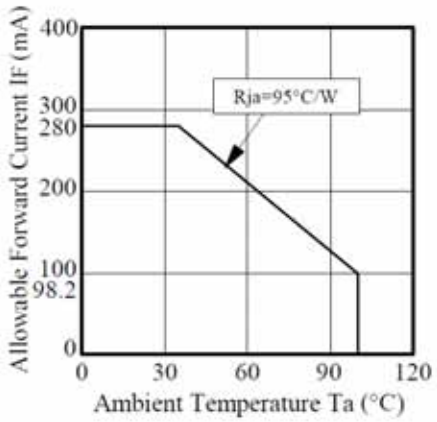
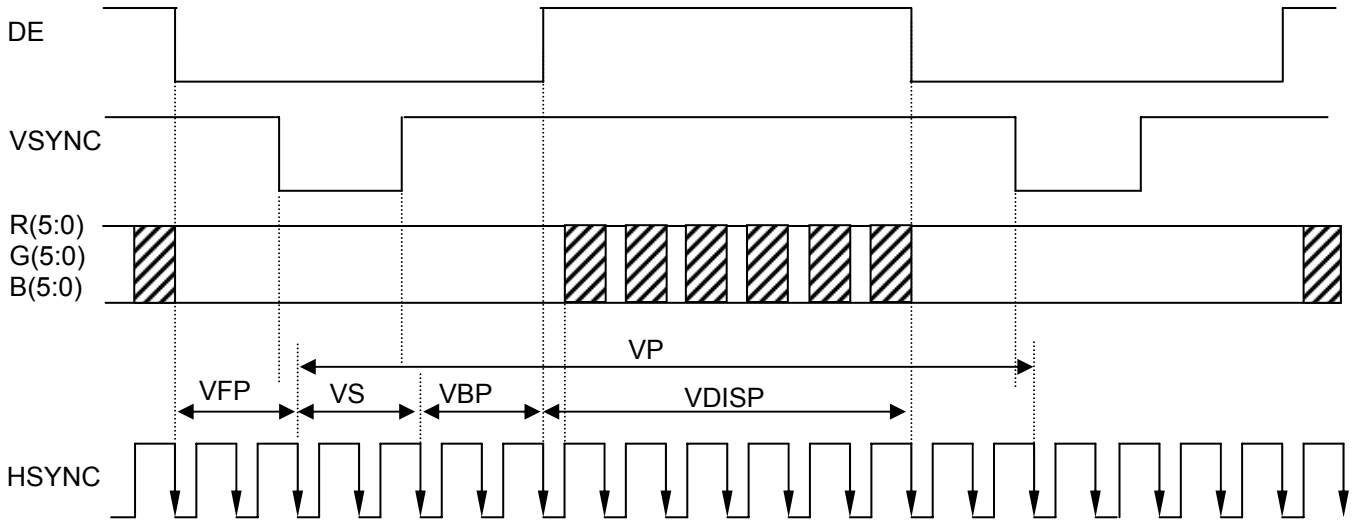


Fig.1: Ambient Temperature vs.
Allowable Forward Current
(from Nichia's specification)

4.2 AC CHARACTERISTICS

4.2.1 RGB interface timing

(1) Vertical timing

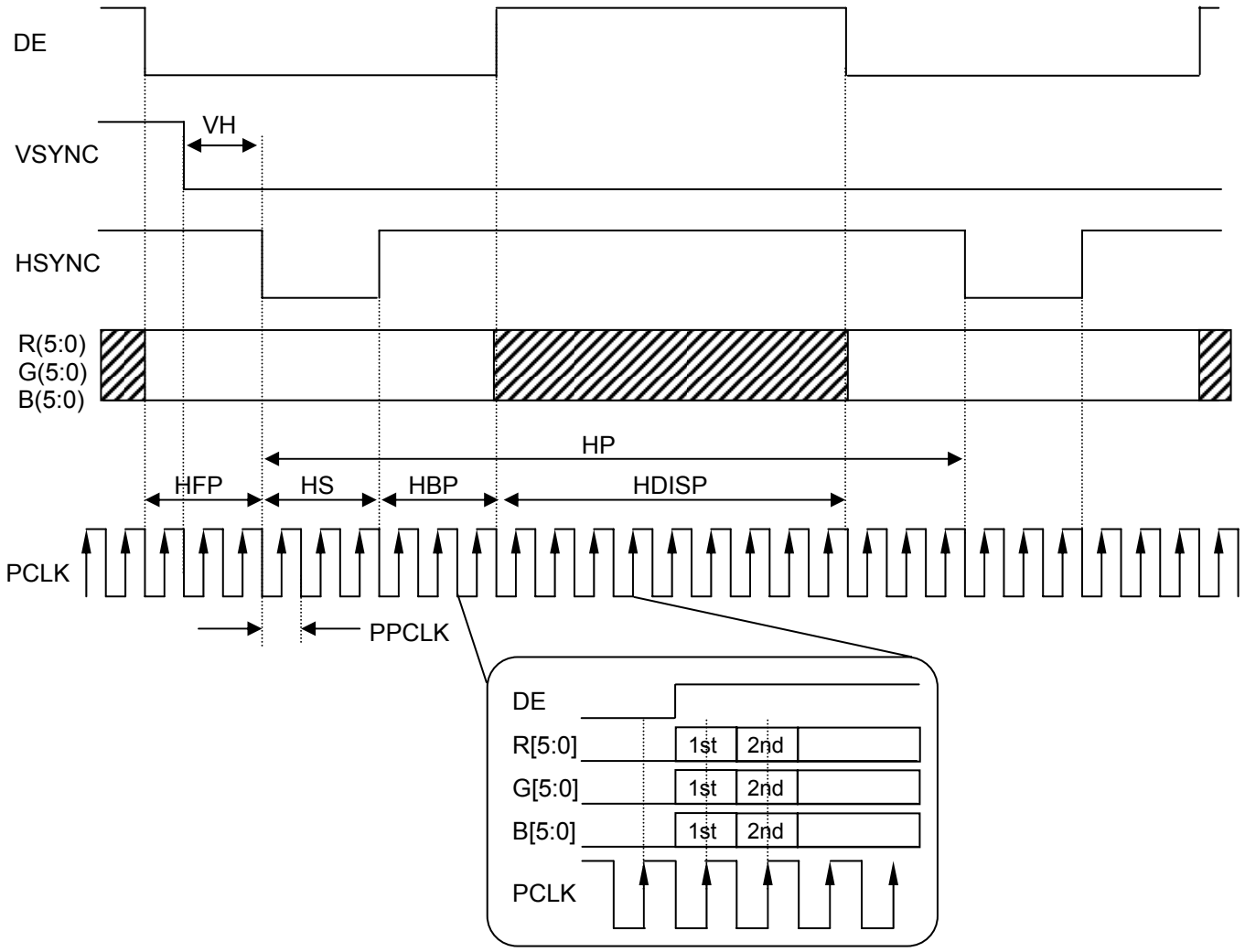


Signal	Parameter	MIN	TYP	MAX	Unit	Description
VP	Vertical cycle	315	315	315	Line	*1, *2, *3
VS	Vertical “L” pulse width	12	12	12	Line	
VBP	Vertical back porch	16	16	16	Line	
VFP	Vertical front porch	7	7	7	Line	
VDISP	Vertical active area	280	280	280	Line	
VRR	Frame rate		60		Hz	*4

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

*1 The rise and fall times of all input signals (tr, tf) are equal or less than 8ns.
*2 For timing of input signals, they are set using 30 % and 70 % of VDD as the base reference.
*3 Number of line is counted an inputted HSYNC falling edge after VSYNC signal is changed.
*4 LCD frame rate should be adjusted 60Hz by porch clock numbers. See 4.2.1 (2).
*5 There is no tolerance for VP,VS,VBP,VFP,VDISP. Please use fixed value.

(2) Horizontal timing

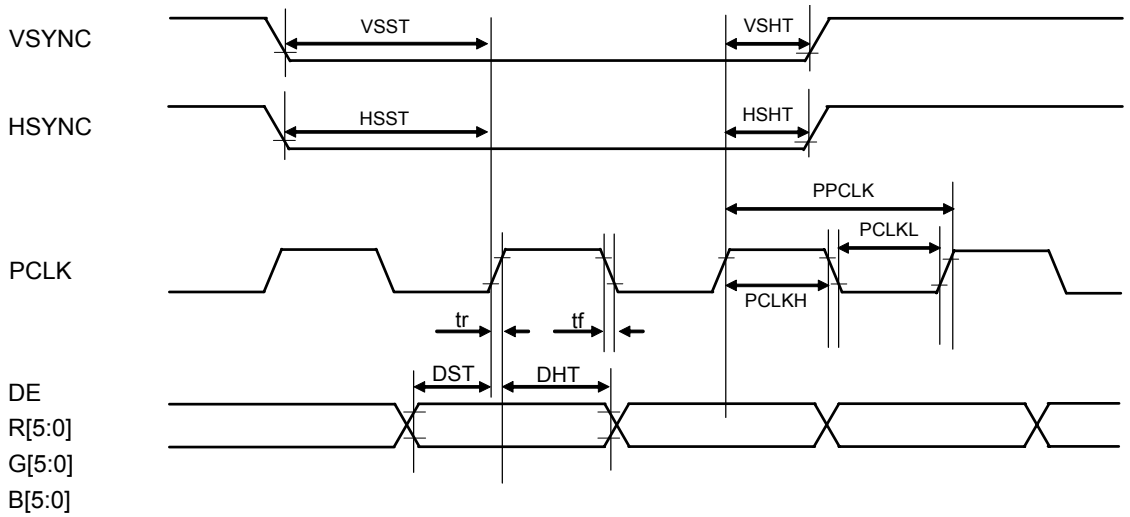


Signal	Parameter	MIN	TYP	MAX	Unit	Description
VH	Phase difference of VSYNC-HSYNC	0	-	898	PCLK	*3
HP	Horizontal cycle	960	1056	1224	PCLK	*1, *2
HS	Horizontal “L” pulse width	80	128	128	PCLK	
HBP	Horizontal back porch	56	88	256	PCLK	
HFP	Horizontal front porch	24	40	40	PCLK	
HDISP	Horizontal active area	800	800	800	PCLK	
f_{PCLK}	Pixel clock frequency	18	20	23	MHz	
PPCLK		43.47	50	55	ns	

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

*1 The rise and fall times of all input signals (tr, tf) are equal or less than 8ns.
*2 For timing of input signals, they are set using 30 % and 70 % of VDD as the base reference.
*3 VH Max value is HP(Horizontal cycle)-62.

4.2.2 RGB interface AC timing

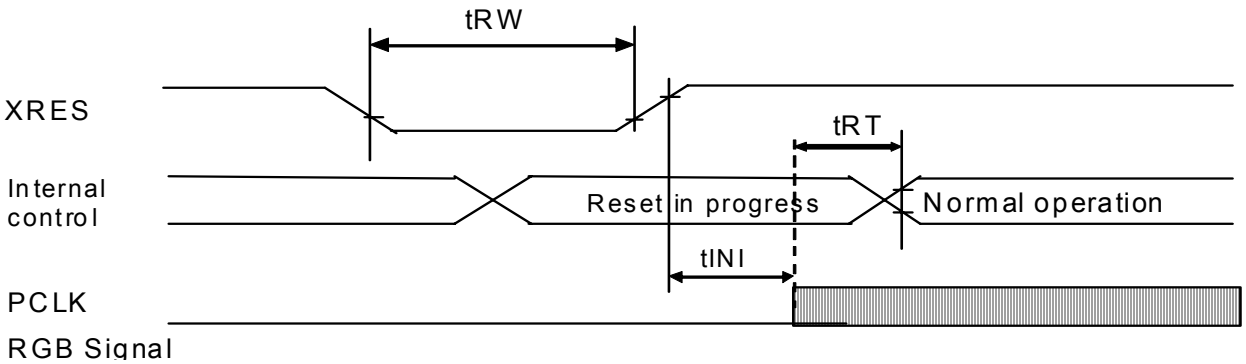


Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
VSYNC	VSST	VSYNC set up time	10	-	-	ns	*1, *2
	VSHT	VSYNC hold time	10	-	-	ns	
HSYNC	HSST	HSYNC set up time	10	-	-	ns	
	HSHT	HSYNC hold time	10	-	-	ns	
PCLK	PPCLK	Pixel clock period	43.47	-	-	ns	
	PCLKL	Pixel clock low time	14	-	-	ns	
	PCLKH	Pixel clock high time	14	-	-	ns	
DE R[5:0] G[5:0] B[5:0]	DST	Data setup time	10	-	-	ns	
	DHT	Data hold time	10	-	-	ns	

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

*1 The rise and fall times of all input signals (tr, tf) are equal or less than 8ns.
*2 For timing of all input signals, they are set using 30 % and 70 % of VDD as the base reference.

4.2.3 Reset timing



Signal	Symbol	Parameter	MIN	MAX	Unit	Measurement Condition and Others
XRES	tRW	reset pulse width	20	-	us	*1
	tINI	initial start	1	-	ms	*2, *3
	tRT	Clear reset	-	10	ms	*1, *2

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

*1 The rise and fall times of the input signal (tr, tf) are equal or less than 5us.
For all timings are set using 30 % and 70 % of VDD-GND as the base reference.

Technically working if the rise and fall time of the input signal (tr,tf) is longer than 5us but this case a noise endurance etc. be getting weak and has to be care by customers.

*2 It must be avoid to transfer the GPU IF terminals for this period.
*3 It is necessary to avoid input PCLK and RGB signals at this period.

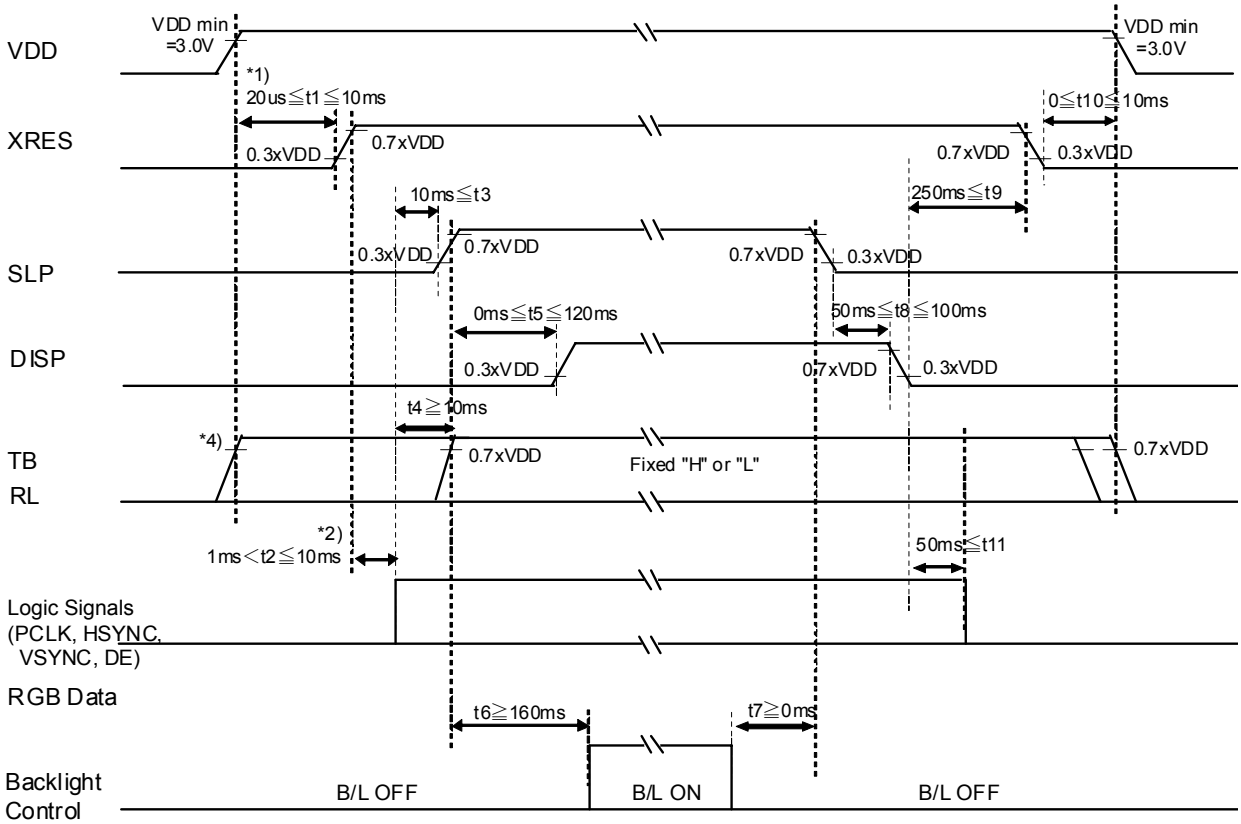
4.3 RECOMMENDED SEQUENCE

Power ON

-1) Start to supply system power (VDD).
-2) Make a device reset after starting to supply the system power.
(XRES must be kept "L" for more than 20us to less than 10ms.)
-3) Wait more than 1ms to less than 10ms after releasing the system reset.
-4) Input logic signals (PCLK, HSYNC, VSYNC, DE and RGB data).
-5) Wait more than 10ms after input logic signals.
-6) Transfer “L” to “H” of SLP signal. (Internal power is started.)
-7) TB and RL signals are fixed in the direction of display, if necessary.
-8) Backlight turns on.

Power OFF

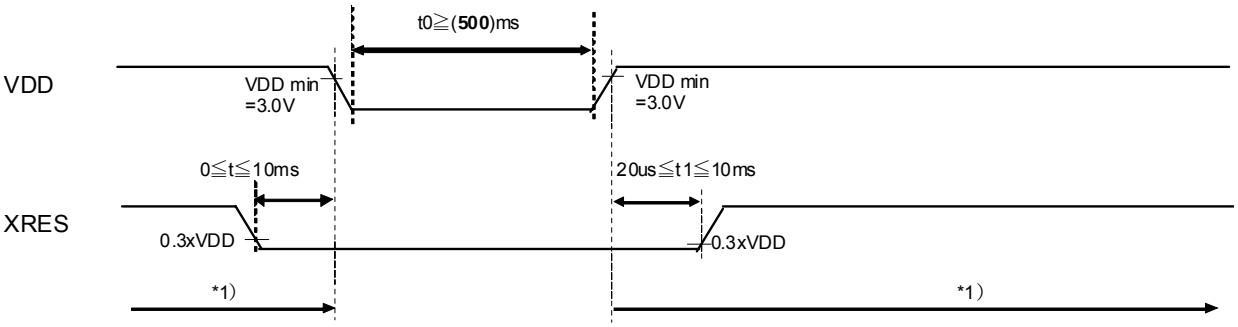
-10) Backlight turns off.
-11) Transfer “H” to “L” of SLP signal. (Internal power and Display is stopped.)
-12) Wait more than 50 ms, then transfer “H” to “L” of DISP signal.
-13) Wait more than 250 ms, then XRES signal turns “L” state.
-14) Stop to supply system power (VDD) .



Notes)

* 1 XRES must be maintained to “LOW” more than 20us after turning on the system power (VDD).
* 2 Logic signals should be start more than 1 ms after XRES signal is released.
* 3 The rising speed of VDD should be less than 2V/100us.
* 4 TB and RL signals allow fix the VDD or GND.

4.4 INTERVAL POWER ON AND OFF



Notes)

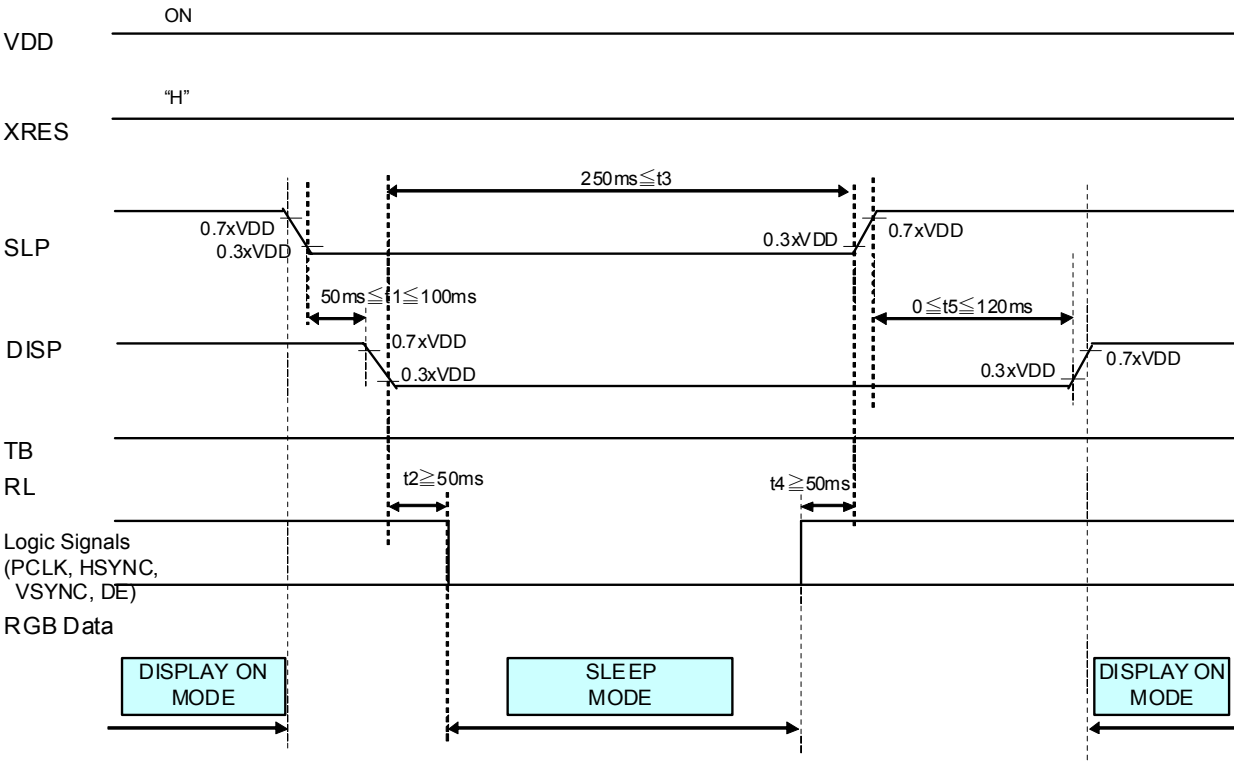
* 1 Please refer to 4.3 RECOMMENDED SEQUENCE when system power(VDD) is stopped and when after system power(VDD) is running.

4.5 TRANSITION OF POWER MODE

This module has three power modes as following.

a) SLEEP MODE : Internal power OFF, LCD driving is OFF in this mode.

b) DISPLAY ON MODE : Internal power ON, LCD driving is ON in this mode.



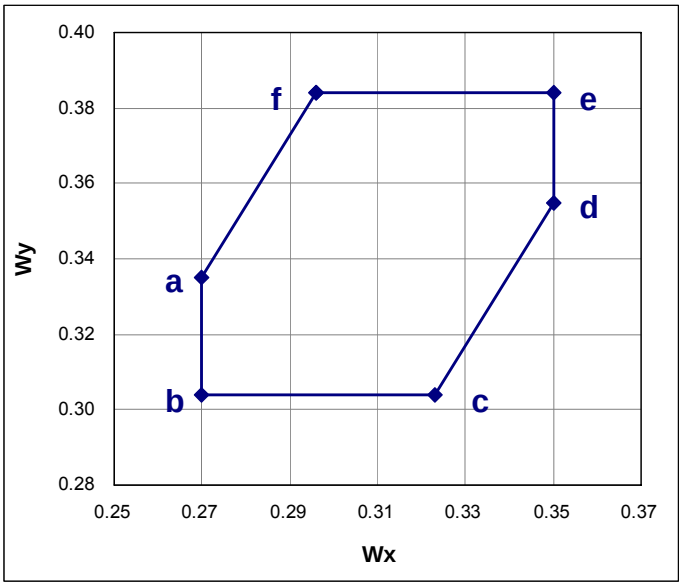
5. OPTICAL SPECIFICATIONS

5.1 OPTICAL SPECIFICATIONS

5.1.1 transparence

Item		Symbol	Temp. (°C)	Rating			Unit	definition (Condition)	Remark
				Min.	Typ.	Max.			
Contrast Ratio		*CR*	25	500	1000	-	-	1,2	-
Response	tr+tf	t_r	25	-	40	-	ms	1,3	-
Color coordinates	W-x	*Wx*	25	see below	0.310	see below	-	1,4	-
	W-y	*Wy*		see below	0.344	see below			
	R-x	*Rx*		-	0.594	-			
	R-y	*Ry*		-	0.329	-			
	G-x	*Gx*		-	0.329	-			
	G-y	*Gy*		-	0.571	-			
	B-x	*Bx*		-	0.154	-			
	B-y	*By*		-	0.145	-			
NTSC ratio		-	25	-	49	-	%	1,8	-
Brightness		*B*	25	280	480	-	cd/m^2	1,6	-
Brightness homogeneity		-	25	70	-	-	%	1,7	-
Viewing angle	Φ=-70-+70		25	10	-	-	Deg.	1,5	-
	Φ=-55-+55		25	40	-	-			
	Φ=-40-+40		25	150	-	-			

White color coordinates



	Wx	Wy
a	0.270	0.335
b	0.270	0.304
c	0.323	0.304
d	0.350	0.355
e	0.350	0.384
f	0.296	0.384

5.2 DEFINITIONS AND CONDITIONS

5.2.1 definitions of optical characteristics

Definition 1

Measuring conditions

(1) Instrument: DMS 803(301) (autronic-MELCHERS GmbH.),or equivalent.
(2) Ambient temperature: Ta=25 °C
(3) Display: white or black or red or green or blue display on all screen,VCC=3.3V
(4) Measure after 15 minutes of LED warm up.
(5) Vf=3.0V, If=80mA per LED

Definition 2

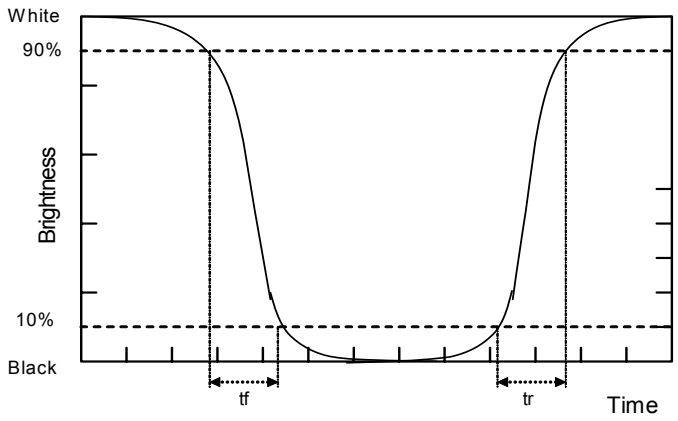
This is a ratio between the screen surface reflectance or brightness of the white raster and the black raster.

$$CR = \frac{\text{White brightness}}{\text{Black brightness}}$$

Definition 3

tf: This is a time that decreases to 10% of total change of the screen surface brightness from the point of 90%, after data signal is switched from white-raster to black-raster.

tr: This is a time that increases to 90% of total change of the screen surface brightness from the point of 10%, after data signal is switched from black-raster to white-raster.



tf：Response time from White to Black

tr：Response time from Black to White

Definition 4

This is the x-y coordinate of Red, Green, Blue and White colors specified on the CIE1931 chromaticity diagram.

Definition 5

This is a maximum angle **θ** from the normal direction that keeps having the contrast ratio more than 10:1,40:1 and 150:1. The angle on surface **ϕ** is defined respectively.

6. INSPECTION

6-1. STANDARDS

*ppm targets

Major defects 100ppm

Minor defects 1000ppm

Note) This figure is a target. It is not guaranteed.

6-2. LOT

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

6-3. INSPECTION CONDITION

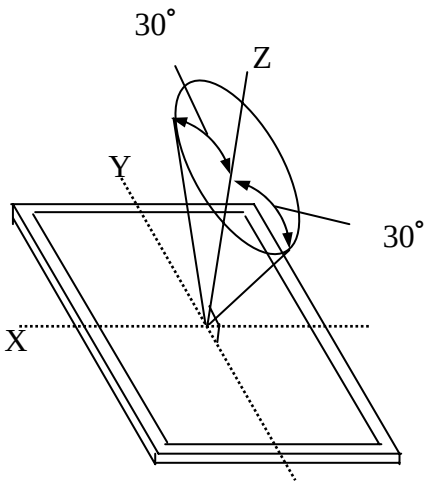
1) Emviromental conditions :

1. Temperature/humidity condtion : Normal temprature (25+- 5 degrees)
   Normal humidity (60+-20%RH)
2. Iluminance environment : Not lighted appearance : 800～2000Lx
   Lighted appearance : 100～ 400Lx
   * 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.**

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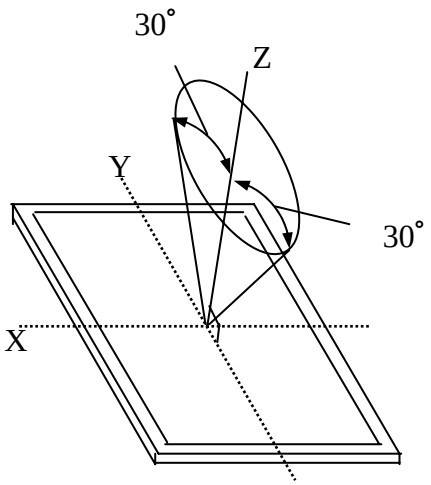
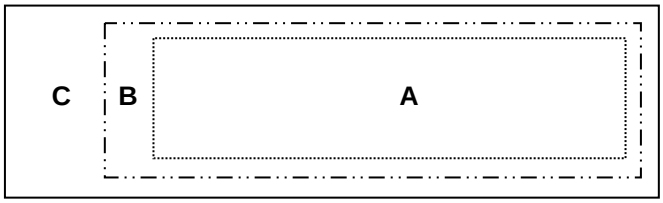


3) **Drive condition : It is done pursuant to product specification.**

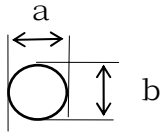
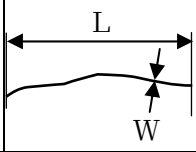
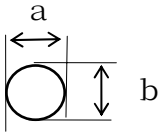
6-4. APPEARANCE STANDARD

6-4-1. Application scope

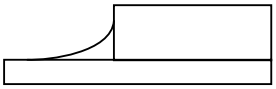


zone	definition
A	Active Area.
B	Area from outside of “A zone” to insight edge of metal frame.
C	Black painting Area.

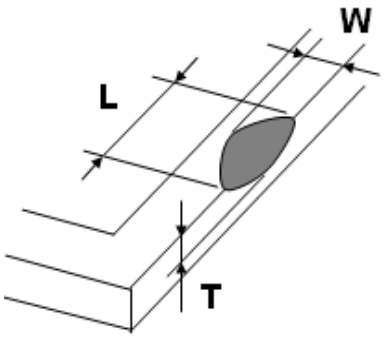
6-4-2. Display appearance standard

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)	NO. / Item / Bright dot / Dark dot / Total 1 / Defect in screen / 0 / 3 / 3 2 / Combined defect / 0 / 0 / 0 Distance between defects :D D>=10mm The smallest one unit R,G or B is defined as one dot. Less than 60 % of one dot area is acceptable.	Minor
4	Dot type defect D = (a + b) / 2 	1. distinctly recognized Size D (mm) / Tolerance A / B D ≦ 0.15 / ignored 0.15 < D ≦ 0.20 / 3 / 4 0.20 < D ≦ 0.25 / 2 / 3 0.25 < D ≦ 0.30 / 0 / 1 0.30 < D / 0 / 0 2. blurred Size D (mm) / Tolerance A / B D ≦ 0.40 / ignored 0.40 < D ≦ 1.00 / 2 / 2 1.00 < D / 0 / 0 Distance between defects :D D>=10mm	Minor
5	Line type defect (Black/ White) 	Length L (mm) / Width W (mm): W ≦ 0.03 / 0.03 < W ≦0.05 / 0.05 < W ≦ 0.15 / 0.15 < W L ≦ 0.3 / ignored / ignored / ignored / Dot type defect 0.3 < L ≦ 2.0 / ignored / 3 / 3 / Dot type defect 2.0 < L / ignored / 0 / 0 / 0 Distance between defects :D D>=10mm	Minor
6	Unevenness Display	Should not be remarkable. (The level of unevenness should be less than the level in the attached Bit Map Data. File Name: Limit_Mura_Data_18th_Nov_2011.bmp. Position and size of the unevenness in the bitmap maybe changed for the inspection process. To increase the throughput in the production a limit simulator is used during production process. Bit Map Data File needs be applied to MURA-free sample to avoid overlap of different effects.)	Minor
7	Bubble in polarizer D = (a + b) / 2	Diameter D (mm) / Tolerance A / B D ≦ 0.30 / ignored 0.30 < D ≦ 0.40 / 3 / ignored 0.40 < D ≦ 0.60 / 2 / 3 0.60 < D / 0 / 0 Distance between defects :D D>=10mm 	Minor

6-4-3. General Appearance Specifications

<table>
<tr><th>No.</th><th>Items</th><th>Judgment criteria</th><th>Class</th></tr>
<tr><td>1</td><td>different specifications</td><td>Not permitted.</td><td>Major</td></tr>
<tr><td>2</td><td>Damaged resist on FPC</td><td>Copper patterns on FPC must not be visible.</td><td>Minor</td></tr>
<tr><td>3</td><td>Circuit pattern</td><td>Must not be peeled or separated from FPC.</td><td>Major</td></tr>
<tr><td>4</td><td>Conductive refuses</td><td>No solder refuses or solder balls easily moving.
Fixed particle which has no functional affect can be ignored.</td><td>Minor</td></tr>
<tr><td>5</td><td>Dirt</td><td>Should not be prominent.
Dirt on backside is permitted.</td><td>Minor</td></tr>
<tr><td>6</td><td>I/F terminal scratch / dirt</td><td>Should not be prominent.</td><td>Minor</td></tr>
<tr><td>7</td><td>Plating</td><td>Must not be peeled, no rust and no discoloration.</td><td>Minor</td></tr>
<tr><td>8</td><td>Soldering defect</td><td>Solder omissions is not permitted at any solder point.
Solder bridges is not permitted.
Cold soldering is not permitted.</td><td>Major
Major
Minor</td></tr>
<tr><td>9</td><td>Parts soldering</td><td>There must be fillet.
  </td><td>Minor</td></tr>
<tr><td>10</td><td>Metal frame Scratch / discoloration</td><td>Scratch out of viewing area and discoloration shall be ignored.</td><td>Minor</td></tr>
<tr><td>11</td><td>Metal frame black painting area (zone C) dent / dirt / scratch</td><td>Repair of black paint is not permitted.

There must not be dents, dirt and scratches that influences product characteristic and the process of the customer.
If any problems arise on this specification , they shall be solved through consultation between both parties.</td><td>Minor</td></tr>
<tr><td>12</td><td>Cushion</td><td>Breakage on cushion

<Breakage on inner edge>
not permitted
<Breakage on outer edge>
 

<table><tr><th>Size(mm)</th><th>Tolerance (Note)</th></tr><tr><td>L≦3.0
W≦2/3*w
T≦2/3*t</td><td>3</td></tr></table>w: cushion width
t : cushion thickness
Note : Number of cushion breakage in circumference.
minimum cushion breakage will be checked by appearance inspection</td><td>Minor</td></tr>
</table>

7. RELIABILITY

7.1 RELIABILITY TESTING CONDITION

No.	Parameter	Condition	Ratings	Evaluation Criteria
1	High-temperature storage	80 ºC ± 2 ºC	500 h	After the test, and 2 hours elapsed at room temperature, it should not be changed in external appearance and/or display appearance that could impair use.
2	Low-temperature storage	-30 ºC ± 2 ºC	500 h	
3	Temperature cycling	-30 ºC <-> 80 ºC (0.5h) (0.5h)	100 cycles	
4	High-temperature operation	70 ºC ± 2 ºC	500 h	
5	Low-temperature operation	-20 ºC ± 2 ºC	500 h	
6	High-temperature, high-humidity operation	50 ºC 90%RH	500 h	

7.2 MECHANICAL PERFORMANCE

1	Vibration (Non-operating)	5-10 Hz, +10dB/octave 10 - 50Hz 5.58m2/s3 (0.0558g2 / Hz) 50 - 500Hz, -10db/octave X，Y，Z / 30 minutes each	There must be no abnormalities of function or display.
2	Shock (Non-operating)	100G 6ms Sinusoidal half wave ±X，±Y，±Z / 1 cycles each	
3	Package vibration	5 - 55 Hz variable / 1 cycle (15 min.) • 5Hz～20Hz 2.0mmp-p • 20Hz～55Hz 1.5G 2 cycles for each in X, Y, Z direction	
4	Package drop	According to JIS-Z0202 Height for plane drop: 50 cm Height for corner and ridge drop: 50 cm	
5	ESD (Non-operating)	Contact Discharge 100pF, 1500ohm, ±8kV Panel center 3 times (intervals of 1s) Non-operating	There must be no abnormalities of function or display. Current consumption should be less than maximum current.
6	ESD (Non-operating)	Air Discharge 100pF, 1500ohm, ±8kV 4 points to metal frame 3 times for each (intervals of 1s) Non-operating	

8. LCD MODULE USAGE AND PRECAUTIONS

8.1 DESIGN OF APPLICATION

1) To prevent damage to the module, design applications in consideration of the following:
   - The absolute maximum ratings represent the rated values which the LCD module must not exceed. When modules are used beyond this rating, the operating characteristics may be irreversibly affected.
   - It is recommended that power supply lines [VCC] include current surge protection (fuses, etc.). Without such protection, foreign material or isolated circuit failures can cause overheating or smoke emission, resulting in injury.
   - When logic circuit power is off, do not apply any signals to the input terminals.
   - Potentially irreversible abnormality may occur with forcible disconnection of LCD module power supply, such as removing the device battery.
   - Employ designs that avoid direct contact with the IC. In the event there is a chance of contact, please contact Data Modul regarding precautions.
2) To prevent erroneous operation, design applications in consideration of the following:
   - To prevent the occurrence of erroneous operation caused by noise, pay special attention to satisfying specified operating conditions. This includes precautionary measures, like using short signal cables.
   - Note that peripheral devices can cause mutual noise interference with LCD modules. In particular, input devices such as touch panels may emit operational level noise as radiation, even when these devices are not in operation. Provisions for, and evaluation of, performance under actual usage conditions with the system are highly recommended.
   - The driver IC used by the LCD module is easily affected by light exposure because it is mounted as a bare chip on the module. To avoid increased current consumption and accompanied shut-down of power supply, give consideration to taking light-shielding countermeasures, and evaluating performance in the system.
   - Just as with general electronic components, ESD may cause LCD modules to malfunction. ESD countermeasures should be considered around components surrounding the LCD module, especially the driver IC and power IC. When an LCD module is mounted near the outer surface of a product, take extra care that components such as these cannot act as conductive paths for ESD.
   - By command, LCD module operation status and display data is saved, but that data can easily be altered by external noise. Noise should be minimized, or its effect avoided, at the device or system level.
   - As unexpected noise may occur, periodic refresh operations, such as resetting commands or resending display data, are highly recommended as part of the software routine.
   - As display problems can occur when signals are fed to the input/output cable NC terminals, system designs should keep them open.

3) System designs should consider the following:
   - Design applications so that excessive force will not be applied to the surface, perimeter or adjoining areas of LCD modules, as this may cause display panel color tone to vary.
   - Be sure that the LCD module is free from twisting, warping, or distortion as any stress can have great influence on the display quality. Ensure sufficient stiffness of the system's outer case or frame. Also, exercise caution when handling.
   - Use the backlight frame section or metal frame section to set and fix the LCD module position inside the system. Using other components to fix the LCD module position may sever circuits on the FPC.
   - As part of the construction of the LCD module, the FPC board with on-board electronic components is only partly fixed to the case, in consideration of reworking. Potentially, the FPC may curve under the weight of individual components, and they may protrude beyond the outline of the case. As such, preventive measures should be taken to prevent any electrical contact between the LCD module components and other circuits inside the system.
   - The viewing angle of the LCD module and that of the system should match.
   - If a display frame or printed frame is provided, place it inside the viewing area and outside the active area for a good appearance.
4) Liquid crystal display elements are temperature dependent. Be sure to use the LCD modules within the specified operating temperature range, as recognition of the display becomes difficult when the LCD module is used outside its range.
5) To avoid EMI, preventive measures should be implemented in the system.
6) Note that sudden powering-up sends excessive inrush current to the LCD module, and can affect the entire system.

8.2 ASSEMBLY PRECAUTIONS

1) Static electricity can destroy LCD module elements, so carefully observe the following during assembly:
   - Be sure to ground your body when handling the LCD module.
   - Make sure that solder guns and all other tools required for assembly have been grounded.
   - The use of anti-static mats (0.5k – 1MΩ) on the workbench for grounding is recommended.
   - To reduce occurrence of static electricity, avoid using this product in dry environments, (less than 50%RH).
   - To eliminate static electricity, the use of an ionizer (anti-static air blower) is recommended.
   - A protective film has been attached to the surface of the LCD panel. When peeling off the protective film, do so carefully near an ionizer.
   - To guard against performance degradation of the LCD module caused by destructive forces such as static electricity, etc., avoid direct contact to the terminal electrodes of connectors and FPC circuit pattern when handling.
2) The LCD Panel surface is protected by a protective film, which must be removed before system installation. Units having been in prolonged storage may have some adhesive residue left on the display panel. In such cases, please remove the contaminant according to the procedure in item 5) under "10.3 Handling Precautions" below.

3) As removing the LCD module's protective film makes the polarizer susceptible to the adhesion of foreign material, do so immediately prior to assembly.
4) Exercise caution when applying adhesive to the LCD module as it is difficult to remove.
5) Do not touch or handle the LCD module directly with bare hands as residue of dirt, oil or water can cause corrosion. Be sure to wear finger stalls or gloves when handling LCD modules. (CAUTION: The following applies to bare panel modules) When holding an LCD module, carefully hold the panel by the edges of the glass plate.
6) Handle LCD modules by their edges. Handling the screen directly can cause display problems or cracks in the panel.
7) When installing the LCD module, don't forcibly bend or stretch the input/output cable. Bending or twisting the FPC section may damage circuit patterns. Applying any excessive stress to the LCD module can damage it.
8) Do not apply pressure to the LSI chip or surrounding mold area as it can cause damage.
9) Do not use sharp, pointy or rigid tools when handing LCD panels. These objects can scratch or nick the glass panel, which can cause it to crack.
10) Perform the LCD module power on/off of the system assembly inspection according to the procedure in the specification document.
11) Do not allow non-atmospheric, specialty gases to contact with the LCD module. Check plastic or rubber materials to be used in the system beforehand as gas they produce can cause functional degradation of internal components like the LCD panel polarizer.

8.3 HANDLING PRECAUTIONS

1) The display panel is made of glass. Do not subject it to mechanical shock such as dropping it from a high position, etc.
2) If the display panel is damaged and internal liquid crystal substance leaks out, be sure not to inhale or consume it. Direct contact with skin should also be avoided. Should contact with the internal liquid crystal substance occur, promptly apply the following responses:
   - Contact with clothing: Remove affected items
   - Contact with skin: Wash off using soap and running water
   - Contact with eyes: Wash out for 15 min. or longer with clean water then consult a physician
   - Ingestion: Induce vomiting with water and consult a physician

3) Take precautions in handling the LCD module because the glass plate has very keen edges. Should it break, take extra care to avoid injury from chips, shards and flying glass.
4) The polarizer covering the display panel surface of the LCD module is soft and can be easily scratched. Handle this polarizer carefully, avoiding contact with sharp, pointy instruments or stiff cloth.
5) If the polarizer surface becomes contaminated, use the following recommended or equivalent adhesive tape for contaminants removal:
   - Scotch-brand mending tape (No. 810) or an equal similar product.

6) Do not breathe on the display surface or use ethyl alcohol solvent for contaminant removal. This can cause cloudiness in the polarizer surface. Furthermore, do not use the following as they can damage the polarizer:
   - Water
   - Ketones
   - Aromatic solvents
7) Avoid using the LCD module under condensation or high-humidity environments as this may cause polarizer or other functional degradation.
8) After being in a high-humidity or condensation environment, keep the LCD module at room temperature more than 30 minutes before using.
9) Current flow in a condensation or high-humidity environment can cause corrosion of electrodes. Also, take precautions against water getting inside the LCD module as it can cause damage.
10) Liquid crystal freezes when stored below the storage temperature range and such freezing may cause orientation defects or bubbles (black or white) to appear in the LCD panel. Bubbles may also occur if the panel receives an impact in a low-temperature environment.
11) If the LCD module is left operating for a long time with the same display showing, the displayed pattern may leave traces on the screen or the contrast may become inconsistent.
12) As optimal operating voltage of the LCD module depends on the surrounding temperature, operation in a high-temperature environment may cause slight flickering.

8.4 DISASSEMBLY AND MODIFICATION

1) Do not attempt to disassemble or modify the LCD module. The internal construction of the LCD module is susceptible to shock, and foreign material or damage can cause screen loss. Data Modul AG shall not be responsible in the event that a customer attempts to disassemble or modify the LCD module.

8.5 STORAGE

1) When storing LCD modules, avoid the following conditions or environments:
   • Exposure to direct sunlight or fluorescent lighting.
   • High-temperature/high-humidity or very low-temperature (below 0°C) environments.
   • Exposure to water droplets, condensation, etc.
   Furthermore, keep LCD modules in anti-static bags to prevent static electricity charge ups. Whenever possible, LCD modules should be stored in the same conditions in which they were shipped from Data Modul AG. When doing so, ensure there are no water droplets, or condensation.
2) Take precaution to minimize corrosion of electrodes. Corrosion of electrodes is accelerated by moisture, condensation or a current flow in a high-humidity environment.
3) Recommended storage conditions:
   • Storage environment : +15 ºC to 35 ºC, less than 65%RH
   • Duration: up to 12 months after shipping date
4) The shipping cartons must not be stacked up over 1.8m in height.

8.6 DISPOSAL

1) When disposing of LCD modules, consult companies authorized to handle industrial waste treatment. When incineration is the method of LCD module disposal, relevant environmental legislation must be observed.

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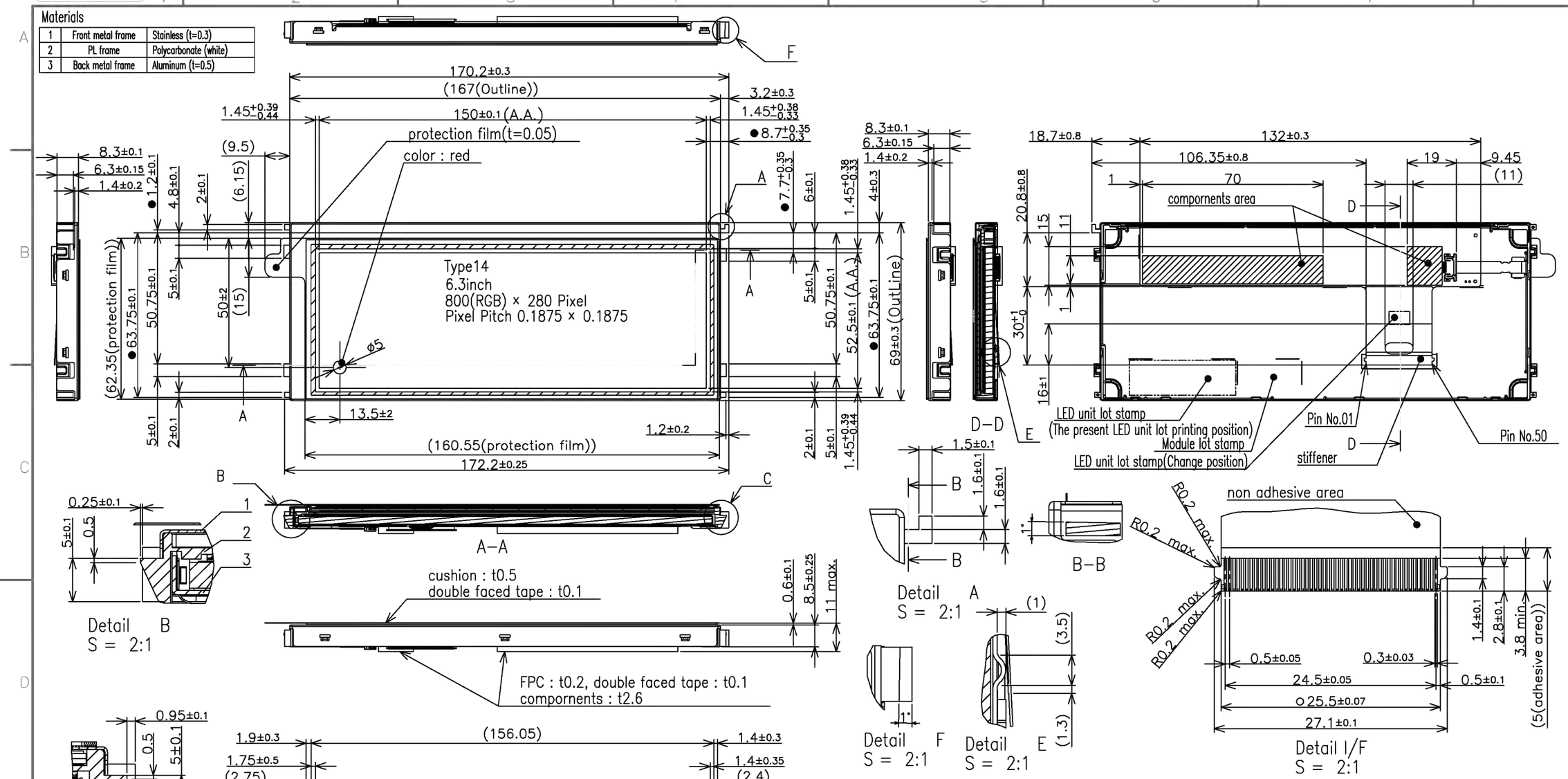
Materials

1	Front metal frame	Stainless (t=0.3)
2	PL frame	Polycarbonate (white)
3	Back metal frame	Aluminum (t=0.5)



Pin No.	I/F Terminal
01	VDD
02	VDD
03	GND
04	GND
05	B5
06	B4
07	B3
08	B2
09	B1
10	B0
11	GND
12	G5
13	G4
14	G3
15	G2
16	G1
17	G0
18	GND
19	R5
20	R4
21	R3
22	R2
23	R1
24	R0
25	GND
26	GND
27	PCLK
28	GND
29	GND
30	DE
31	HSYNC
32	VSYNC
33	GND
34	XRES
35	GND
36	DISP
37	SLP
38	RL
39	TB
40	N.C.
41	N.C.
42	GND
43	N.C.
44	LED1_C
45	N.C.
46	LED2_C
47	N.C.
48	LED1_A
49	N.C.
50	LED2_A

4)We do not take any responsibility for damages in relation to the
3)Critical dimensions are indicated in white circle (○) Cmk≥ 1.67
2)Critical dimensions are indicated in black circle (●) Cpk≥ 1.33
Note1)Connecter for I/F Terminal : FH28D–50S–0.5SH(05) (HIROSE)

6	x		–		
5	x		–		
4	x		–		
3	x		–		
2	x		–		
1	x		EC–E80486 '12.07.06	P/N RELEASE	
HISTORY x COUNT	SUFFIX REPL.		ECN–NO. DATE	REVISION	SIGN.

DRAWN BY | PLANNED BY | CHECKED BY | APPROVED BY

TENTATIVE

MODEL BTFT063C-01

PART No. 12002380

UNIT mm	TOLERANCE	USED ON	RANK
ANGLE	±0.5		FAMILY
SCALE 3:5		ORIGINAL MODEL GCX119AKM–E	
MATERIAL(COLOR) –		FINISH(COLOR) –	

TITLE/DESCRIPTION
(E) Outline Drawing
(J)

PART No. | SHEET 1/1

BATRON

A3
'12.4