Reference only

Preliminary

Product Information

ISSUE DATA : 2009-06-08
MODEL : LMS700KF15

Note : The Product and specifications are subject to change without any notice. Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

Samsung Mobile Display

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Revision History

Data	Rev. No.	Page	Summary
JUN. 08. 2009	000		**Rev000 is first issued.**

General Description

*** Description**

LMS700KF15 is a TMR(Transmissive with Micro Reflective) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. The resolution of a 7.0" contains 800 x (RGB) x 480 dots and can display up to 16.7M colors.

*** Features**

- Transmissive with Micro Reflective type and Back-light with LED.
- TN (Twisted Nematic) mode
- 24bit RGB Interface
- Back Light with 24 LEDs (Light Emitting Diode)

*** Applications**

- Display terminals for VoIP, PMP(Portable Multimedia Player), Portable CNS(P-CNS) , AV , UMPC (Ultra Mobile PC) application products.

*** General information**

Items	Specification	Unit	Note
Display area	152.4(H) x 91.44(V)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	800(H) x RGB x 480(V)	dot	-
Pixel arrangement	RGB stripe type	-	-
Pixel pitch	0.1905(H) x 0.1905(V)	mm	-
Display mode	Normally white	-	-
Viewing direction	6	o'clock	-

*** Mechanical information**

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	162.9	163.2	163.5	mm	-
	Vertical(V)	103.7	104.0	104.3	mm	(1)
	Depth(D)	3.2	3.4	3.6	mm	(1)
Weight		-	110	-	g	-

Note (1) Not include FPC

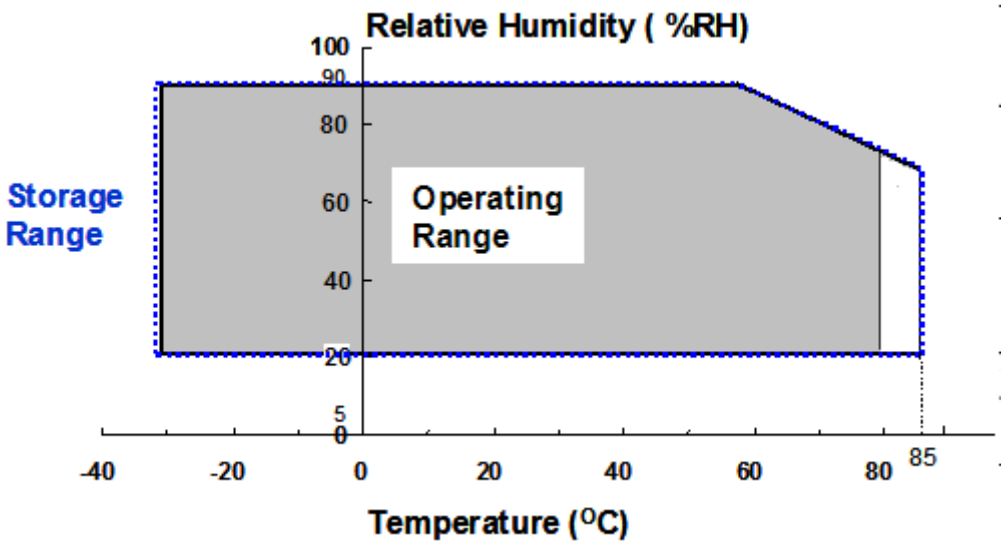
Refer to the Outline Dimension in the "8.Outline Dimension" for further information.

1. Absolute Maximum Ratings

1.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	85	℃	(1)
Operating temperature (Panel Surface temperature)	T_{OPR}	-30	80	℃	(1),(2)

Note (1) 90 % RH Max. (40 °C ³ Ta)
Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.



(2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one.
Level of retardation depends on temperature, because of LC's characteristics.

(3) If any fixed pattern is displayed on LCD for minutes, image-sticking phenomenon may occur.

1.2 Electrical Absolute Ratings

(1) TFT-LCD Module

(Ta = 25°C, V_{SS}=GND=0V)

Characteristics	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{CC}	-0.5	5.0	V	-

(2) Back-Light Unit

(Ta = 25 ± 2°C)

Item	Symbol	Min.	Max.	Unit.	Note
LED Current	I_L	-	30	mA	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.
Functional operation should be restricted to the conditions described under normal operating conditions.

2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

Measuring equipment: SR-3, BM-7, EZ-Contrast

(Ta = 25 ± 2°C, V_{CC} = 3.3V, f_B = 60Hz, I_B = 20mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio (Center point)		C/R	NOTE (1) f = 0 q = 0 Normal Viewing Angle B/L On	300	700	-	-	(2) SR-3
Luminance of white (Center point)		YL		280	350	-	cd/㎡	(3) SR-3
Response time	Rising:Tr	Tr+Tf		-	16	50	msec	(5) BM-7
	Falling:Tf							
Color chromaticity (CIE 1931)	White	Wx		0.266	0.316	0.366	-	(6) SR-3
		Wy		0.285	0.335	0.385		
	Red	Rx		0.557	0.607	0.657		
		Ry		0.321	0.371	0.421		
	Green	Gx		0.295	0.345	0.395		
		Gy		0.521	0.571	0.621		
	Blue	Bx		0.099	0.149	0.199		
		By		0.064	0.114	0.164		
Viewing angle	Hor.	qL	C/R³10 B/L On	55	70	-	Degrees	(7) Ez-Contrast
		qR		55	70	-		
	Ver.	fH		55	70	-		
		fL		55	70	-		
Brightness Uniformity (9 point)		Buni		70	80	-	-	(4) SR-3

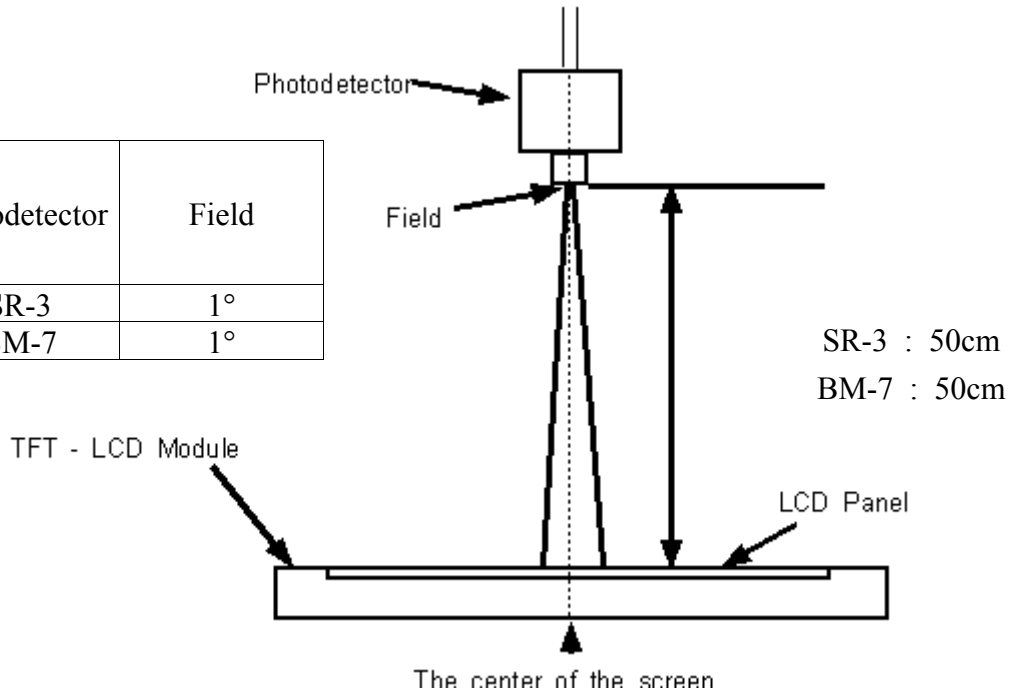
Note (1) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.

Environment condition : Ta = 25 ± 2 °C

Back-Light On condition

Photodetector	Field
SR-3	1°
BM-7	1°



Note (2) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point

$$CR = \frac{G\max}{G\min}$$

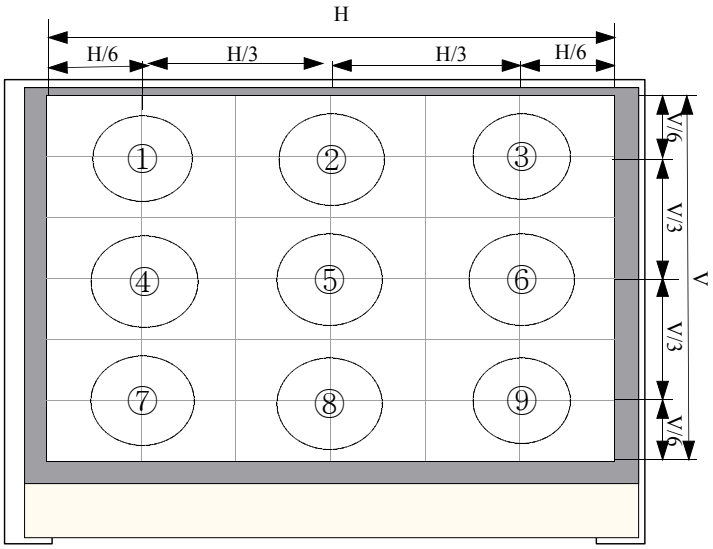
* Gmax : Luminance with all pixels white

* Gmin : Luminance with all pixels black

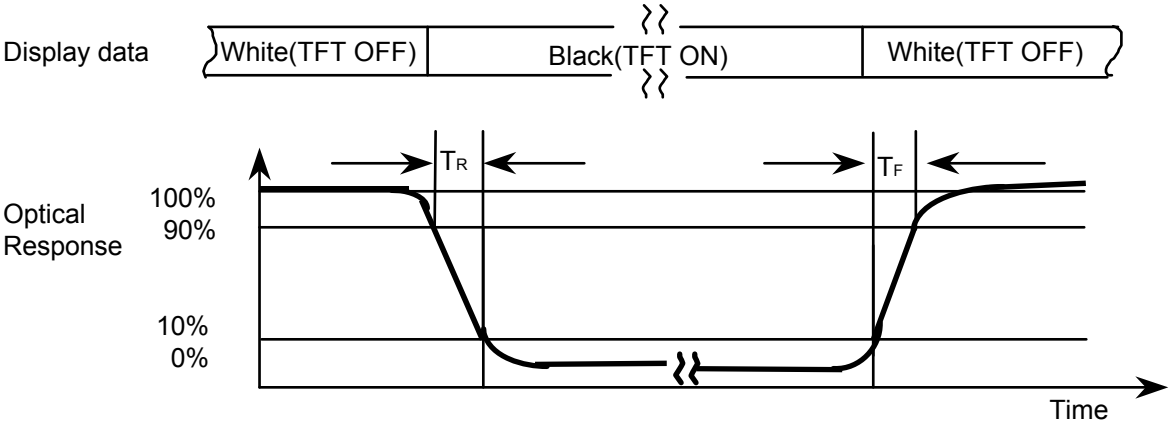
Note (3) Definition of Luminance of White : Luminance of white at the center point

Note (4) Definition of White Uniformity :

$$\text{White Uniformity} = \frac{\text{Min luminance of white among 9-points}}{\text{Max luminance of white among 9-points}} \times 100$$



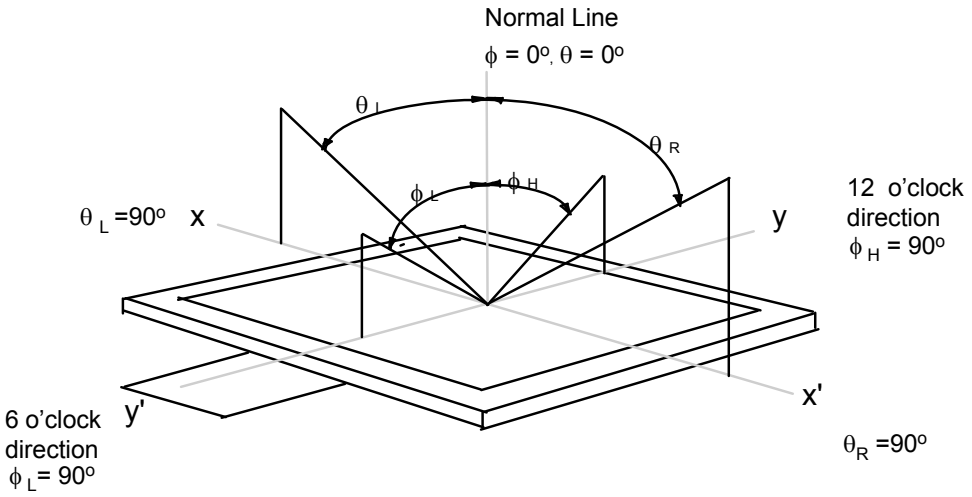
Note (5) Definition of Response time : Sum of Tr ,Tf



Note (6) Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.

Note (7) Definition of Viewing Angle : Viewing angle range (CR≥10)



3. Electrical Characteristics

3.1 TFT-LCD Module

Ta = 25 ± 2°C

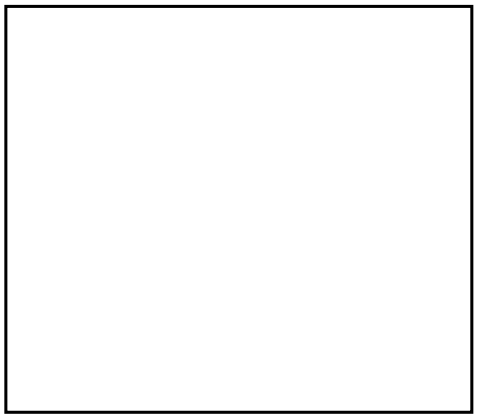
Characteristics		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage		V_{CC}	3.0	3.3	3.6	V	-
Power Dissipation	White	P_{FULL}	-	350	450	mW	(1),(2)
	Black		-	650	850		
	1 DOT		-	500	650		
Frame frequency		f_{Frame}	55	60	-	Hz	-
Dot Clock		DOTCLK	-	24.5	-	MHz	-

* To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the Chapter 7. Power Up/Down Sequence.

Note (1) V_{CC} = 3.3V, f_{Frame} = 60Hz, DOTCLK = 24.5MHz

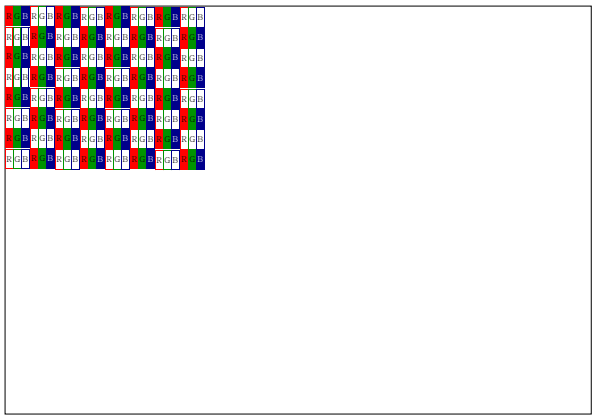
(2) Dissipation current check pattern

▶ White pattern



▶ Black pattern

▶ 1 Dot pattern



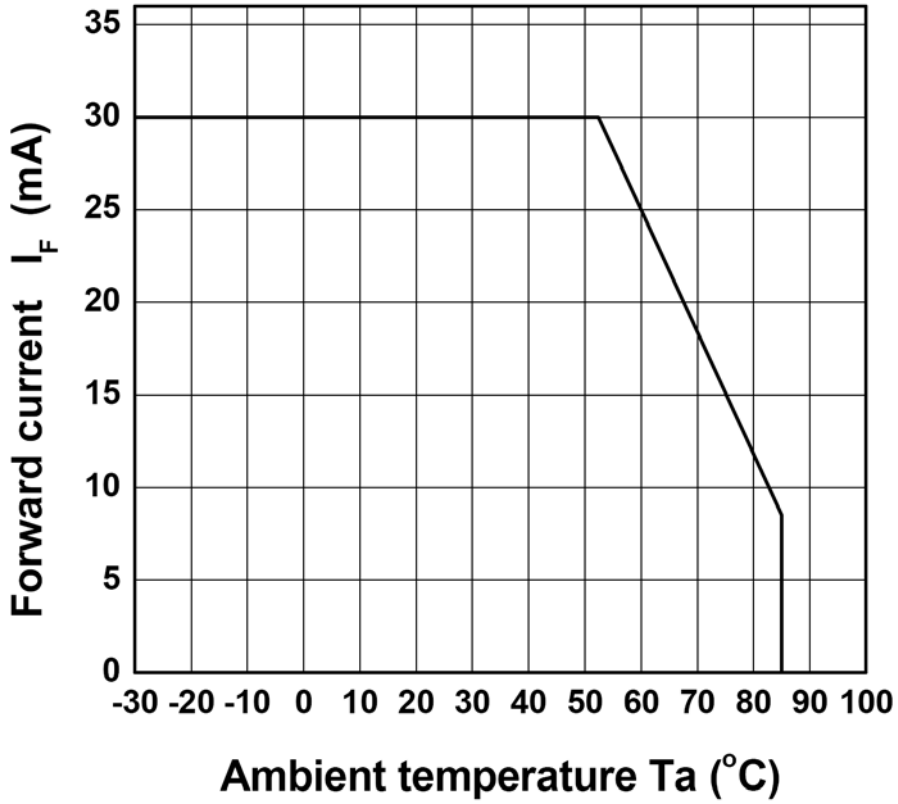
3.2 Back-Light unit

The Back Light system is an edge-lighting type with 24 white LED (Light Emitting Diode)s.

(Ta=25 ± 2°C)

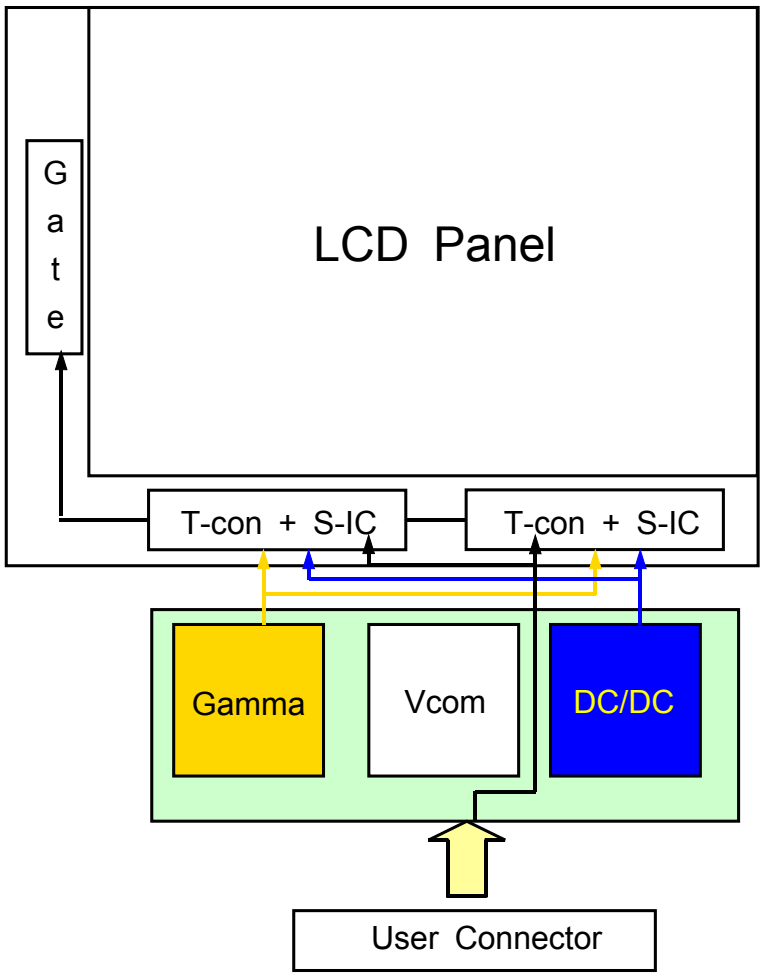
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LEDs Current	I_B	15	20	25	mA	(1)
Power Consumption	P_{BL}	1.2	1.6	2.0	W	-

Note (1) The LEDs parallel type (Refer to 4.2)

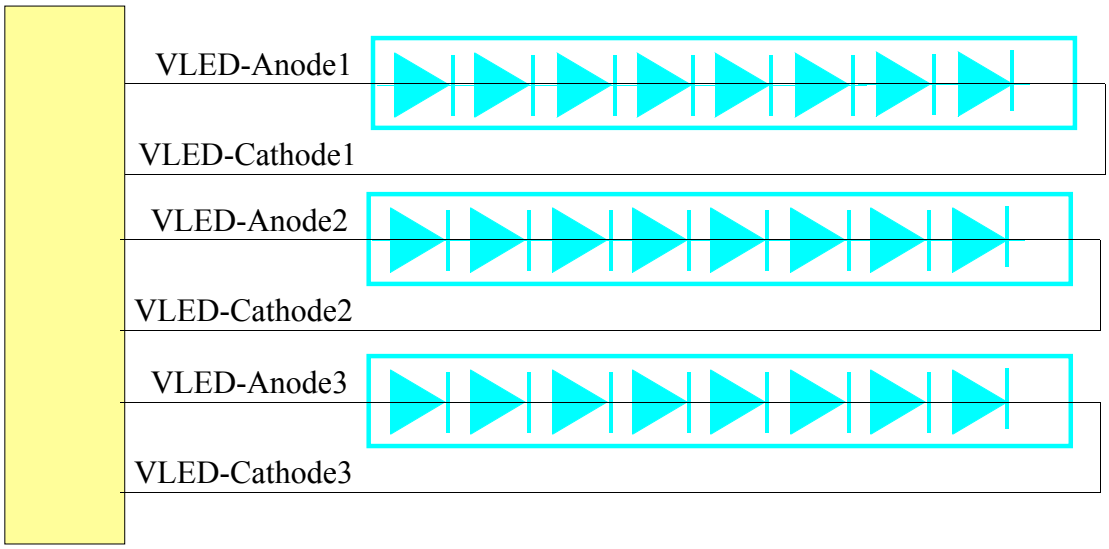


4. Block Diagram

4.1 TFT-LCD Module (Interface System Structure) with Back Light Unit



4.2 Back Light Unit



Pin No.	Pin Description
#1	VLED-Anode1
#2	VLED-Cathode1
#3	VLED-Anode2
#4	VLED-Cathode2
#5	VLED-Anode3
#6	VLED-Cathode3

* Note) LED FPC Connector : 04-6298-006-000-883 (Kyocera) or compatible connector is preferred

5. Input Terminal Pin Assignment

5.1 Input Signal & Power (Connector : 40Pin FPC Connector type, 0.5mm,

ex.) Hirose connector FH28H-40S-0.5SH or compatible Connector used.)

Pin No	Symbol	Description	I/O	Pin No	Symbol	Description	I/O
1	GND	GND	I	21	PD0	Graphic Data 0 (B0)	I
2	GND	GND	I	22	PD1	Graphic Data 1 (B1)	I
3	Vcc	System Power Supply	I	23	PD2	Graphic Data 2 (B2)	I
4	Vcc	System Power Supply	I	24	PD3	Graphic Data 3 (B3)	I
5	PD16	Graphic Data 16 (R0)	I	25	PD4	Graphic Data 4 (B4)	I
6	PD17	Graphic Data 17 (R1)	I	26	PD5	Graphic Data 5 (B5)	I
7	PD18	Graphic Data 18 (R2)	I	27	PD6	Graphic Data 6 (B6)	I
8	PD19	Graphic Data 19 (R3)	I	28	PD7	Graphic Data 7 (B7)	I
9	PD20	Graphic Data 20 (R4)	I	29	GND	GND	I
10	PD21	Graphic Data 21 (R5)	I	30	DOTCLK	DOT CLOCK	I
11	PD22	Graphic Data 22 (R6)	I	31	PCI	Display Mode	I
12	PD23	Graphic Data 23 (R7)	I	32	HSYNC	HSYNC	I
13	PD8	Graphic Data 8 (G0)	I	33	VSYNC	VSYNC	I
14	PD9	Graphic Data 9 (G1)	I	34	DE	Data Enabling Signal	I
15	PD10	Graphic Data 10 (G2)	I	35	NC	No Connect	-
16	PD11	Graphic Data 11 (G3)	I	36	NC	No Connect	-
17	PD12	Graphic Data 12 (G4)	I	37	GND	GND	I
18	PD13	Graphic Data 13 (G5)	I	38	GND	GND	I
19	PD14	Graphic Data 14 (G6)	I	39	NC	No Connect	-
20	PD15	Graphic Data 15 (G7)	I	40	NC	No Connect	-

5.2 Input Signal, Basic Display Colors and Gray Scale of Each Colors

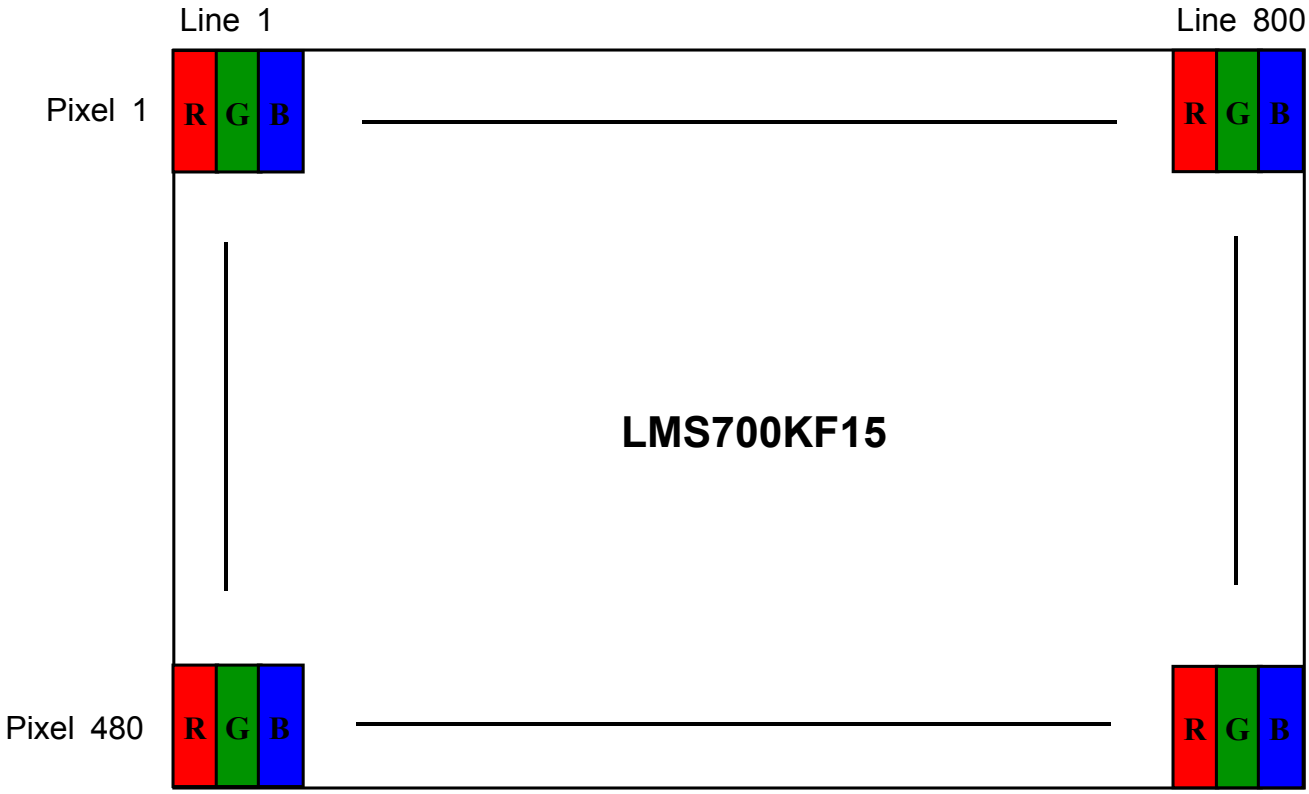
COLOR	DISPLAY	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	G3~G252
	↓ LIGHT	:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

5.3 Pixel Format



6. INTERFACE TIMING

6-1. Vertical / Horizontal Timing in sync mode

Signal	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	fFRM	-	60	-	Hz	
Vertical Back porch	VBP	-	8	-	H	*Note1
Vertical Front porch	VFP	-	5	-	H	*Note1
Horizontal Back porch	HBP	-	16	-	DOTCLK	*Note1
Horizontal Front porch	HFP	-	8	-	DOTCLK	*Note1
DOTCLK Frequency	f_{DOTCLK}	-	24.5	-	MHz	@fFRM=60Hz

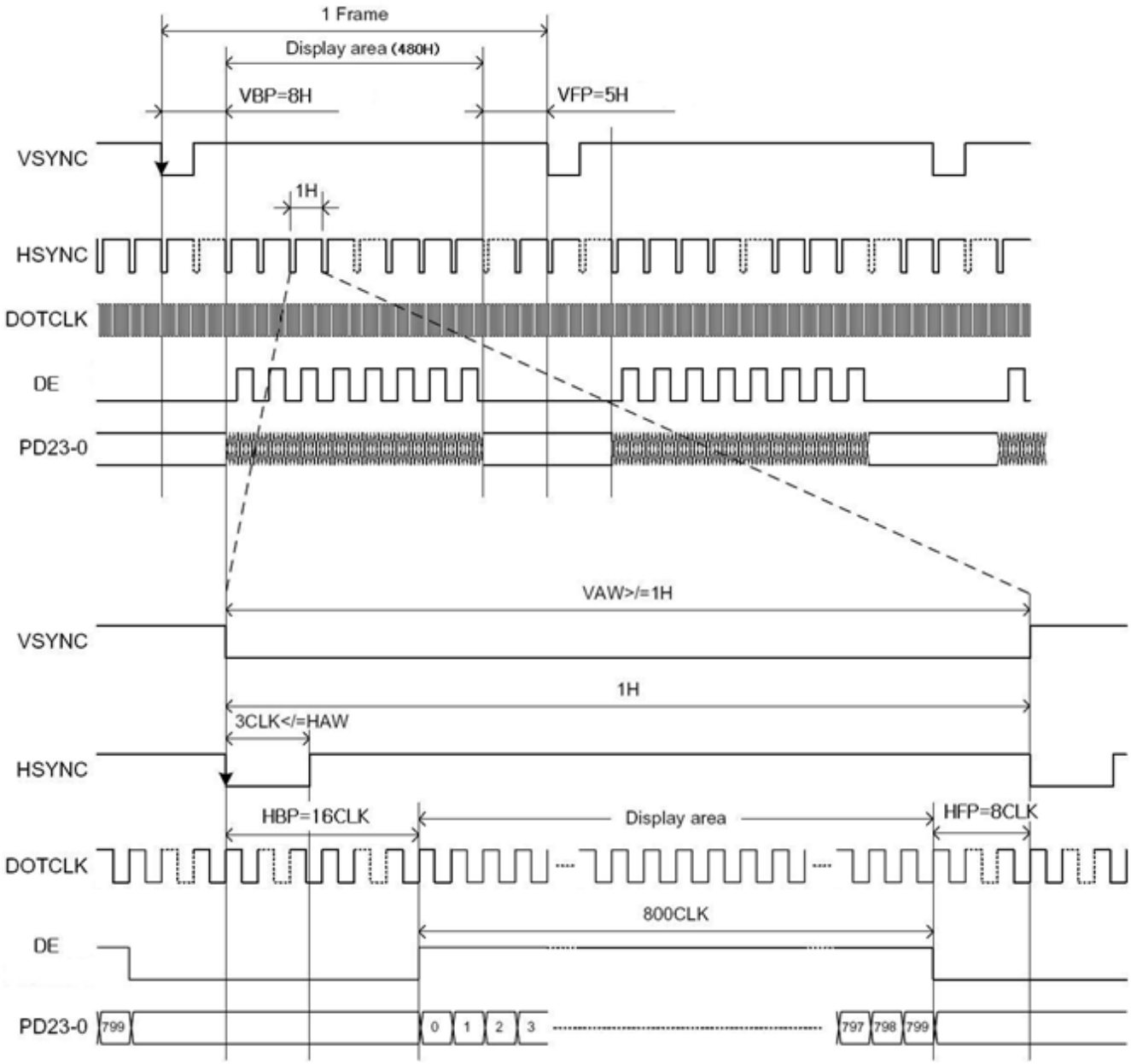
6-2. Vertical / Horizontal Timing in DE mode

Signal	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	fFRM	-	60	-	Hz	
Vertical Back porch	VBP	3	-	-	H	*Note 2
Vertical Front porch	VFP	TBD	-	-	H	
Horizontal Back porch	HBP	TBD	-	-	DOTCLK	
Horizontal Front porch	HFP	TBD	-	-	DOTCLK	
DOTCLK Frequency	f_{DOTCLK}	-	(24.5)	-	MHz	@fFRM=60Hz

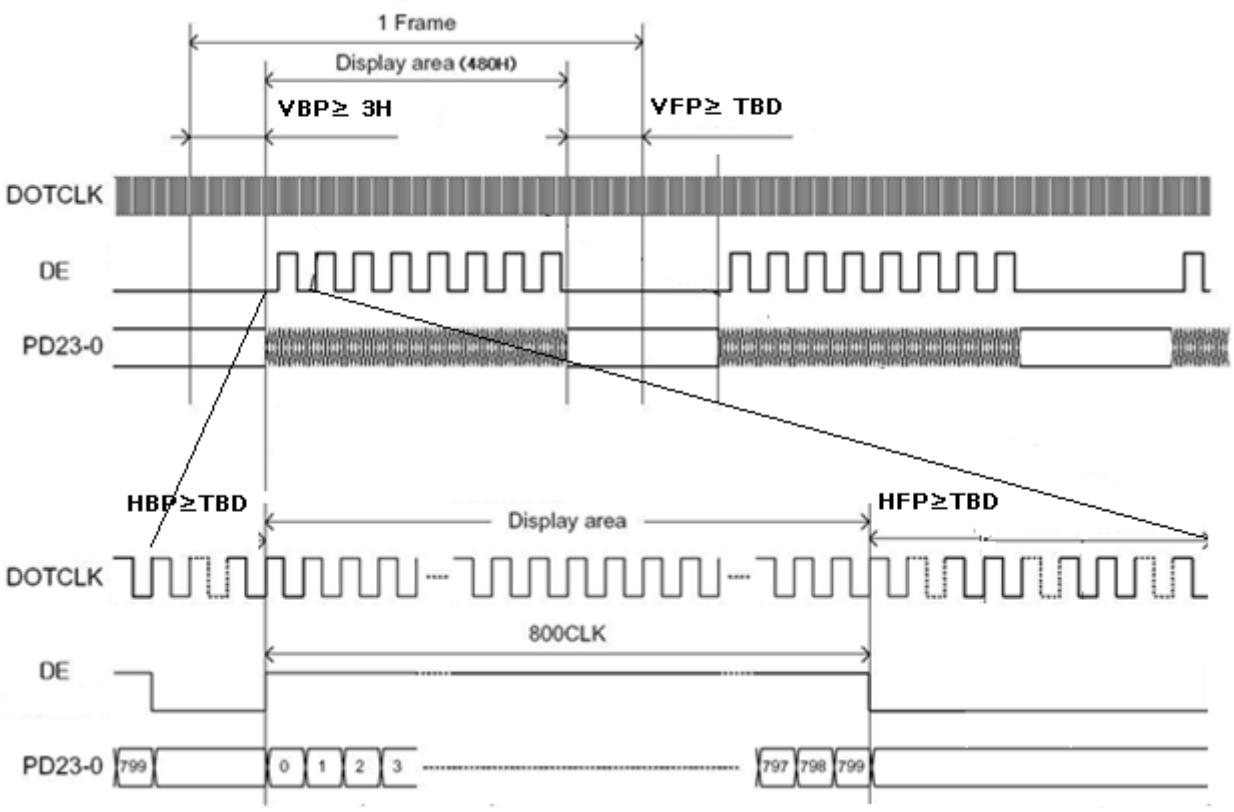
*Note1). VBP, VFP, HBP, HFP is not confirmed yet, Those should be fixed in Sync mode

*Note2). In DE mode, there must be at least 3H blank period between frame and frame to recognize the beginning of the next frame.

6.3 Interface Timing (sync mode)



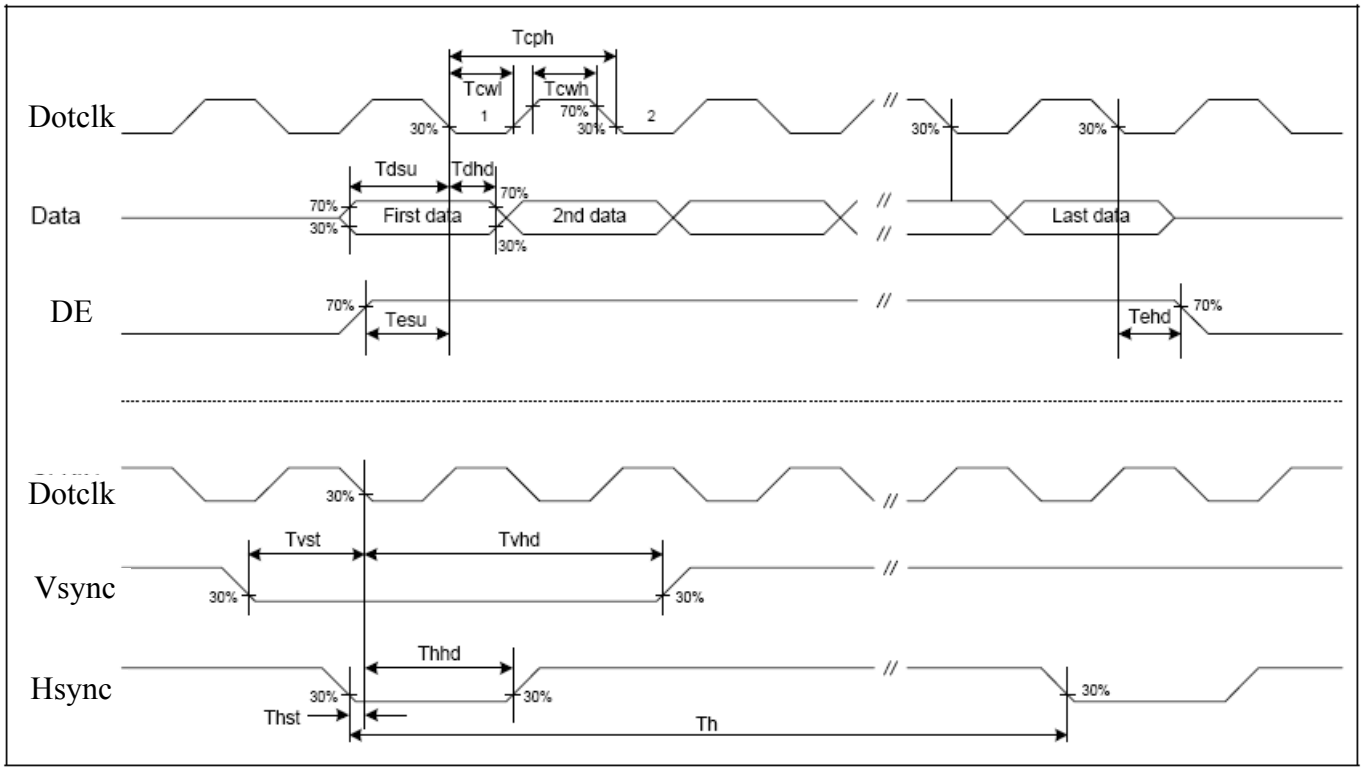
6.4 Interface Timing (DE mode)



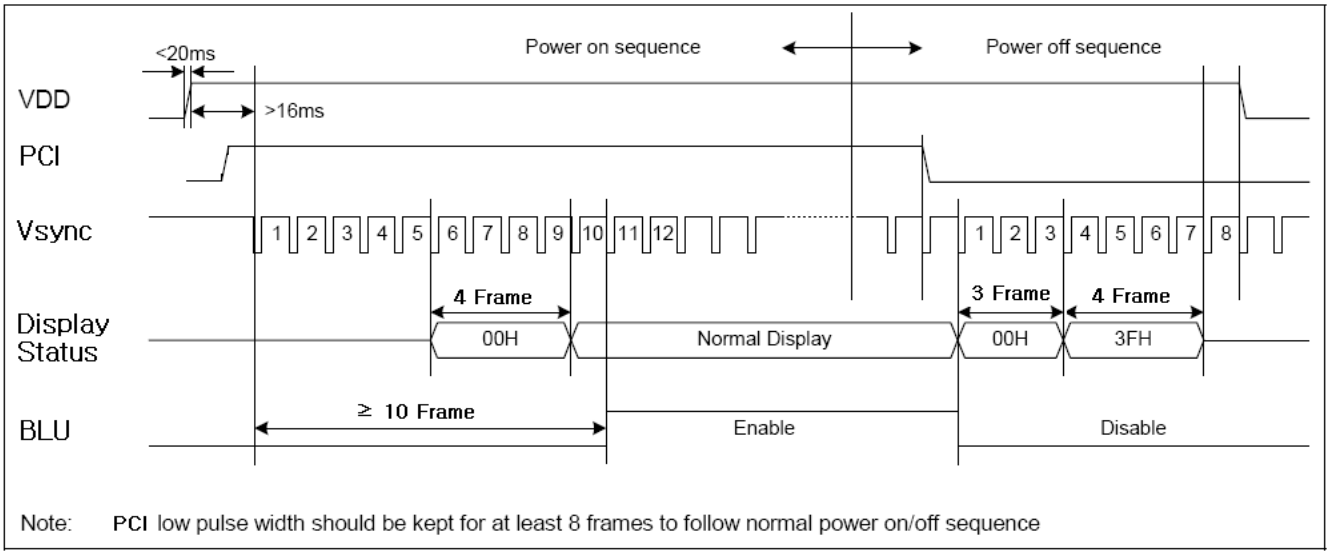
6.5 AC Characteristic

(Ta=-20 to +60 °C)

Parameter	Synbol	min	Typ.	Max	Unit	Condition
VDD Power In Slew Rate	TPOR	-	-	20	ms	From 0% to 90% of VDD
RSTB pulse width	TRst	50	-	-	us	
Dotclk cycle time	Tcph	20	-	-	ns	
Dotclk pulse duty	Tcwh	40	50	60	%	
VSync setup time	Tvst	8	-	-	ns	
VSync hold time	Tvhd	8	-	-	ns	
HSync setup time	Thst	8	-	-	ns	
HSync hold time	Thhd	8	-	-	ns	
Data set-up time	Tdsu	8	-	-	ns	
Data hold time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hold time	Tehd	8	-	-	ns	

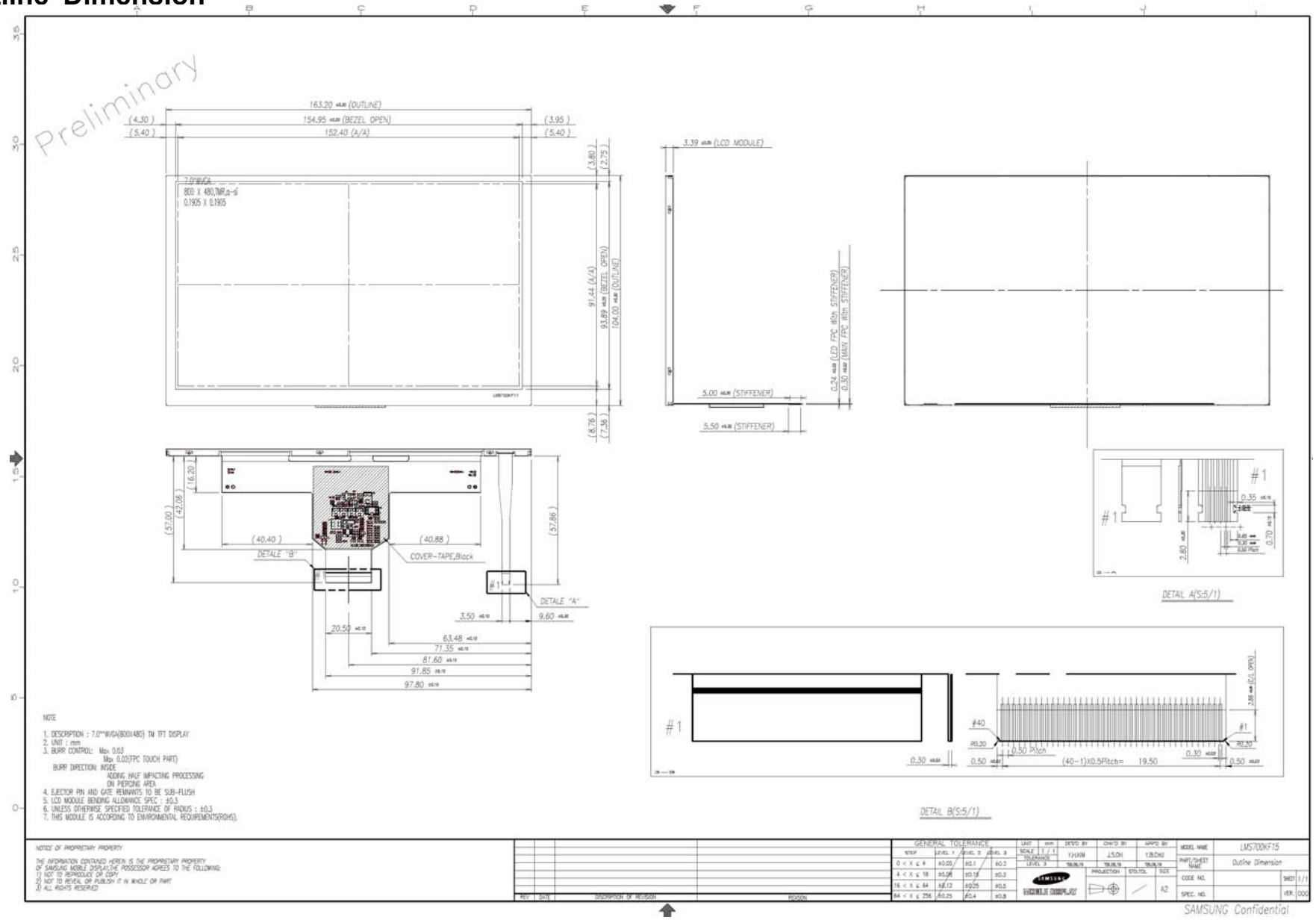


7. Power On/Off sequence



Note: PCI low pulse width should be kept for at least 8 frames to follow normal power on/off sequence

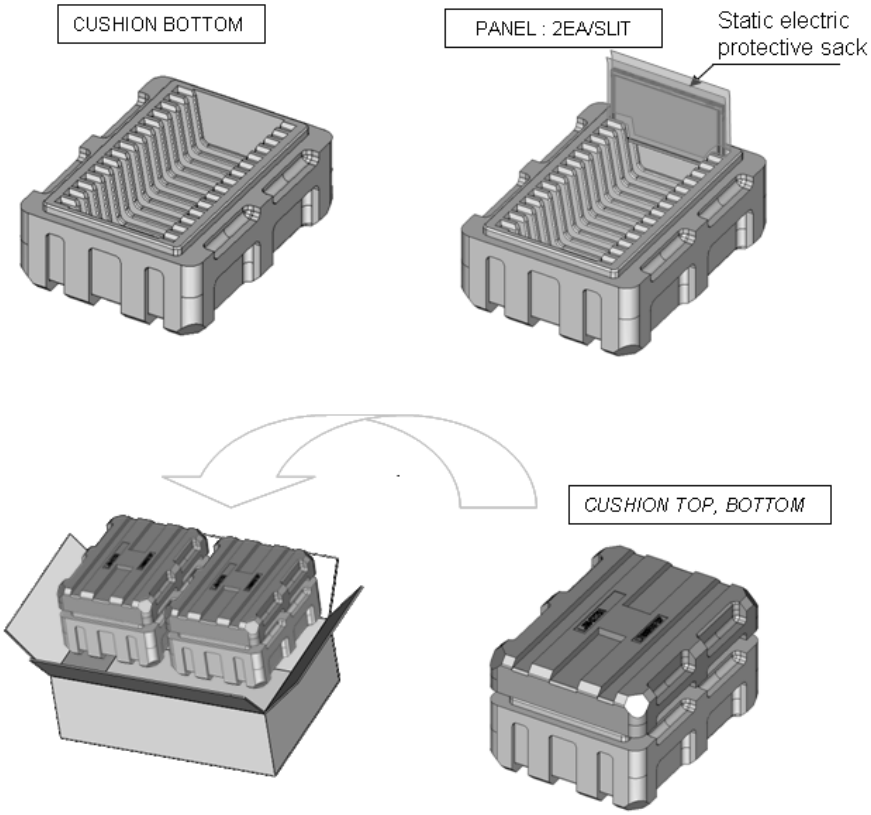
8. Outline Dimension



10. Packing (TBD)

(1) Packing Form
Corrugated Cardboard box and EPS form as shock absorber

(2) Packing Method



Note (1) Total Weight : Approximately (TBD) kg
Note (2) Acceptance number of piling : 18 sets
Note (3) Carton size : 583(W) X 388D) X 210(H)

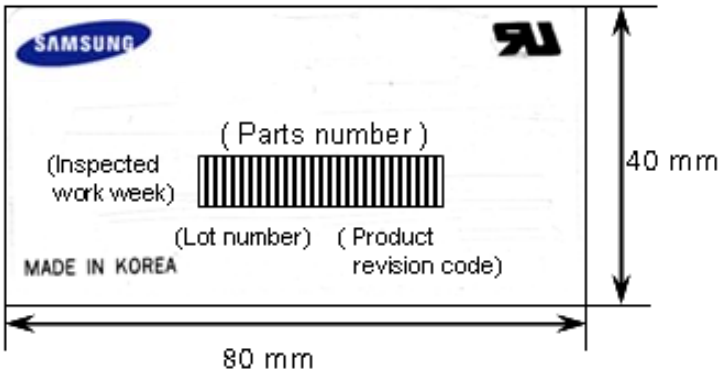
(3) Packing Material

No	Part name	Quantiity
1	Static electric protective sack	18 pcs
2	Packing case (Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

10. Marking & Others

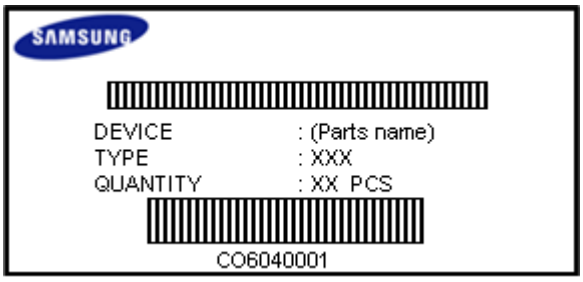
A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Part number : : LMS700KF15-0
(2) Revision : TBD
(3) Lot number : TBD
(4) Nameplate Indication



Parts name	: LMS700KF15-0
Lot number	: TBD
Inspected work week	: TBD
Product revision code	: TBD

(5) Packing small box attach



11. General Precautions

11.1 Handling

(a) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the Integrated Gate Circuit.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(l) Pins of I/F connector shall not be touched directly with bare hands

11.2 Storage

(a) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

11.3 Operation

(a) Do not connect, disconnect the module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

11.4 Others

(a) The Liquid crystal is deteriorated by ultraviolet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the panel may be damaged.

(d) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.

(e) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.