date	Ver	page	Contents	reason	editor
2007/2/20	0.1	all	First edition		A.kawamura
2007/3/22	0.2	All	2nd Edition Revise Pin assignment		K.Ohnishi
2007/5/18	1.0	All	English Version		K.Ohnishi
2007/8/20	2.0	2,3,4 7 22 23 24 29 35,38,39	Backlight 1LED->2LED Update LED supply codn. Update Panel Elec. Spec Update Optical Spec Update Backlight Spec	Keep Spec	K.Ohnishi

Description

The ACX385AKM-8 is an LCD panel module with LED backlight developed exclusively for the ACX385AKM-8 6.3cm diagonal active matrix TFT-LCD panel addressed by low temperature polycrystalline silicon transistors with built-in peripheral driving circuits. Especially ACX385AKM-8 is so called **SYSTEM DISPLAY** which involves not only Horizontal & Vertical driver circuits but also following peripheral system blocks , Timing generator ,gamma correction ,Direct digital I/F circuits, RGB data processing , 3-wire control , VCOM driver and negative voltage supply. ACX385AKM-8 is able to connect DSP device (set application) directly and contribute reduction of peripheral parts.

The backlight module uses 2LED and realize high luminance and low power consumption.

Features

◆Number of active dots 640(H)×240(V) =153,600 dots
◆System display Built-in Driving circuits as following
LCD Timing generator & H/V Driving circuits
Direct digital Interface receiver circuits (Mck 13.5MHz RGB serial format)
3-wire serial control circuits
D/A converter (8bits) circuits
LCD gamma control circuits (S-curve shape characteristic)
Negative voltage generation circuits (-5V)
COM driving & COMDC adjust circuits
◆ Low voltage, low power consumption
LCD portion ; 3V power supply 60 mW(HSweep) power consumption
Backlight portion ; 72mW (Iled=12mA)
132mW(typ) total power consumption
◆Supports NTSC , Smooth picture with RGB delta array (horizontal resolution 320TV-lines)
◆Backlight module with 2 LED
◆Center luminance 250cd/cm2 (72 mW typ)
◆Color chromaticity NTSC 35%
◆High contrast ratio with Normally white mode 400:1 (typ)
◆Narrow frame a

Element Structure

◆Active matrix TFT-LCD panel with built-in peripheral driving circuits using low temperature polycrystalline silicon transistors.

◆Number of dots
Number of active dots 640(H) ×240(V) = 153,600

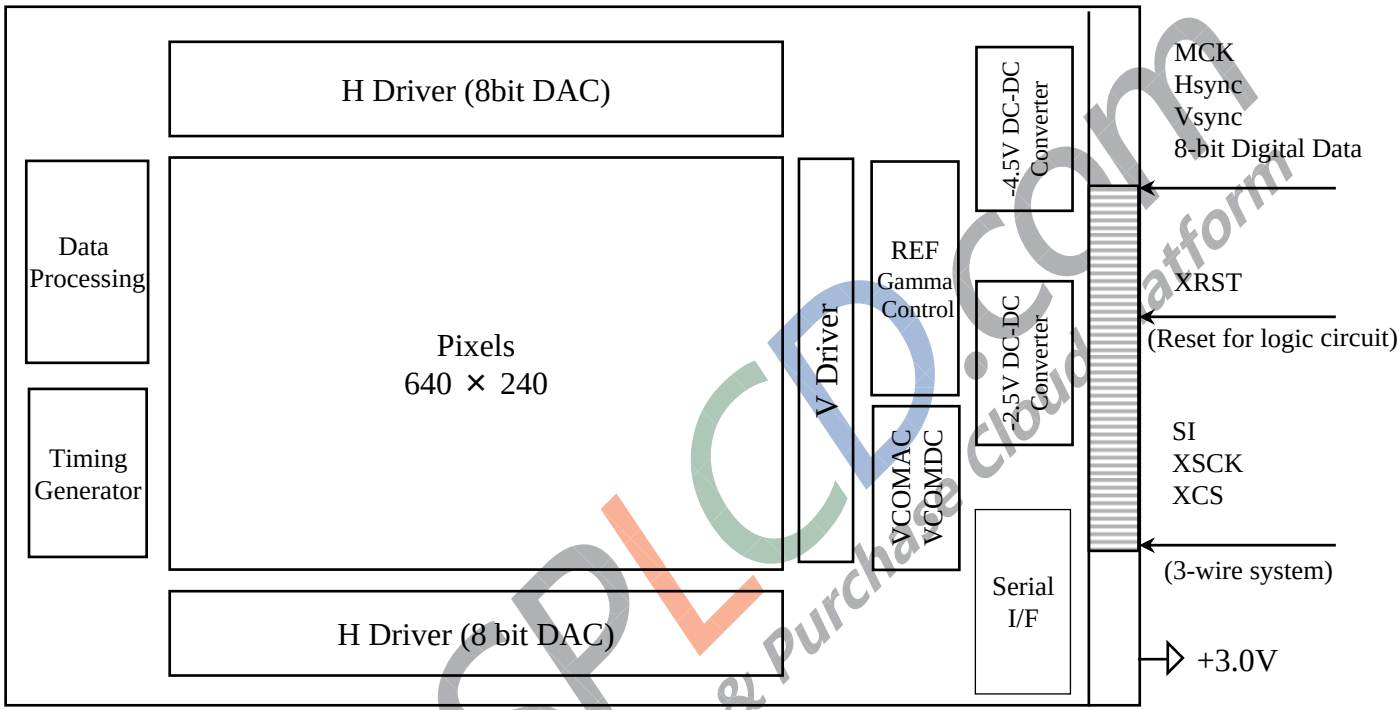
◆Module dimension
Package dimension 58.85 (W) × 43.55 (D) ×2.847 (H)〔mm〕
Active area 49.92 (H) × 37.44 (V)〔mm〕

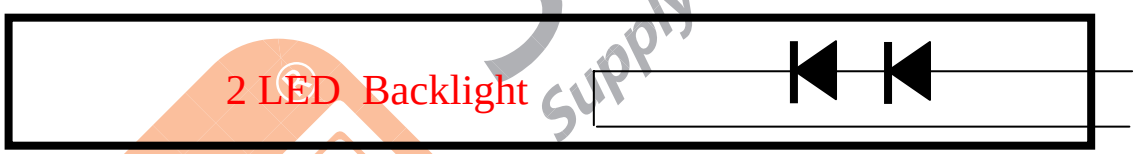
Block Diagram

ACX385AKM-8 is consist of Panel Portion and Backlight module.

The panel module diagram is shown below

LCD Panel portion





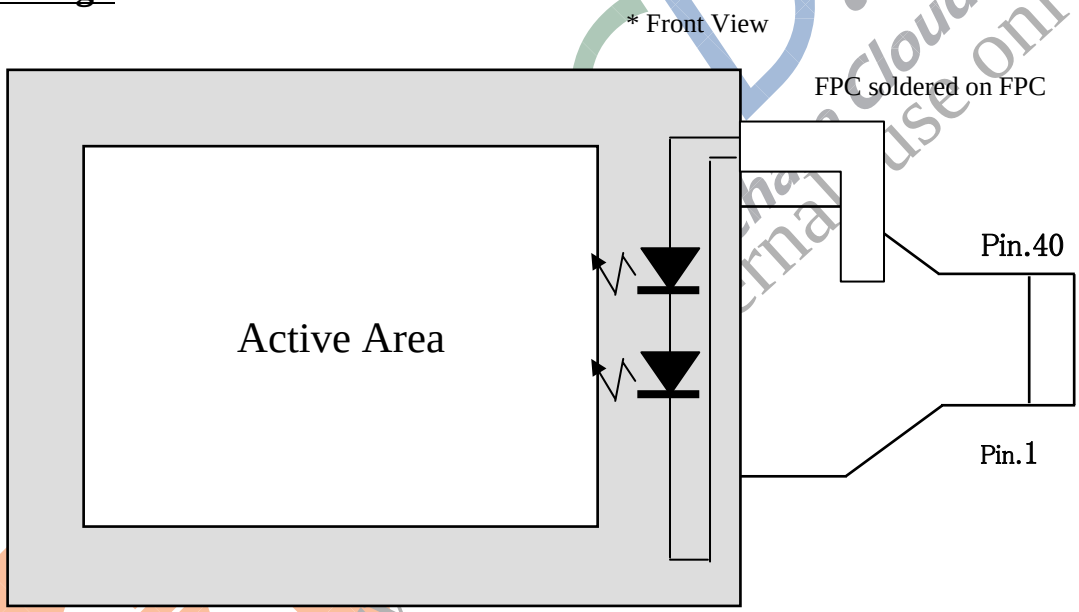
Backlight Module

Absolute Maximum Rating

(Ta=25℃、VSS=0V)

・Supply voltage1	VDD1D , VDD1A	-0.5 ～ 3.5 V
・RST input pin voltage	XRST	-0.5 ～ VDD1+0.5 V
・LCD input pin voltage	Hsync , Vsync , MCK	-0.5 ～ VDD1+0.5 V
・Data signal input pin voltage	D7, D6, D5 , D4 , D3 , D2 , D1 , D0	-0.5 ～ VDD1+0.5 V
・Serial Control input pin voltage	XCS , XSCK , SI	-0.5 ～ VDD1+0.5 V
・Operating Temperature	Topr	-10～+60℃
・Storage Temperature	Tstg	-30～+70℃
・Storage Humidity	Thdy	40℃ Below 90%
・LED backlight DC forward current	Ifhl	35 mA
・LED backlight reverse withstand voltage	Vrhl	0 V

Pin assign



Pin Description

管脚号	信 号 名	说 明	备 注
1	LEDK	背光电源负极	
2	LEDA	背光电源正极	
3	GND	地	
4	TESTOUT	液晶正常工作时输出帧脉冲	
5	D1	3.3V，颜色信号，最低位	
6	D2	3.3V，颜色信号	
7	D3	3.3V，颜色信号	
8	D4	3.3V，颜色信号	
9	D5	3.3V，颜色信号	
10	D6	3.3V，颜色信号	
11	D7	3.3V，颜色信号，最高位	
12	VCLK	13.4MHZ，上升沿采样，3.3V	
13	HSYNC	15.7KHZ，下脉冲，行同步，3.3V	
14	VSYNC	60HZ，下脉冲，帧同步，3.3V	
15	VSS3IN	电源输入	
16	VSS3OUT	电源输出	
17	VSS3C2	接电容	
18	VSS3C1	接电容	
19	NC	未用	
20	NC	未用	
21	VSS2IN	电源输入	
22	VSS2OUT	电源输出	
23	VSS2C2	接电容	
24	VSS2C1	接电容	
25	GND	地	
26	VDD5V	5V 电源	
27	NC	未用	
28	NC	未用	
29	NC	未用	
30	NC	未用	
31	NC	未用	
32	VCC	3.2V 电源	
33	VCC	3.2V 电源	
34	GND	地	
35	XSCK	配置字写信号，上升沿采样。3.3V	
36	SI	配置字，3.3V	
37	XCS	写配置字片选信号，3.3V	
38	RST	复位信号，低电平复位	
39	VSS1C2	接电容	
40	VSS1C1	接电容	

Operation Conditions of panel block

1. Input supply voltage conditions

Item	Symbol	Pin	Measurement Condition	Min.	Typ.	Max.	Unit.
Supply Voltage1	VDD1A	VDD1A		2.85	3.0	3.15	V
	VDD1D	VDD1D		2.85	3.0	3.15	V

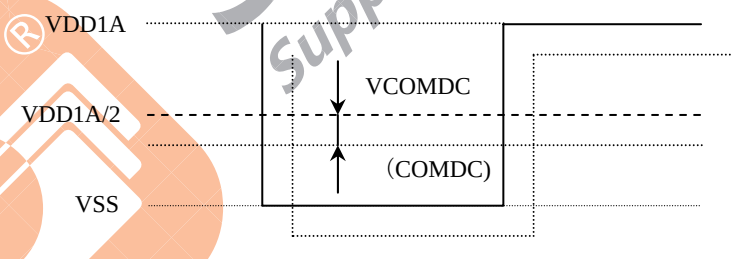
VDD1A needs high accuracy because of basement voltage for analog circuit.

2. Panel input signal voltage condition

Item	Symbol	Pin	Measurement Condition	Min.	Typ.	Max.	Unit.
Input clock voltage	VIH	(*1)	|IIH|=0.2mA	VDD1D×0.9	VDDID	3.5	V
	VIL	(*1)	|IIH|=0.2mA	- 0.3	0	0.1×VDD1D	V

(*1) Apply for Hsync , Vsync , MCK , XRST , SI , XSCK , XCS , Data[7:0]
(*2) VCOMDC is adjusted by 3-wire serial control

VCOMDC waveform symbolic chart



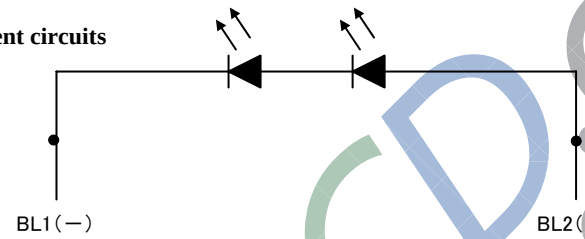
(*) VCOMAC = VDD1A – VSS

Operating condition of backlight block

1. Input supply voltage conditions

item	symbol	min	typ	max	unit
Backlight DC forward current	IfBL	—	12	—	mA
Backlight DC forward voltage	$Vfbl_{12}$	TBD	6.0	TBD	V
Backlight Power consumption	Pbl_{12}		72	TBD	mW

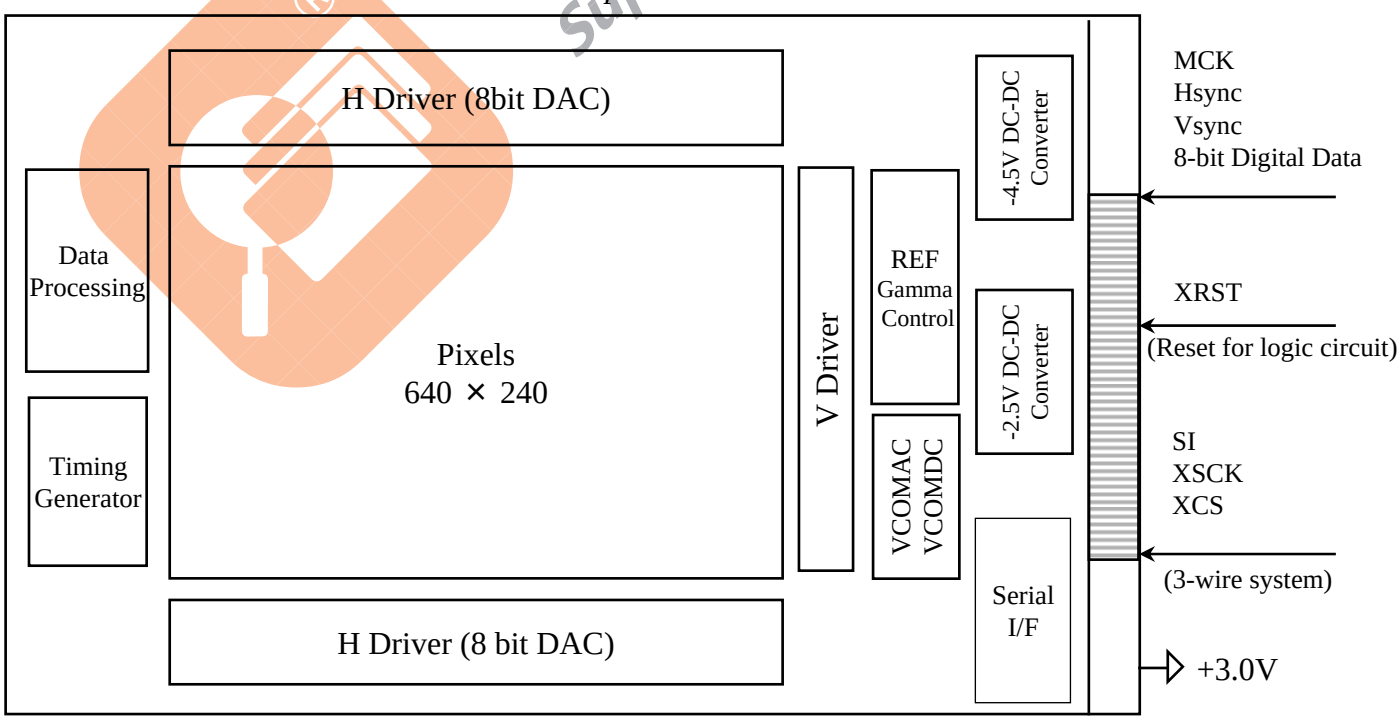
Backlight Equivalent circuits



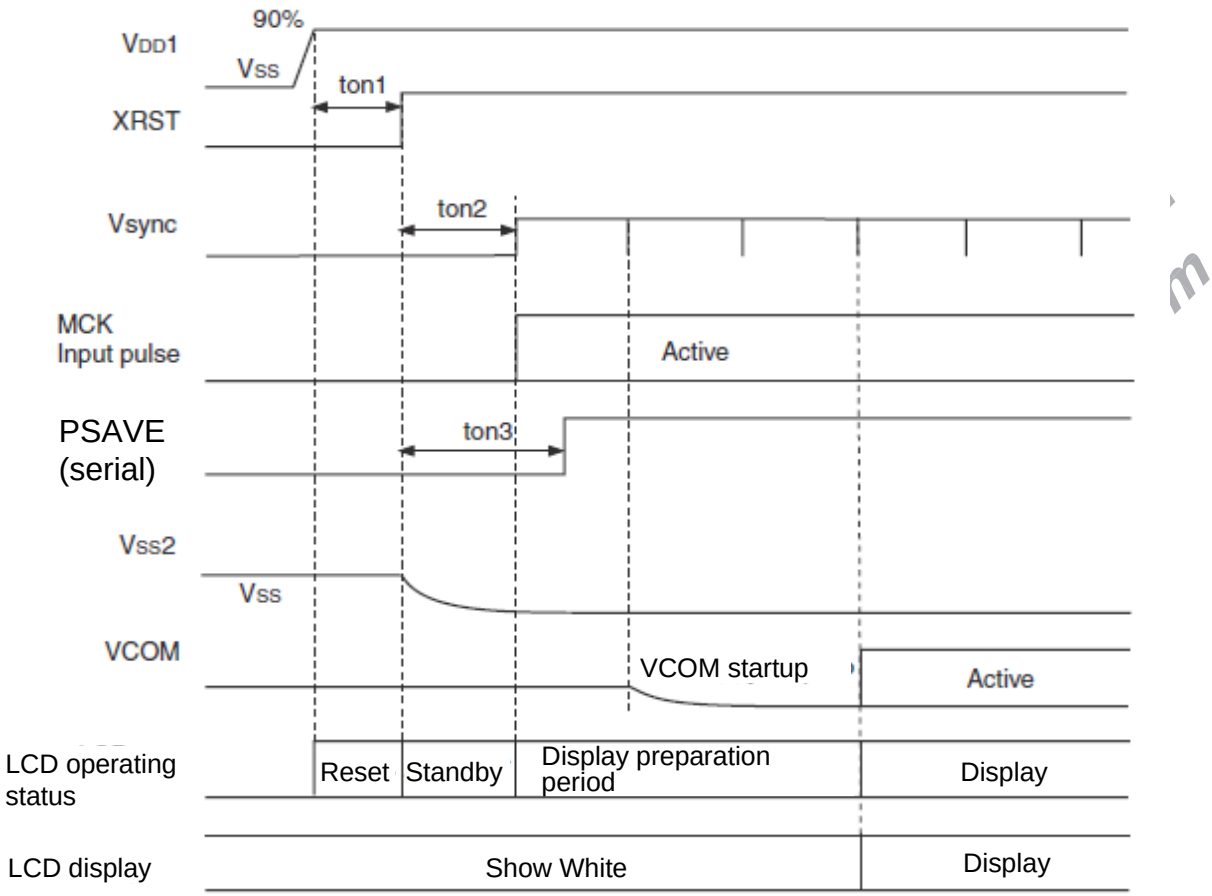
Power Supply Sequence Specifications

The ACX385AKM-8 Requires external +3.0V power supply. The VDD1 power supplies (VDD1A and VDD1D) can be separated, but the power supply sequences should be controlled so that these power supplies turn on and off at the same timing. In addition this panel has a standby function, so operation ON must be controlled via the serial interface. The respective power-on timings and reset cancel timings are specified on separate pages, so be sure to observe these timings.

LCD Panel portion

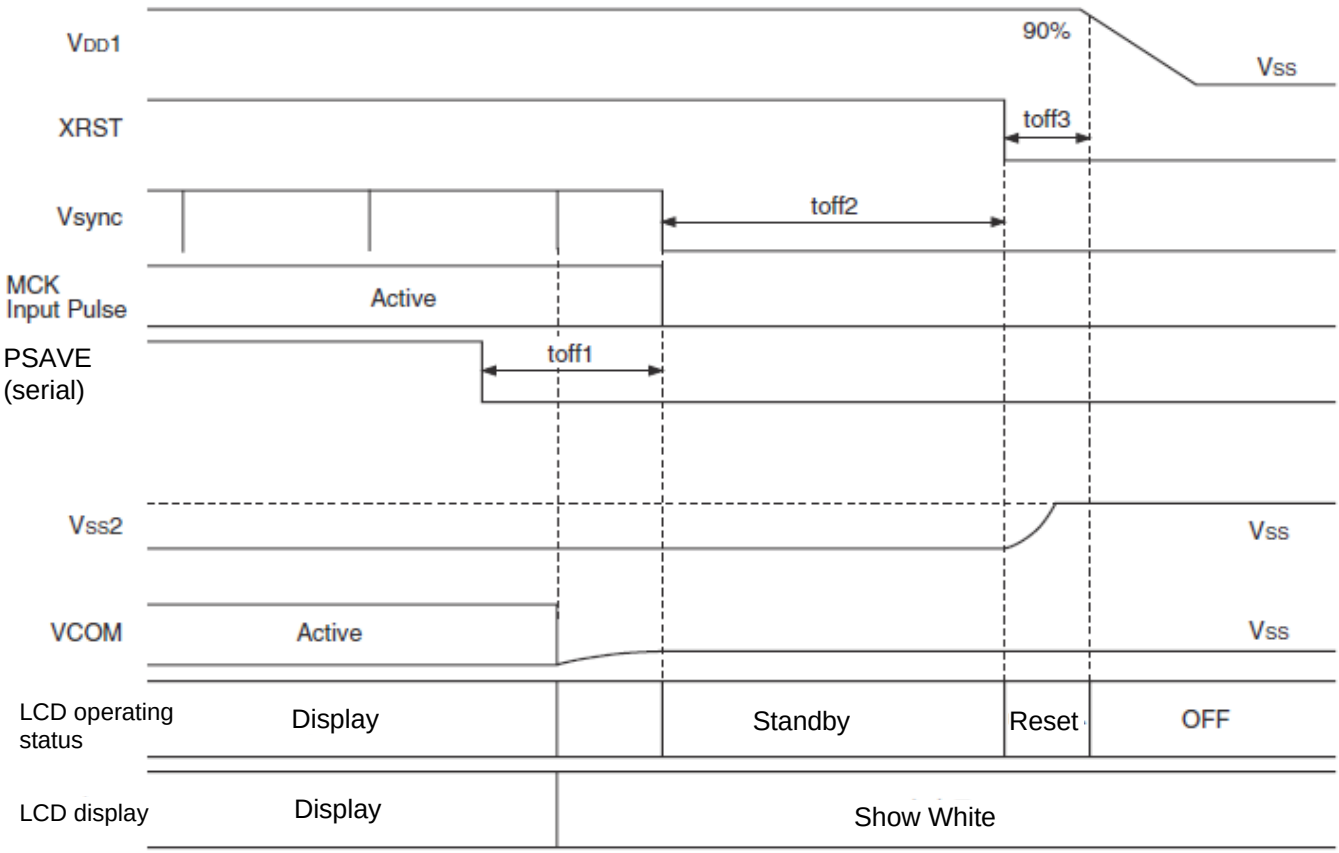


1.Power ON Sequence



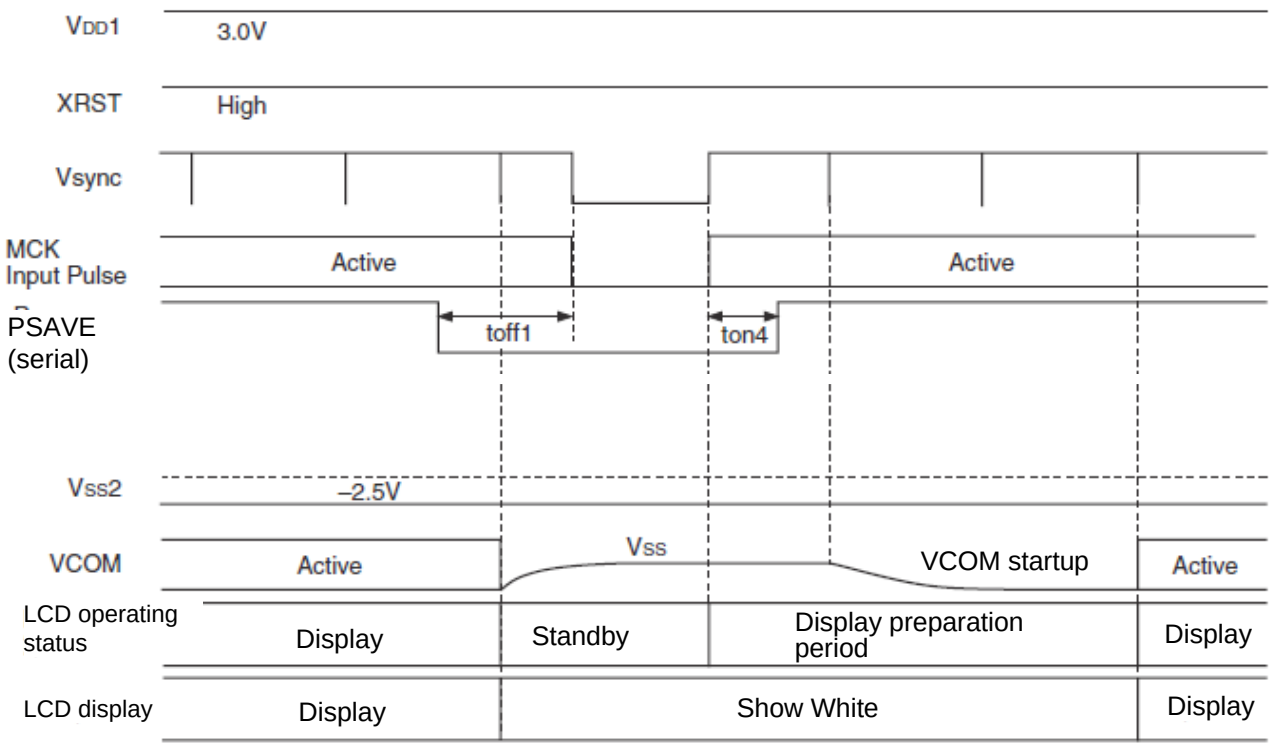
Item	Symbol	Pins	Min.	Typ.	Max	Unit
VDD1 (90%) → XRST ↑	ton1	VDD1, XRST	1	—	—	ms
XRST ↑ → Input pulse (Active)	ton2	XRST, Input pulse	1	—	—	ms
XRST ↑ → PSAVECanceled	ton3	XRST, PSAVE	30 (ton3 > ton2)	—	—	ms

2.Power OFF Sequence



Item	Symbol	Pins	Min.	Typ.	Max	Unit
PSAVE Canceled → Input pulse (Low)	toff1	Input pulse , PSAVE	1	-	-	Field
Input pulse(Low) → XRST ↓	toff2	PSAVE , XRST , VDD2	1	-	-	ms

3. Standby ON/OFF Sequence

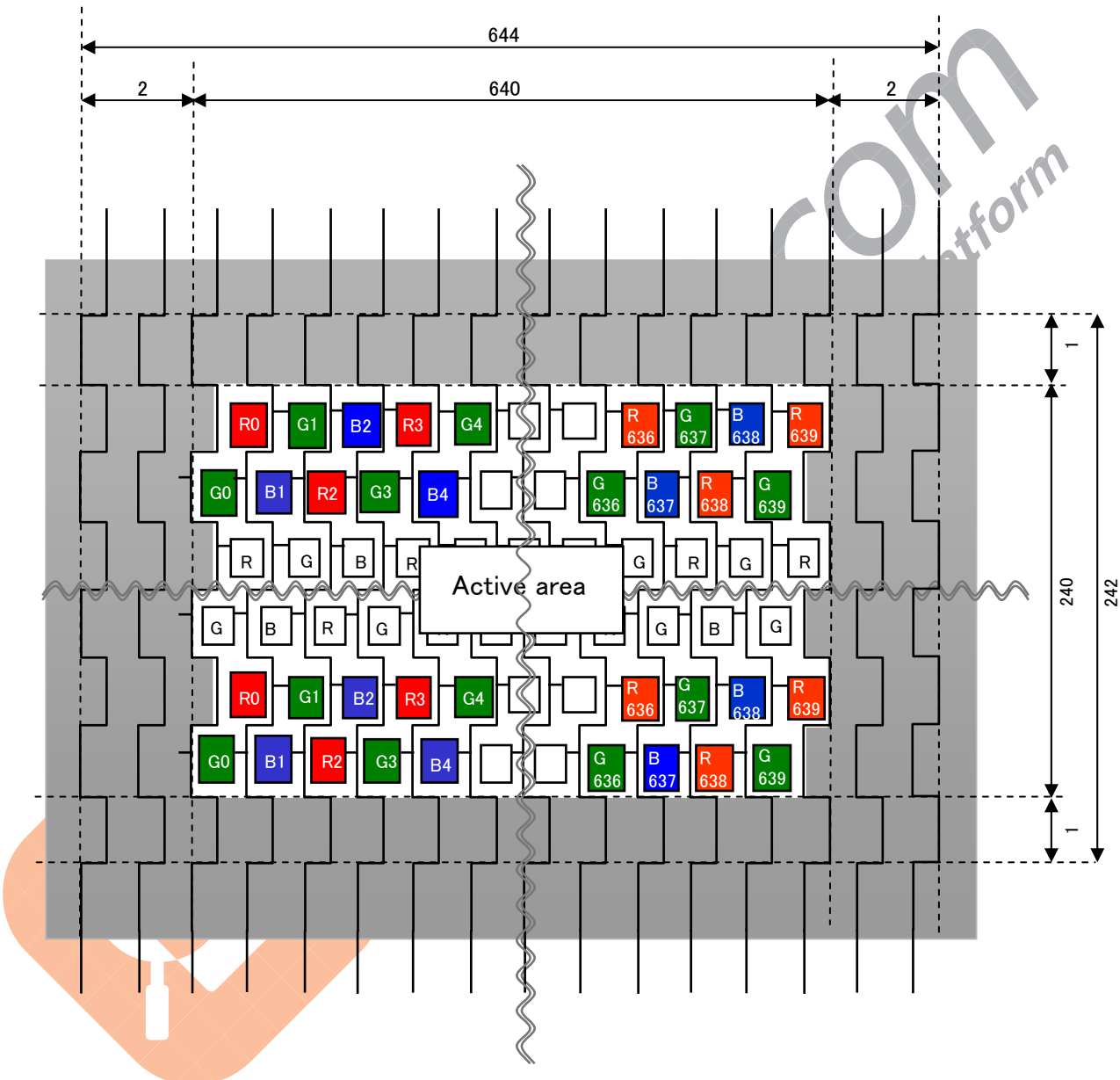


Item	Symbol	Pins	Min.	Typ.	Max	Unit
Input pulse(Active) → PSAVE Canceled	ton4	Input pulse , PSAVE	1	-	TBD	ms
PSAVE canceled → Input pulse (Low)	toff1	Input pulse , PSAVE	1	-	-	Field

Note) Input pulses may be input during Standby period.

640×240 LCD color coding

The color filters are coded in a delta array.
The shaded area is used for tha dark border around the display.

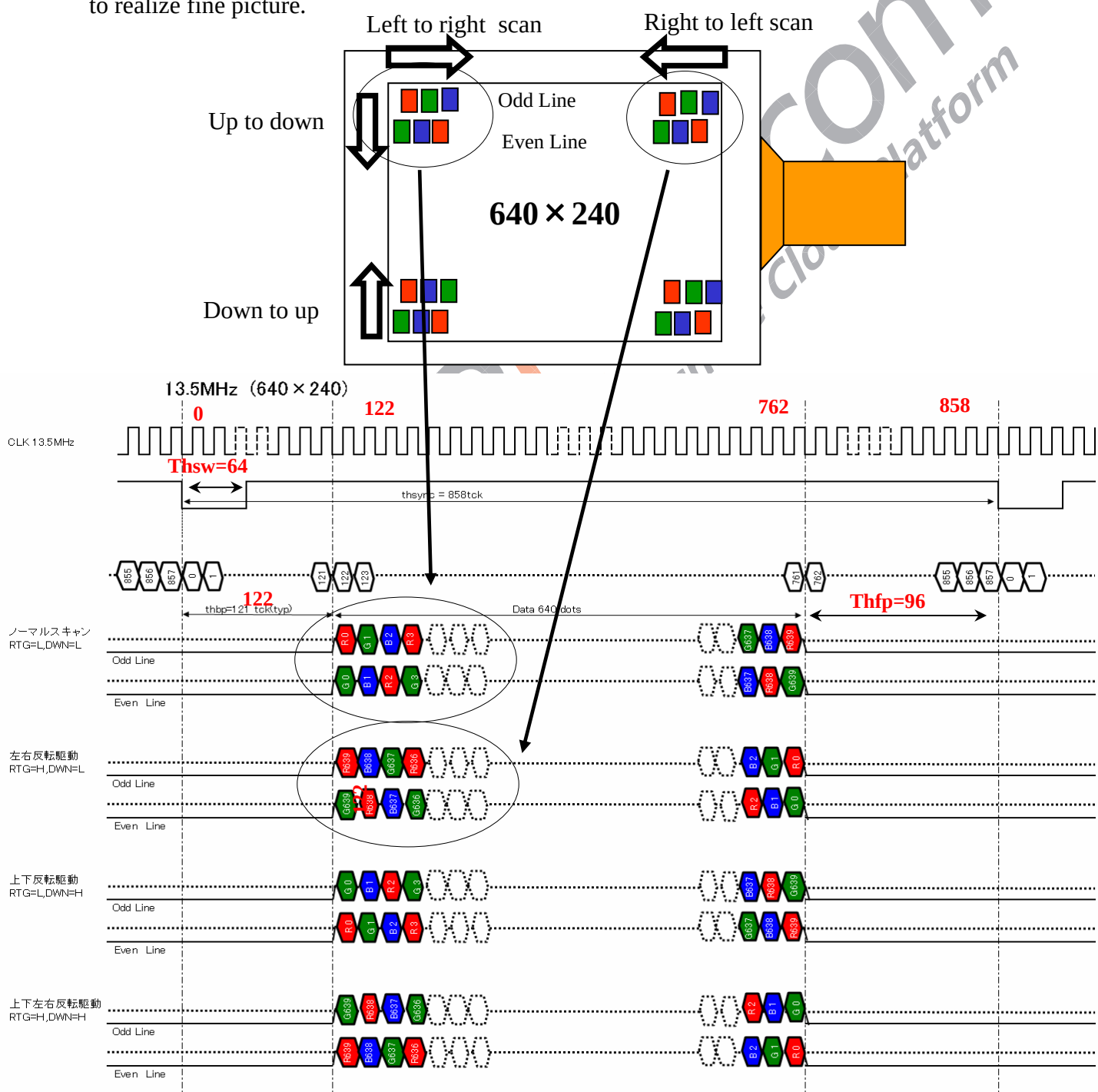


Picture (RGB) input signal format

Description of RGB serial format

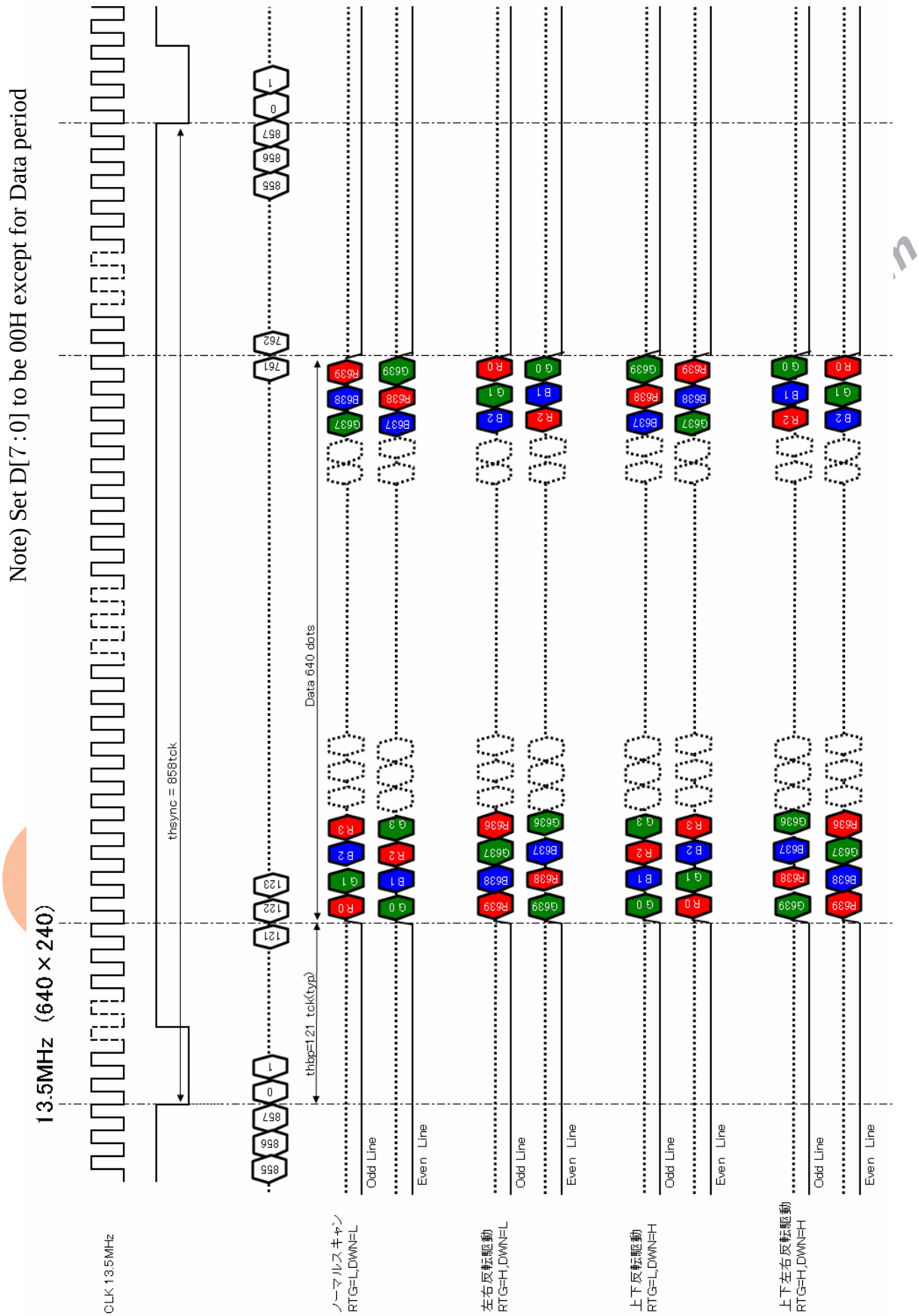
○RGB serial format

RGB serial format should be made according to pixel arrangement of display.
RGB serial format exist 4 pattern by H and V scan direction.
Because Pixel color of each 4corner is different. Pixels locates delta arrange like below figure.
Between odd line and even line 0.5pixels phase shift of RGB data should be required to realize fine picture.

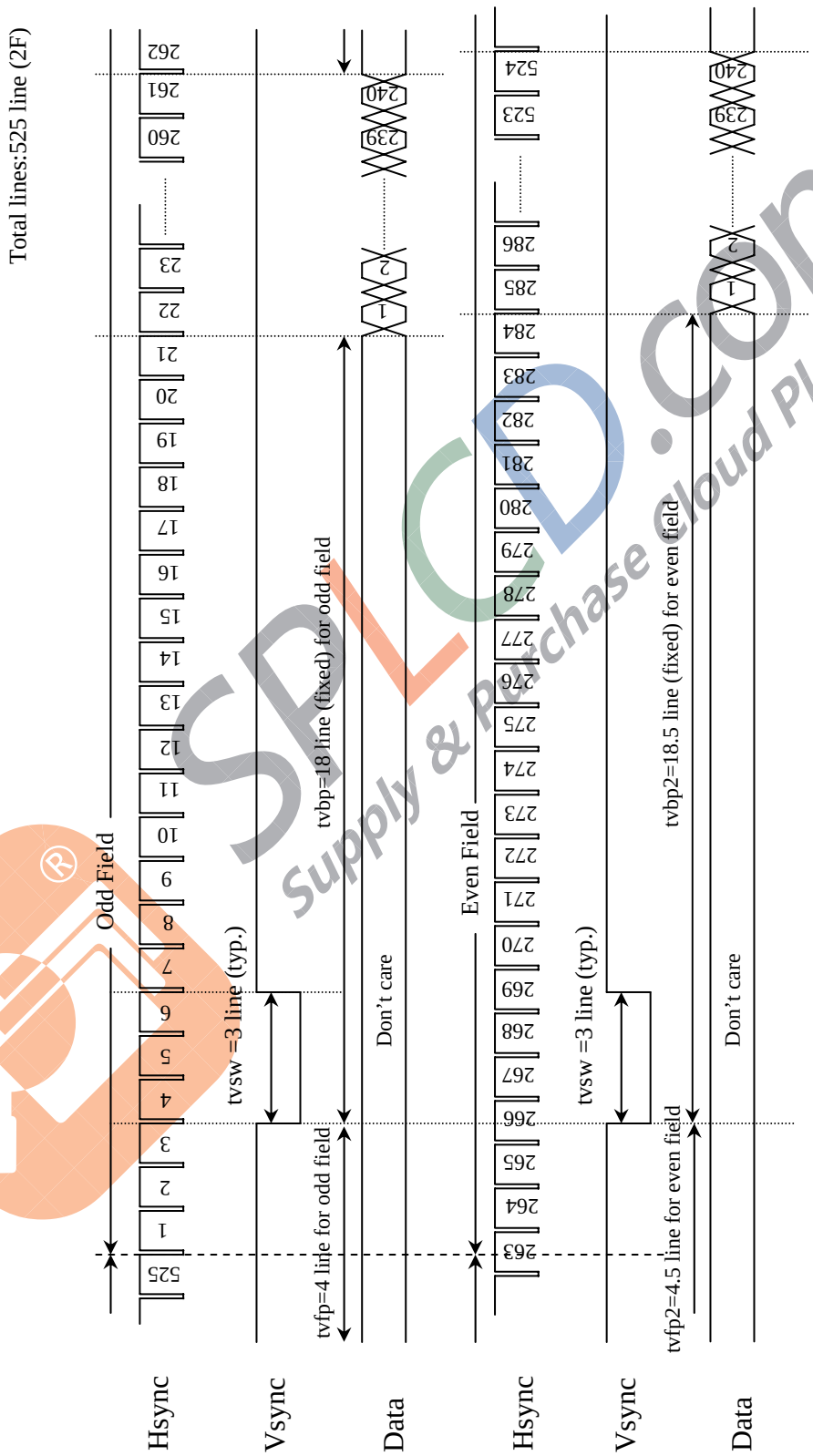


Note) Set D[7:0] to be 00H except for Data period

Horizontal standard timing



Vertical standard timing

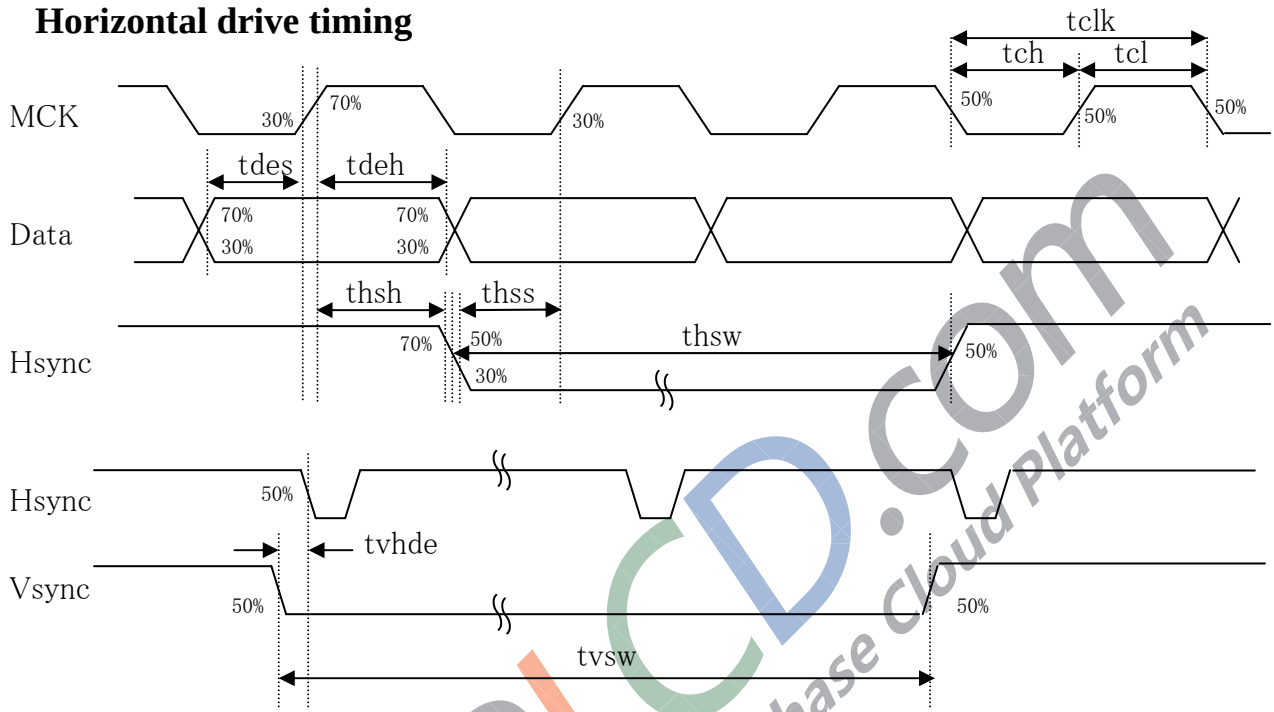


Input pulse AC condition

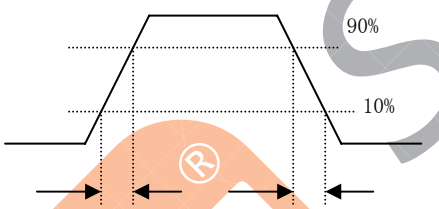
Item	Symbol	Pin	Measurement	Min.	Typ.	Max.	Unit
MCK frequency	ftch	MCK		-	13.5	-	MHz
MCK Period	tclk	MCK		-	74	-	ns
MCK Low/High pulse width	tch , tcl	MCK		0.45tclk	0.5tclk	0.55tclk	ns
Hsync low pulse width	thsw	Hsync		3	64	96	dot
Hsync front porch	thfp	Hsync		-	256	-	dot
Hsync falling edge →1st Data start	thbp	Hsync		-	122	-	dot
Nh				-	858	-	dot
Horizontal Period		Hsync		-	63.5	-	us
Horizontal Frequency		Hsync		-	15.8	-	kHz
Hsync setup time	thss	Hsync		22	-	-	ns
Hsync hold time	thsh	Hsync		22	-	-	ns
Data setup time	tdes	Data[6:0]		22	-	-	ns
Data hold time	tdeh	Data[6:0]		22	-	-	ns
Vsync falling edge →Hsync falling edge	tvhde	Hsync , Vsync		0tclk	-	300tclk	ns
Vsync Low pulse width	tvsw	Vsync		2	3	6	line
Vsync front porch (odd field)	tvfp	Vsync		-	4	-	line
Vsync front porch (even field)	tvfp2	Vsync		-	4.5	-	line
Vsync falling edge →1st Data start (odd field)	tvbp	Vsync		-	18	-	line
Vsync falling edge →1st Data start (even field)	tvbp2	Vsync		-	18.5	-	line
Nv				-	262.5	-	line
Vertical Period		Vsync		-	16.7	-	ms
Vertical Frequency		Vsync		-	60.0	-	Hz
Fast Clock Rise Time	trf	MCK , Hsync , Data[6:0]		-	-	15	ns
Fast Clock Fall Time	tff	MCK , Hsync , Data[6:0]		-	-	15	ns
Slow Clock Rise Time	trs	Vsync , RST		-	-	50	ns
Slow Clock Fall Time	tfs	Vsync , RST		-	-	50	ns

Definition of each symbol (AC condition)

Horizontal drive timing



Definition of Rise & Fall time



Description of 3-wire control system

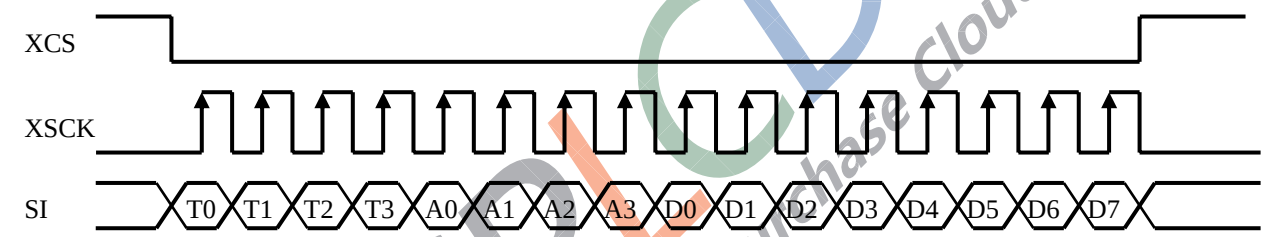
Description of 3-Wire control receiver

- Control data consists of 16 bits data which is loaded one bit at a time at the rising edge of XSCK
- Loading operation starts from the falling edges of XCS and is completed at the next rising edge.
- Digital block control data is established by the vertical sync signal, so if data is transferred multiple times for the same item, the last data before the vertical sync signal is valid.
- If 16 bits of more of XSCK are not input while XCS is low, the transferred data is not loaded to he inside of the LCD and is ignored.
- If 16 bits of more of XSCK are input, the first 16 bits of data before the rising edge of the XCS pulse are valid data.
- Serial block operates with the XSCK clock.
- Serial data can be accepted in the power save mode.

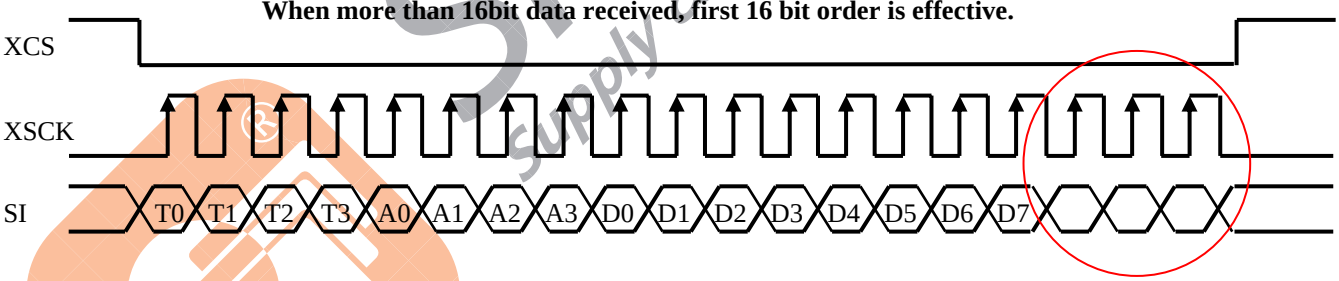
3-wire control system timing

Note: To prevent LCD turns abnormal situation caused by external noise, To refresh the data frequently is recommended.

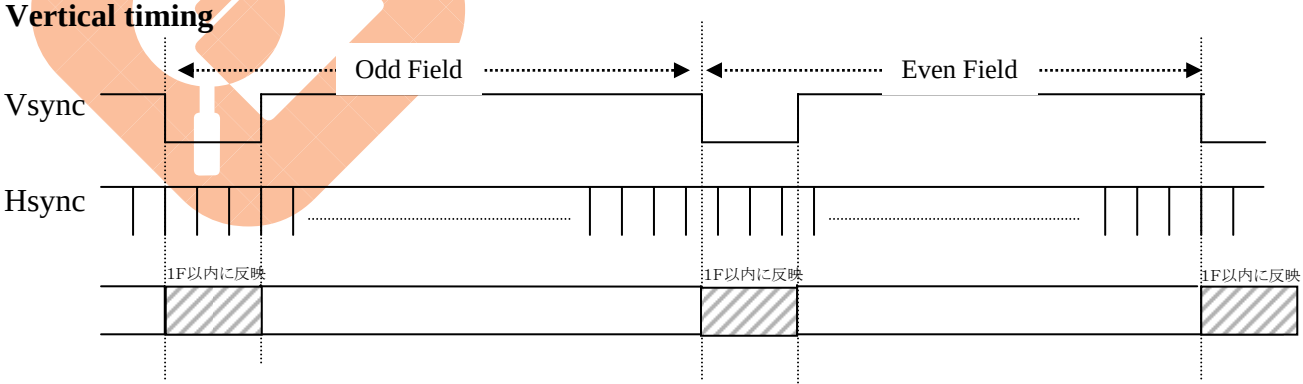
Timing chart



When more than 16bit data received, first 16 bit order is effective.



Vertical timing



If data are input during this term, operation will be valid at latest vsync timing.

If data are input during this term, operation will be valid at latest vsync or next vsync timing.

※ If same data is accepted , Last data is valid.

3-wire control register map

T0 (LSB)	T1	T2	T3	A0	A1	A2	A3 (MSB)	D0 (LSB)	D1	D2	D3	D4	D5	D6	D7 (MSB)
Don't Care				0	0	0	0								
				1	0	0	0				COM-DC 1Fh～10h～00h				
				0	1	0	0								
				1	1	0	0								
				0	0	1	0								
				1	0	1	0			SLFR					
				0	1	1	0		SLDWN	SLRGT		PSAVE			
				1	1	1	0								
				0	0	0	1								
				1	0	0	1								
				0	1	0	1								
				1	1	0	1						0		
				0	0	1	1								
				1	0	1	1		0				0		
				0	0	0	1								
				0	1	1	1								
				1	1	1	1								

Description of Control data

(1)VCOM DC〔COM output DC setting〕

Then adjusts the DC level of the VCOM output.

Data	VCOMDC level [V]			Operation
	Min.	Typ.	Max.	
0	1.02	1.07	1.12	-
↑	↑	↑	↑	↑
16	1.22	1.27	1.32	Default
↓	↓	↓	↓	↓
31	1.45	1.50	1.55	+

(2)SLRGT〔Right /Left inversion setting〕

This switches the right /left inverted display of screen.

* see P12. Selection of scan direction should be fit RGB data serial format.

SLRGT	operation
0	(Left →Right scan) (Default)
1	Reverse scan (Right → Left scan)

(3)SLDWN〔Up/Down inversion setting〕

This switches the Up / Down inverted display of screen.

* see P12. Selection of scan direction should be fit RGB data serial format.

SLDWN	operation
0	(Up → Down scan) (Default)
1	Reverse scan (Down → Up scan)

④POWER SAVE〔Power save ON/OFF〕

This control the power save ON/OFF sequence.

The operation conditions in the power save ON/OFF status are set by PSAVE.

When turning Power save ON , during approximately 2 fields, LCD LAG is disappeared.

PSAVE	operation
0	Power save ・・・Operation ⇒about 2Field⇒ Power save mode (Default)
1	Operation ON ・・・ Power save mode ⇒about 2Field⇒ Operation

⑤SLFR (1-field inversion of RGB and COM polarities)

This perform 1 field polarity inversion of RGB and COM signals.

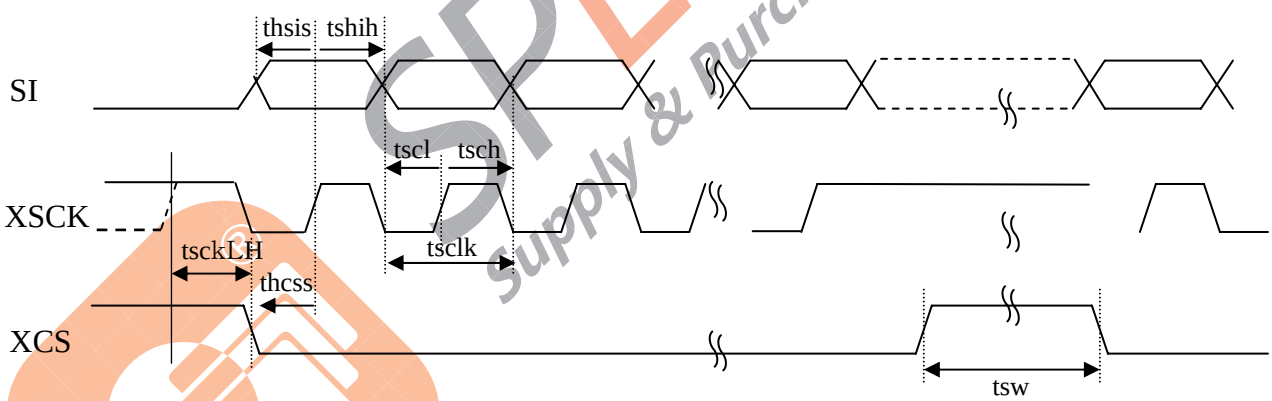
SLDWN	operation
0	Normal inversion (1H/ 1-field inversion) (Default)
1	1field inversion

AC characteristics of 3-wire control block

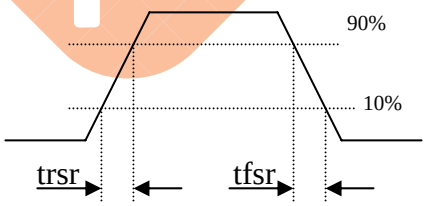
Unless otherwise specified, Ta=-10～+60℃, VDD1=2.85～3.15V,GND=0V

Item	Symbol	Pin	Measurement Condition	Min.	Typ.	Max.	Unit
XSCK frequency	ftsch	XSCK		-	-	0.9	MHz
XSCK Period	tsclk	XSCK		1111	-	-	nsec
XSCK Low/High pulse width	tsch,tscl	XSCK		0.35tsclk	0.5tsclk	0.65tsclk	
SI setup time	thsis	SI		450	-	-	nsec
SI hold time	thsih	SI		450	-	-	nsec
XCS falling edge ->XSCK rising edge	thcss	XSCK, XCS		0.6tsclk	-	-	
Serial input clock rise time	trsr	SI , XSCK		-		50	nsec
Serial input clock fall time	tfsr	SI , XSCK		-	-	50	nsec
XCS high level pulse width	tsw	XCS		500	-	-	nsec
XSCK L⇒H ->XCS falling edge	tsckLH	XSCK, XCS		0.5	-	-	nsec

3-Wire control block measurement condition



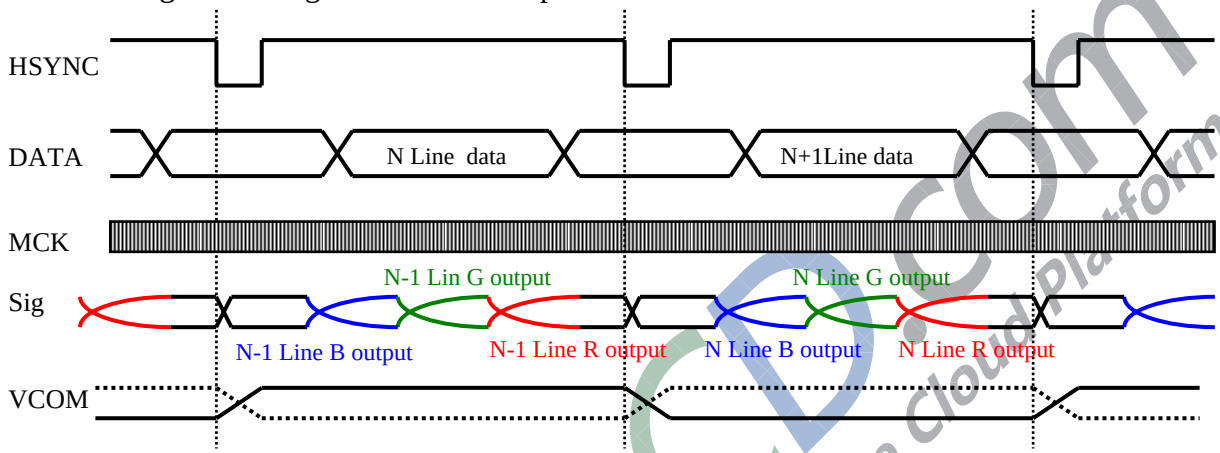
Output Transition time measurement conditions



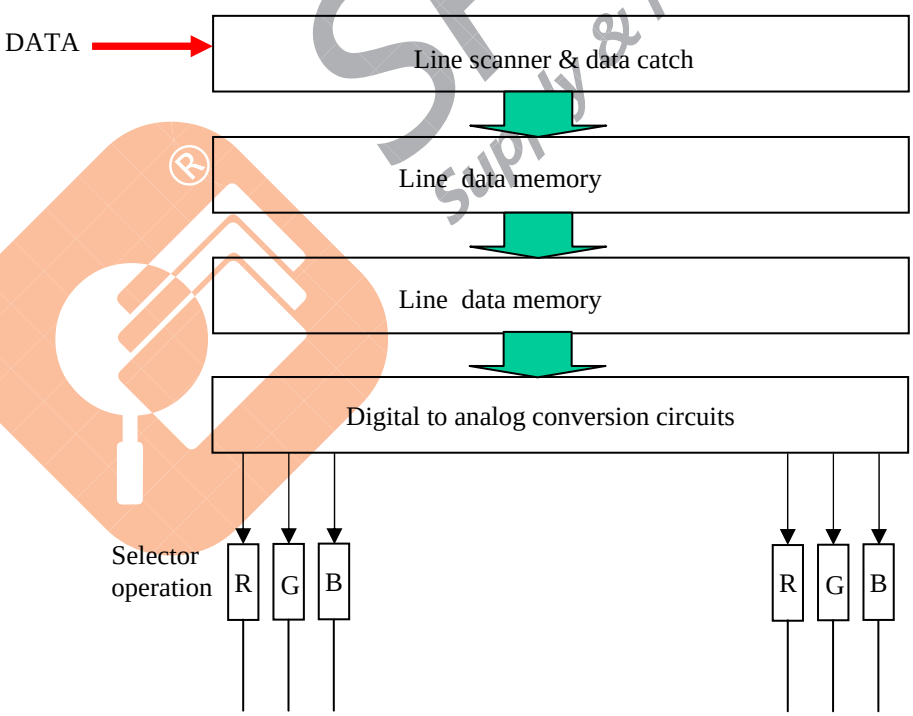
Description of LCD operation

Input signal operation in LCD (relation between input timing and LCD display timing)

Input RGB signal send to LCD pixels after 1H .
Serial RGB signal changes in parallel signal in LCD, R/G/B Digital data is changed to analog signals ,
In each timing R/G/B signal send to LCD pixels



LCD data block is following chart.



To LCD Pixels

Electrical Characteristics

(VDD1=3.0V,GND=0V,Ta=25℃)

Power Consumption

Pin	Min.	Typ.	Max.	Unit.	Conditions
VDD1 current	-	20	T.B.D.	mA	On Hsweep screen (SPEC standard screen)
		0.05	T.B.D.	mA	at Power save mode
Maximun rash current		T.B.D.	T.B.D.	mA	VDD1
Total Power consumption		60	T.B.D.	mW	On Hsweep screen (SPEC standard screen)

Input Pin capacitance

Pin	Min.	Typ.	Max.	Unit.	Conditions
MCK	-	TBD	30	pF	
Hsync	-	TBD	30	pF	
Vsync	-	TBD	30	pF	
Data	-	TBD	30	pF	
XRST	-	TBD	30	pF	
SI	-	TBD	30	pF	
XSCK	-	TBD	30	pF	
XCS	-	TBD	30	pF	

Input pin current

Pin	Min.	Typ.	Max.	Unit.	Conditions
MCK	-0.2	T.B.D.	-	mA	
Hsync	-0.2	T.B.D.	-	mA	
Vsync	-0.2	T.B.D.	-	mA	
Data	-0.2	T.B.D.	-	mA	
XRST	-0.2	T.B.D.	-	mA	
SDT	-0.2	T.B.D.	-	mA	
SCK	-0.2	T.B.D.	-	mA	
SEN	-0.2	T.B.D.	-	mA	

Electro Optical Characteristics

Each value is tentative (Ta＝25℃, NTSC mode)

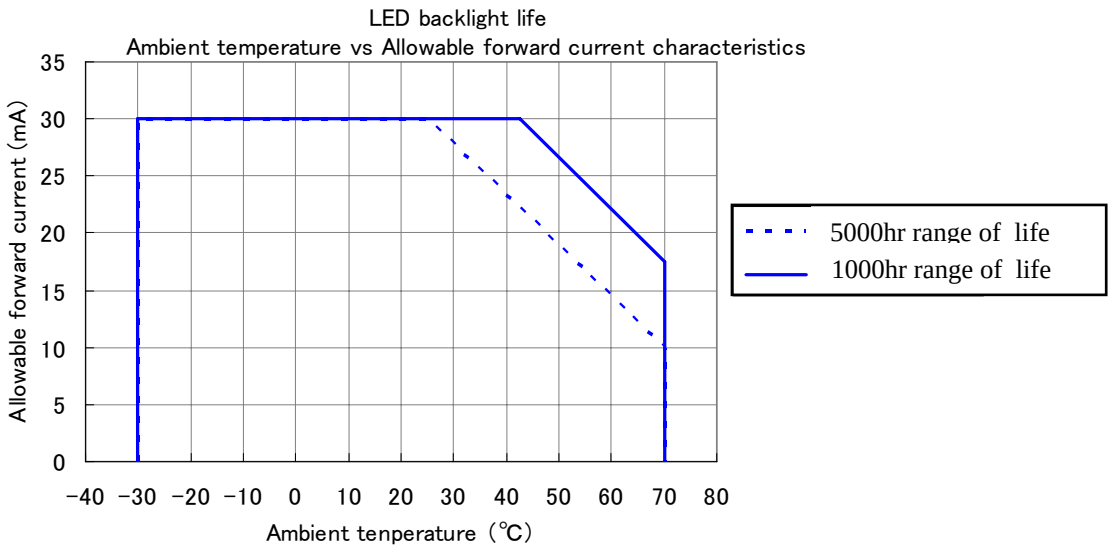
item			Symbol	Measure	Min	Typ	Max	Unit
Contrast ratio			CR_{25}	1	200	400	—	
Center Luminance	I LED＝23mA		Lm_{25}	2		250	—	cd/m^2
Chromaticity (Iled＝25mA)	W	x	Wx	3	TBD	0.32	TBD	CIE
		y	Wy		TBD	0.325	TBD	
		Tc	Tcm		TBD	6500	TBD	K
		⊿uv	duvm		TBD	0.005	TBD	
	R	x	Rx		TBD	0.59	TBD	CIE
		y	Ry		TBD	0.345	TBD	
	G	x	Gx		TBD	0.35	TBD	
		y	Gy		TBD	0.51	TBD	
	B	x	Bx		TBD	0.16	TBD	
		y	By		TBD	0.12	TBD	
G-T Characteristics*1	G_{90}	25℃	G_{90-25}	4		TBD		HEX
	G_{50}	25℃	V_{50-25}			TBD		
	G_{10}	25℃	V_{10-25}			TBD		
Response time*1	ON time	0℃	Ton0	5	—	35		ms
		25℃	Ton25		—	15		
	OFF time	0℃	Toff0		—	6		
		25℃	Toff25		—	20		
Viewing angle range		CR≧10	θT	6		20	—	deg
			θB			60	—	
			θL			45	—	
			θR			45	—	
Crosstalk*1		25℃	CTK	7	—	----	1.5	%

*1 Conform to the measurement results for the discrete panel.

Electro optical characteristics of backlight

(Ta＝25℃)

item	condition	symbol	measurement	Min	Typ	Max	Unit
Forward current	Ifbl＝12mA	Vfbl	8		6		V
Power consumption	Ifbl＝12mA	Pbl			72		mW
Center luminance	Ifbl＝12mA	Lbl		2000	2500	-	cd/㎡
Luminance uniformity	Ifbl＝12mA	Blunif	9	60	-	-	%
Backlight life (Luminance half-life)	Conforms to the condition of the temperature and allowable forward current shown below.						



Panel/Module/Backlight Electro optical Characteristics Measurement

Basic measurement condition

(1) Driving voltage

VDD1D=VDD1A=3.0V VIH=3.0V

3-wire control condition: SLRGT=0,SLDWN=0,COMDC=10H, PSAVE=1,

White signal input condition : D[7..0]= 3FH

Black signal input condition : D[7..0]= 00H

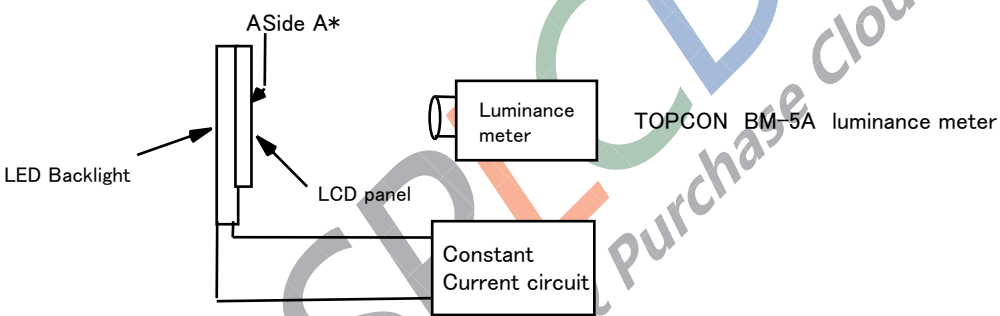
(2) Measurement temperature

25℃ Unless otherwise specified

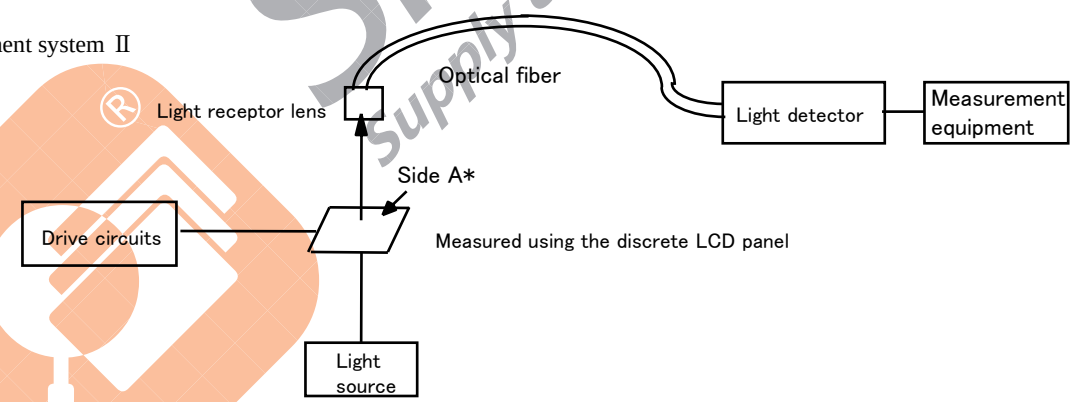
(3) Measurement point

One point of center of the screen unless otherwise specified

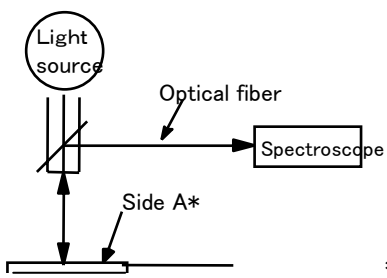
Measurement system Ⅰ



Measurement system Ⅱ



Measurement system Ⅲ



*Side A :See the package Outline

1. Contrast ratio

Contrast ratio (CR) is given by the following formula.

$$CR = \frac{L\ (White)}{L\ (Black)}$$

L(white): Surface luminance of the LCD panel when input signal is **White signal** input condition
L(Black): Surface luminance of the LCD panel when input signal is **Black signal** input condition

2. Center luminance of Module, Color temperature

L(white) is the same expression as defined in "Contrast ratio"
Lm=White luminance at the center of the panel
Tcm=Color temperature at the center of the panel

3.Chromaticity

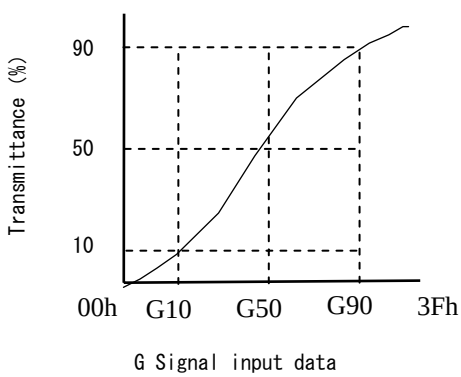
Chromaticity of the panel is measured by Measurement system Ⅰ. Raster modes of each color are difined by the representations at the signal input condition shown in the table below. Measurement system Ⅰ uses x and y of the CIE standards as the chromaticity here.

		Signal input condition to each input		
		R input	G input	B input
Raster	R	**White signal**	**Black signal**	**Black signal**
	G	**Black signal**	**White signal**	**Black signal**
	B	**Black signal**	**Black signal**	**White signal**
	W	**White signal**	**White signal**	**White signal**

4. G－T Characteristics

G-T characteristics ,or the relationship between signal input data and the transmittance of the panel, are measured by measurement system Ⅰ by inputting the signal data to each input pin.

G90,G50 and G10 correspond to the voltages which define 90%,50% and 10% of transmittance respectively.



5. Response Time

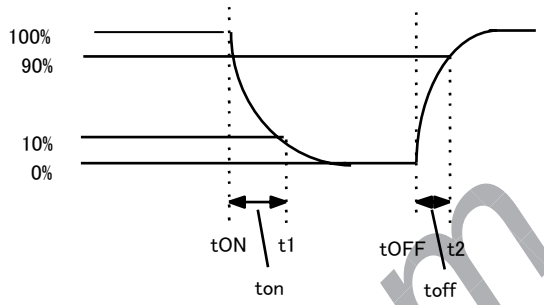
Response times ton and toff are measured by Measurement system Ⅰ by applying the input signal voltages in the figure below to each input pin. These times are defined by the following formulas.

ton = t1 − tON

toff = t2 − tOFF

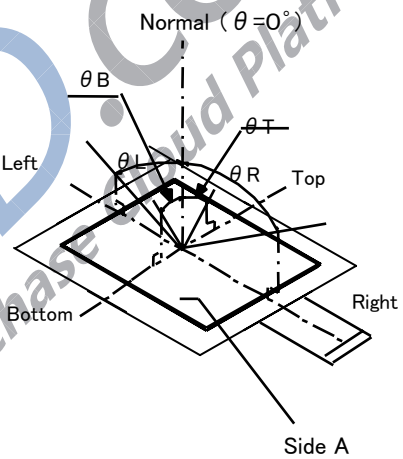
t1: time which gives 10% transmittance of the panel.
t2 : time which gives 90% transmittance of the panel

Optical output waveform



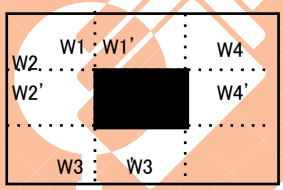
6. Definition of Viewing Angle Range

Viewing angle is measured by Measurement system Ⅱ. the contrast raio (CR) is measured at the angles defined in the figure right and the range when CR ≧10 are taken as the following angle range. Measure with side A*1 up.



7. Crosstalk

Crosstalk is defined by the luminance differences between adjacent area represented by Wi' and Wi (i=1 to 4) around the black window



Crosstalk value CTK= $\left| \frac{Wi' - Wi}{Wi} \times 100(\%) \right|$

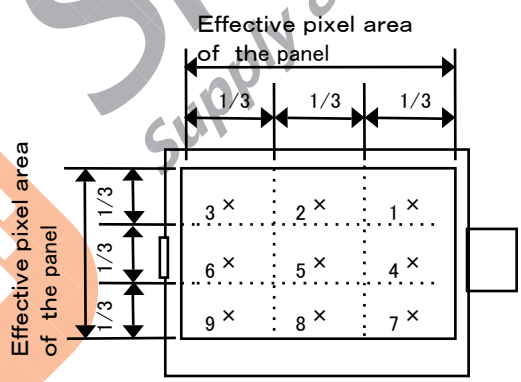
8. Backlight center Luminance measurement method

(1) Environmental condition
Temperature : 25±5 ℃
Humidity : 30 to 80 %
Start measurement after leaving the module with above environment for one hour.
Measurement should be performed in a dark room with a luminance of 10 lx or less and which is not subject to the effects or reflective or external light .
There should be no heat insulating objects around the module unit, and measurement should be performed in a draftless condition.

(2) Luminance and chromaticity measurement method
Measurement equipment : TOPCON BM-5A,viewing angle : 0.2° , distance : 450±50 nm
Measurement 30s after the backlight is lit.
Using a constant current circuits, measure the luminance under conditions of |fb|=20mA.

9. Backlight Luminance Uniformity measurement method

(1) Environmental conditions
Measure under the same conditions as "9 backlight center Luminance and chromaticity measurement method " above.
(2) Light the backlight at |fbl =20mA using a constant current circuits. and start measurement 30s after the backlight is lit.
Backlight luminance uniformity is obtained by dividing the effective pixel area into 9 equal sections as shown below. Measuring the luminance at each of the centers 1 to 9,and calculating
Min. luminance ÷ Max. luminance × 100〔%〕



Quality Standards

1.Defect Standards (Guaranteed at 25℃)

Item		Definition	Standard
Point Defects	Bright Spot	When a pixel is partially or completely transmittable during an entirely black raster.	See the Point Defect Standards
	Dark Spot	When a pixel is completely turned off during an entirely white raster.	
	Bright and Dark Spot	When a pixel is change from entirely black to white or red or green or blue, it changes from Bright to dark or dark to black	
Line defects			None

2.Uniformity Standards (Guaranteed at 25℃)

Item	Definition	Standard
Stain, partially unevenness		None, visible through a 5% ND Filter
String shaped		None, visible through a 5% ND Filter
Quality of external appearance		No remarkable dirt or scratches

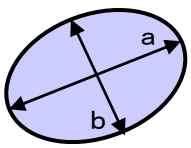
3.External Appearance Standards (Guaranteed at 25℃)

Item		Standard
Panel Surface A*1	Scratches	Width 50um, length 10mm or less
	Foreign objects, gouges	Average diameter*2 200um or less
	Dirtiness, air bubbles, peeling	No remarkable dirtness, air bubbles or peeling
	BM pinholes	No remarkable pinholes
	Scratches, foreign objects, gouges, dirtiness, air bubbles, peeling	偏光板外で進行性無こと （幅2mm以内，1個まで）
	Non Glue spot on Film	有効領域から0.2～0.7mmまでは 幅2mm以内1個まで。0.7mm外不問
Shield case	Scratches, burrs, dirtness, bending	No remarkable scratches, burrs, dirtiness or bending
FPC	Folds, scratches	No remarkable folds or scratches

*1 The guaranteed area is the area expanded by 0.7mm to the top, bottom, left and right of the active area.

*2 Definition of average diameter

$$\text{Average diameter} = \frac{a+b}{2}$$



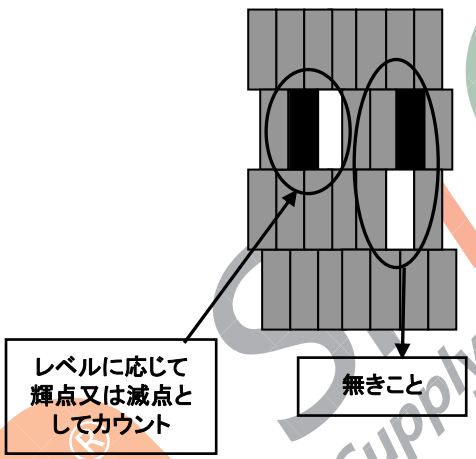
＊輝滅点と面押し輝点の評価方法

輝滅点

輝滅点は、全面黒、白、赤、緑、青で最も輝点として目立つ画面を表示し、各レベルに応じて輝点又は滅点としてカウントします。

	レベル	判定
単一／水平方向2連続	ND 3.0%で見える	高輝点
	ND 10%で見える	低輝点
	ND 10%で見えない	滅点
水平方向3連続以上	無きこと	
垂直方向連続	無きこと	

連続輝滅点の例



Point Defect Standards (Guaranteed at 25℃)

Bright spots

		Standard
A	High bright spot (ND 3.0%)	0
	Low bright spot (ND 10%)	2
B	High bright spot (ND 3.0%)	1
	Low bright spot (ND 10%)	4
Total		5
Distance between bright spots		5mm or more
Continuous bright spots		2 or more = NG

Dark spots

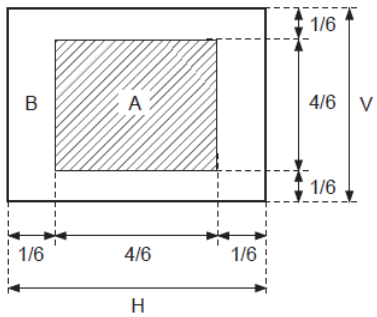
	Standard
A	2
B	4
Total	5
Continuous horizontal dark spots	2 are counted as one defect, 3 or more =NG
Continuous vertical dark spots	None
Distance between dark spots	5mm or more

Total bright and dark spots

	Standard
A	3
B	6
Total	6

* Continuous bright spots must be none.
* Continuous horizontal dark spots are counted as 1 point, 3 or more must be none
  Contiunous vertical spots must be none

* Definition of Zones
  Zones A and B in the Point Defect Standards are defined as follows



Application

New issues regarding external appearance and uniformity standards shall be resolved through discussions.

Inspection method

Item	Visual inspection of external appearance	Display inspection (line, surface, dot)
Backlight	—	250 +0/–60 cd／m^2 (ambient temperature: 25 ± 2°C, maximum dimmer)
Ambient illumination	500 to 1000 lx, 3-wavelength fluorescent light	100 to 300 lx or less, white fluorescent light
Inspection distance	Inspect 35cm from the display surface.	Inspect 35cm from directly in front (normal) of the display surface.
Standard inspection vision	1.0	1.0

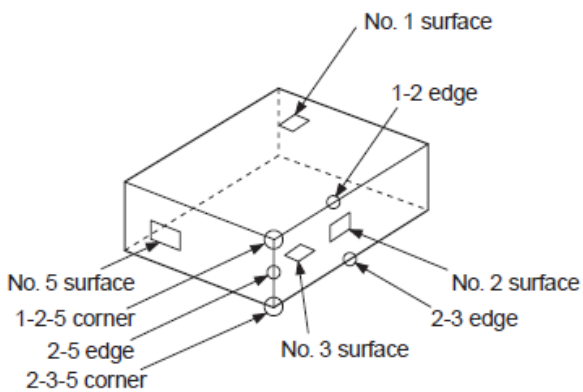
Application

Questions concerning the items noted in these specifications shall be resolved in good faith through discussions by the parties concerned.

Environmental Tests

Item		Specification	Judgment
Storage test	High temperature	70°C, 240h	There should be no changes that impair use under the display quality inspection conditions at the room or test temperatures. (However, the polarizer deterioration data is excluded from the high temperature & high humidity storage test.)
	High temperature & high humidity	60°C, 90%, 240h, no condensation	
	Low temperature	–30°C, 240h	
	Temperature cycle	–30°C/+70°C, 30min. each for 100 cycles	
Operation test	High temperature	60°C, 240h	
	High temperature & high humidity	40°C, 95%, 240h, no condensation	
	Low temperature	–10°C, 240h	
Strength test	Static electricity discharge	±200V, 200pF, 0Ω (non-operating)	Remarkable defects should not be found on the outward appearance of the display or the panel.
	Surface discharge	±8kV, 150pF, 330Ω (operating)	
	Shock	980.6m/s^2, t = 6ms, 2 times each in the ±X, ±Y and ±Z directions, sine wave (non-operating)	
	Vibration	20min. each in the X, Y and Z directions, 5 to 50Hz random vibration (non-operating)	
	Lead strength	Apply a 4.9N load at an angle of ±90° with respect to the pull-out surface. (non-operating)	
	Surface pressing strength	Apply pressure to the center of the surface with a push-pull gauge. Apply 49N of pressure one time with a pressing head of diameter 12.7mm. (non-operating)	
	Low pressure	50.5kPa, 2h (non-operating)	
	Drop test	See the figure below for the test method.	
	Drop vibration	20min. in the Z direction, 5 to 50Hz random vibration, acceleration: 8.1m/s^2	

* Drop test

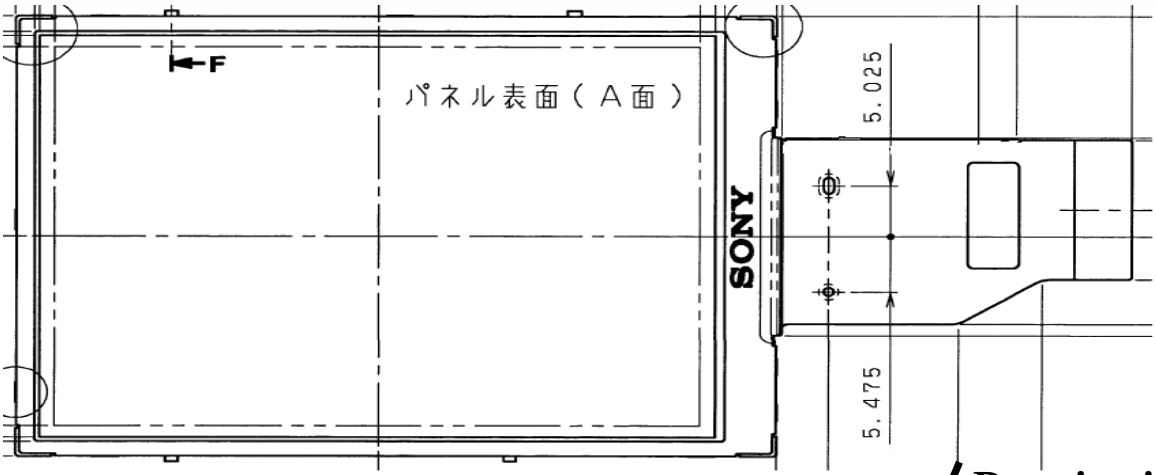


Drop heights: 75cm, 60cm, 42cm

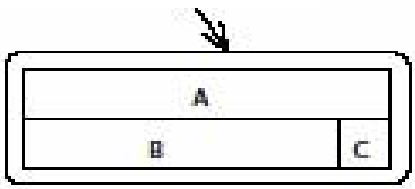
Tested locations: 75cm: No. 3 surface
60cm: No. 2 and No. 5 surfaces, 2-3-5 corner, 2-3 edge
42cm: 1-2-5 corner, 1-2 and 2-5 edges

Drop times: 1 time each for a total of 8 times

Product Label



Drawing is T.B.D



ACX385AKM-8

A : ACX351AKM-3

B : □ □ □ □ □ □

Control No.

Week manufactured

Year manufactured

C : Ass'y factory code

Notes On Handling

1. Static charge prevention
   Be sure to take the following protective measures. TFT-LCD panels and LED backlights are easily damaged by static charges.
   (1) Use non-chargeable gloves, or simply use bare hands.
   (2) Use a wrist strap when handling directly.
   (3) Do not touch any electrodes of the panel.
   (4) Wear non-chargeable clothes and conductive shoes.
   (5) Install grounded conductive mats on the working floor and working table.
   (6) Keep the panel away from any charged materials.
   (7) Use ionized air to discharge the panel.

2. Protection from dust and dirt
   (1) Operate in a clean environment.
   (2) When delivered, the panel surface (Polarizer) is covered by a protective sheet.
   Take appropriate measures to prevent static charges, and peel off the protective sheet carefully so as not to damage the polarizer.
   (3) Do not touch the polarizer surface. The surface is easily scratched. When cleaning, use a clean-room wiper with isopropyl alcohol. Be careful not to leave stains on the surface.
   (4) Use ionized air to blow dust off the polarizer surface.

3. Module fixing method
   (1) The following items should be taken into account for the positioning guide design.
   - The design reference edges are the upper and left edges of the panel as viewed from the front. Design the guides using the panel frame as the reference and not the backlight.
   - Set the guides on the same side of the set as the monitor window frame.
   - To prevent LCD image unevenness, the guides should be the maximum package tolerance or more so that a clasping load is not applied to the panel from the x and y directions.

   (2) Design the monitor window frame of the set so that it is within the guaranteed area shown below including variance. (Fig. 1)

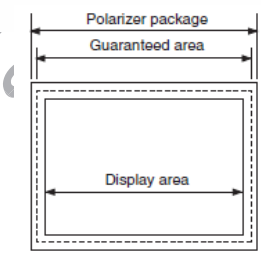
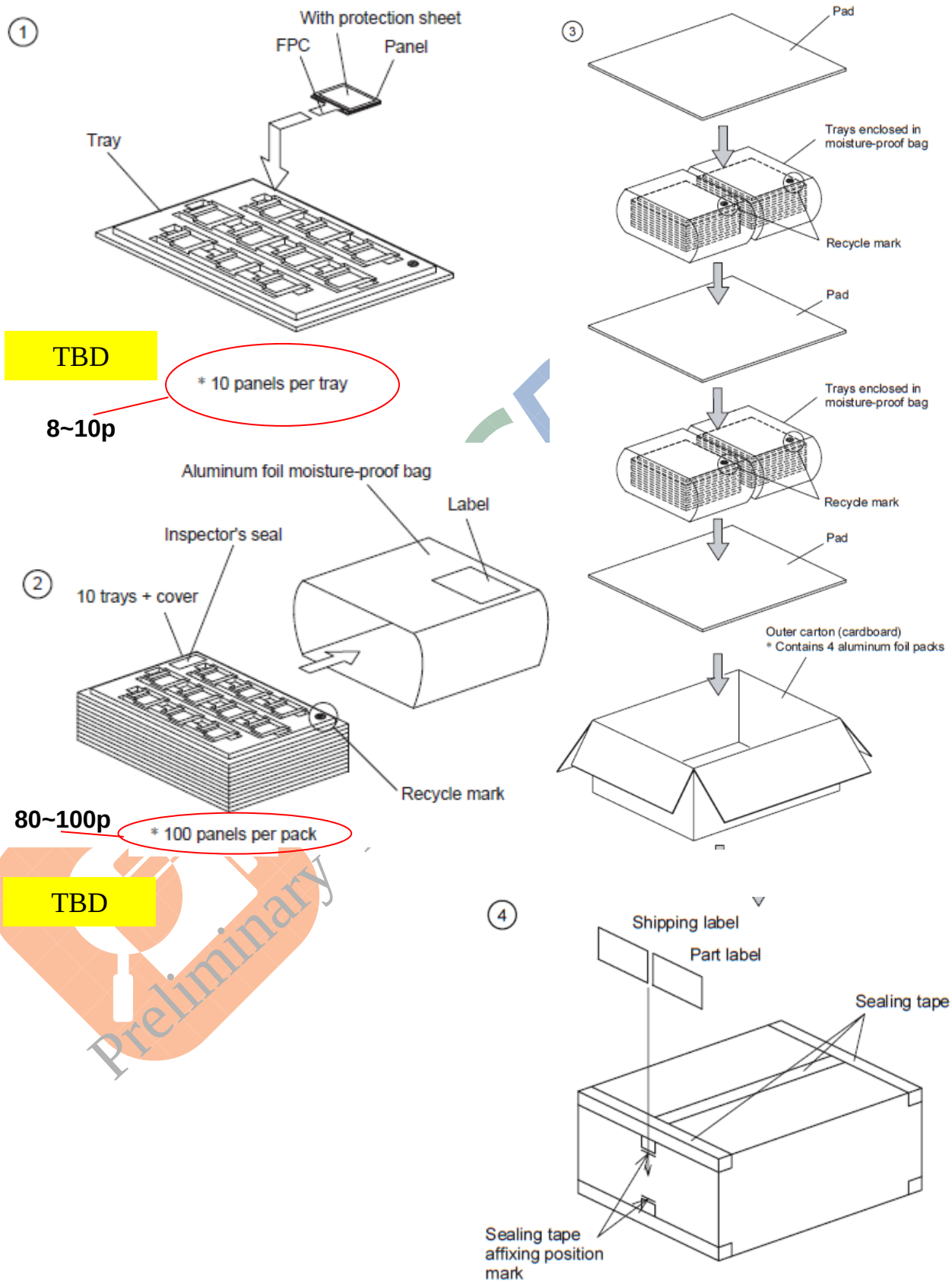


Fig. 1

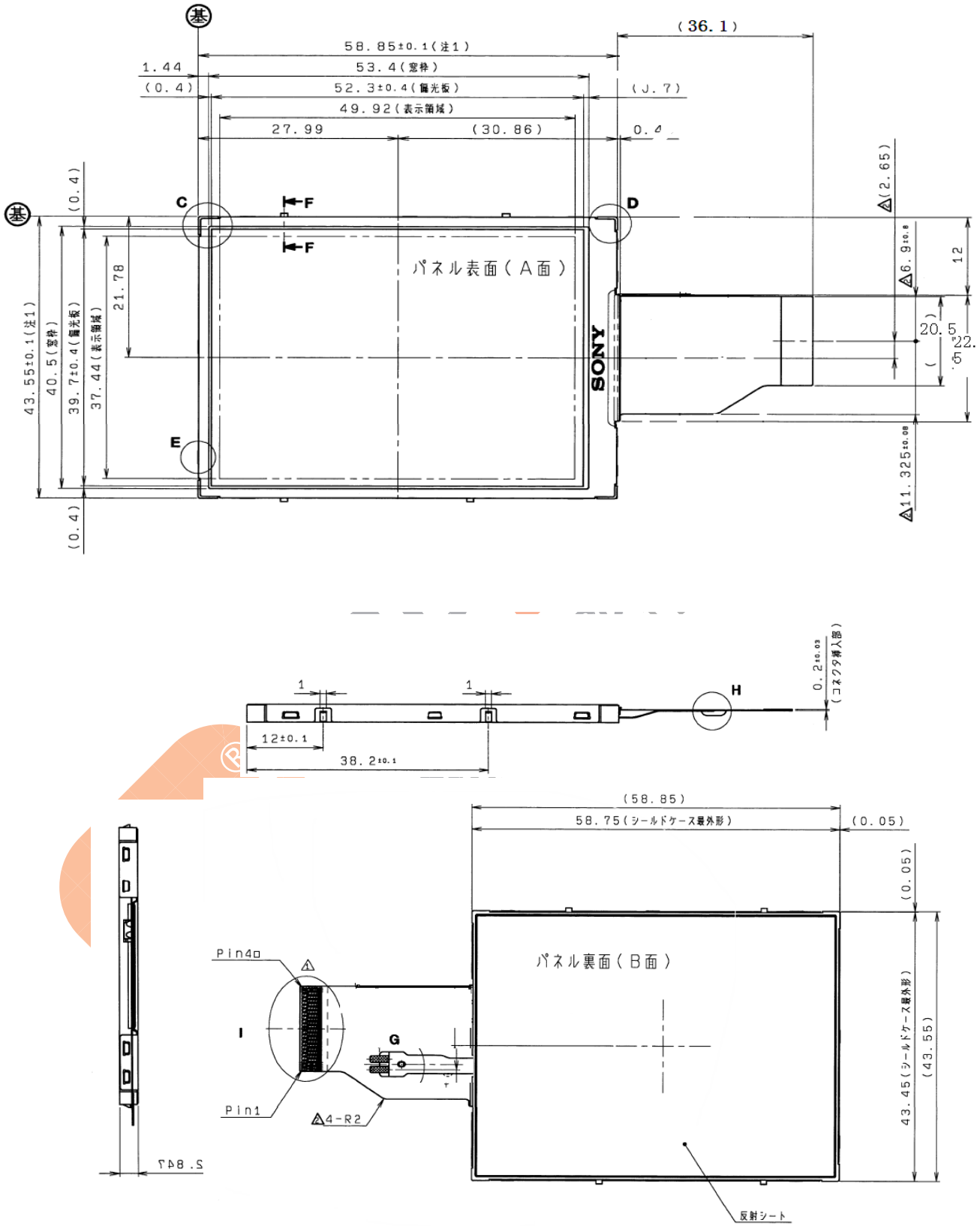
   (3) Set the holders on the rear of the backlight around the circumference as far from the center of the backlight as possible.
   Local pressure applied to the center of the rear of the backlight for an extended period may result in uneven luminance, so the holder pressure on the center of the backlight should be 50g or less.
   (4) Connecting the metal frame of the product to GND at an optional location is recommended to prevent electrostatic breakdown.

4. Others
   (1) Do not twist or bend the flexible PC board especially at the connecting region because the board is easily deformed.
   (2) Do not drop the panel or backlight.
   (3) Do not twist or bend the panel, panel frame or backlight.
   (4) Keep the panel and backlight away from heat sources.
   (5) Do not dampen the panel or backlight with water or other solvents.
   (6) Avoid storage or use of the panel and backlight at high temperatures and high humidity, which may result in damage.

Packing Specification



Package Outline



Connector Pin Outline