

Display Elektronik GmbH

DATA SHEET

MIP Display

DE MIP320240A-RGB-PW

(3,54“ Memory in Pixel, RGB + LED)

Product Specification

Ver.: 0

08.07.2026

Revise Records

Rev.	Date	Contents	Written	Approved
0	08.07.2026	Preliminary Specification	A	MH

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

Contents

1. General Description and Features.....	4
1.1 Features	4
1.2 LCD Module	4
2. Mechanical Information.....	4
3. Electrical Specifications	5
3.1 Absolute Max. Ratings	5
3.2 Timing Characteristic of The LCD	7
3.3 Power Supply Sequence	15
4. Optical Characteristics.....	17
4.1 Optical characteristic of the LCD	17
5. I/O Terminal	19
5.1 LCM Pin Definition (Connector: Molex 503566-2100 or equivalent)	19
5.2 Backlight Pin Assignment	20
5.2 Block Diagram	21
6. Reliability Condition.....	22
7. Dimensional Outlines	23
8 Incoming Inspection Standards.....	24

1. General Description and Features

DE MIP320240A-RGB-PW - 64-Color LCD module is a reflective active-matrix with slightly transmissive memory liquid crystal display module with CG silicone thin film transistor.

1.1 Features

- Reflective active-matrix with slightly transmissive panel of Color.
- 3.54" screen has 320 x 240 Resolution.
- Display control by 6 bit parallel data signal communication.
- 1 pixel has RGB each 2bit · the pixel can display 64 colors.
- Super low power consumption TFT panel.
- 9 LED Backlight

1.2 LCD Module

Item	Specification	Unit
Screen Size	3.54 Inches	Diagonal
Display Resolution	320 x RGB x 240	Dot
Active Area	72.00 x 54.00	mm
Outline Dimension	76.40 x 63.40 x 2.81	mm
Display Mode	MIP, Normally Black	--
Pixel Arrangement	Stripe Array	--
Dot Pitch	0.225 x 0.225	mm
Surface Treatment	HC	--
Weight	19	G

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	76.40	--	mm	--
	Vertical (V)	--	63.40	--	mm	--
	Thickness (T)	--	2.81	--	mm	(1)
Weight		--	19	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T _{STG}	-30	80	°C	(1)
Operating Temperature	T _{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40°C ≥ Ta). Maximum wet-bulb temperature at 39°C or less. (Ta > 40°C)
No condensation.

Note (2) In case of below 0°C, 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 character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

Parameter		Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	V_VDD1	VDD1	-0.3	5.5	V	--
	V_VDD2	VDD2	-0.3	5.5	V	--
	V_VSS	VSS	0	0	V	--
Input Signal Voltage	High Level	VIH	--	V_VDD1	V	--
	Low Level	VIL	-0.3	--	V	--
VCOM,VA,VB Terminal Voltage	High Level	VH_VCOM	--	3.4	V	--
	Low Level	VL_VCOM	-0.3	--	V	--

3.1.2.2 Backlight Unit

(Ta=25°C ± 2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current of One LED alone	ILED	--	25	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.

3.1.3 DC Electrical Characteristics of the TFT LCD

Parameter		Symbol	Min.	Typ	Max.	Unit	Remark
Power Supply Voltage	V_VDD1	VDD1	3.1	3.2	3.3	V	--
	V_VDD2	VDD2	4.85	5.0	5.15	V	--
	V_VSS	VSS	0	0	0	V	--
Input Signal Voltage	High Level	VIH	VDD1-0.1	3.2	VDD1	V	--
	Low Level	VIL	VSS	0	VSS+0.1	V	--
VCOM,VA,VB Terminal Voltage	High Level	VH_VCOM	VDD1-0.1	3.2	VDD1	V	Note 1-1
	Low Level	VL_VCOM	VSS	0	VSS+0.1	V	Note 1-2

[General Note]

Above Voltage value is a value based on VSS (GND = 0V)

Note 1-1 :

VB is in-phase with VCOM. VA is opposite-phase to VCOM.

Please design not to be occurred deviation of Center voltage / Signal timing.

VB is the same signal as VCOM and VA is the inverse signal of VCOM and VB

Note 1-2 :

The Hight Level of VA/VB/VCOM must be below VDD1 voltage.

3.1.4 The back-light system is an edge-lighting type with white LED (Light Emitting Diode)s.

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	7.5	8.4	9.4	V	-
LED Current	If	-	60	-	mA	-
Power Consumption	P _{BL}	-	504		mW	(2)
LED Lifetime (25°C)	-	30000	-	-	hr	(3)

Note: (1) 3LEDs serial 3 parallel type

(2) Where If = 60mA, VL = 8.4V, PBL = VL × If

(3) The environmental conducted under ambient air flow, at Ta=25°C±2°C, 60%RH±5%

3.2 Timing Characteristic of The LCD

3.2.1 Recommend Operating Conditions and DC Characteristics

VDD1=3.2V, VDD2=5.0V, VSS(GND)=0V, Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
1frame frequency	fV	—	—	18	Hz	
vertical period	tV	55.6	—	—	msec	

3.2.2 AC Characteristics (1)

VDD1=3.2V, VDD2=5.0V, VSS=(GND)=0V, Ta=25°C

Signal	Item	Symbol	Min	Typ	Max	Unit	Remark
INTB	Rising time	trINTB	—	—	50	ns	
	Falling time	tfINTB	—	—	50	ns	
	Pulse width Hight level	thwINTB	52.6	53.4	—	ms	Note 6-3-2
	Pulse width Low level	tlwINTB	216.48	219.76	—	μs	
	Setup time (Hight level)	thsINTB	27.06	27.47	—	μs	INTB to GSP
	Hold time (Hight level)	thhINTB	351.78	357.11	—	μs	GCK(483) to INTB
	Hold time (Low level)	tlhINTB	27.06	27.47	—	μs	GCK(487) to INTB
GSP	Rising time	trGSP	—	—	50	ns	
	Falling time	tfGSP	—	—	50	ns	
	Setup time Hight level	thsGSP	54.12	54.94	—	μs	
	Setup time Low level	tlsGSP	54.12	54.94	—	μs	
GCK	Rising time	trGCK	—	—	50	ns	
	Falling time	tfGCK	—	—	50	ns	
	Setup time 2	tsGCK2	0	(330)	—	ns	GCK to BSP
	Setup time1	tsGCK1	22	—	—	μs	GCK to GEN
	Hold time1	thGCK1	22	—	—	μs	GCK to GEN
	GCK width Hight level	thwGCK	108.24	108.88	—	μs	Duty 50%
			1.0	—	—	μs	Note 6-3-1 Duty 50%
	GCK width Low level	tlwGCK	108.24	108.88	—	μs	Duty 50%
			1.0	—	—	μs	Note 6-3-1 Duty 50%
GEN	Rising time	trGEN	—	—	50	ns	
	Falling time	tfGEN	—	—	50	ns	
	Pulse width Hight level	thwGEN	33	—	—	μs	

Note 6-3-1 : Partial Update mode (non-updated timing) [Fast forward GCK]

Note 6-3-2 : Keep "Lo" INTB signal without communicating.

Not to make a INTB terminal "Hi" when it does not communicate.

3.2.3 AC Characteristics (2)

VDD1=3.2V, VDD2=5.0V, VSS=0V, Ta=25°C

Signal	Item	Symbol	Min	Typ	Max	Unit	Remark
VCOM VA VB	VCOM frequency	fVCOM	40	—	70	Hz	Note 6-3-3 Duty 50%
	Rising time	trVCOM	—	—	100	μs	
	Falling time	tfVCOM	—	—	100	μs	
	(Duty cycle)	(tdyVCOM)	48	50	52	%	
BSP	Rising time	trBSP	—	—	50	ns	
	Falling time	tfBSP	—	—	50	ns	
	Setup time Hight level	thsBSP	330	335	—	ns	BSP to BCK
	Setup time Low level	tlsBSP	330	335	—	ns	BSP to BCK
BCK	Rising time	trBCK	—	—	50	ns	
	Falling time	thBCK	—	—	50	ns	
	BCK frequency	fBCK	—	0.746	0.758	MHz	Duty 50%
	BCK width Hight level	thwBCK	660	670	—	ns	Duty 50%
	BCK width Low level	tlwBCK	660	670	—	ns	Duty 50%
DATA	Rising time	trRGB	—	—	50	ns	
R [0],R[1]	Falling time	tfRGB	—	—	50	ns	
G [0],R[1]	Data set-up time	tsRGB	330	335	—	ns	
B [0],R[1]	Data hold time	thRGB	330	335	—	ns	

Note 6-3-3 : Please evaluate sufficienth when determing the VCOM,VA and VB frequency.

Signal Timing

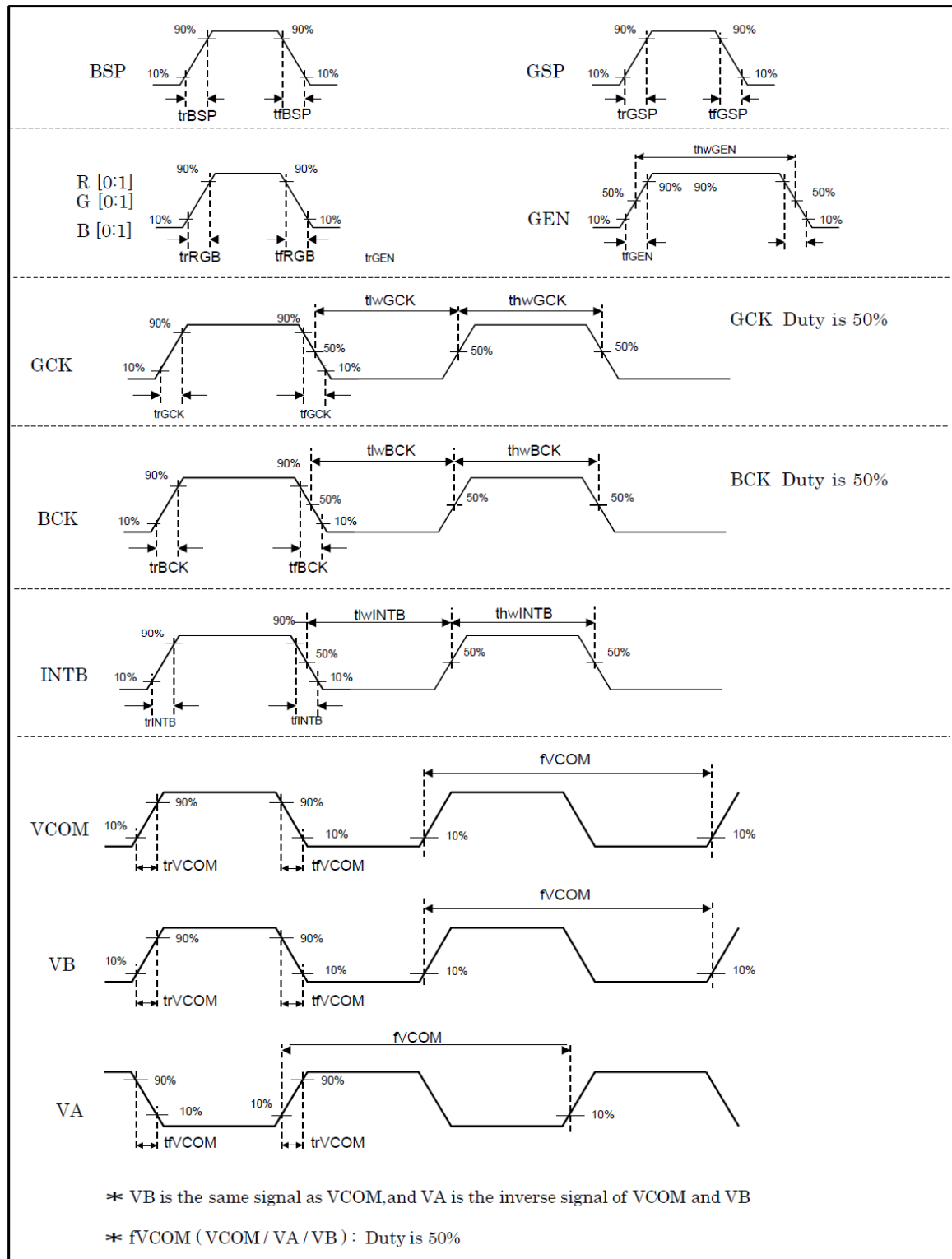


Figure: AC Timing 1

Vertical Signal Timing

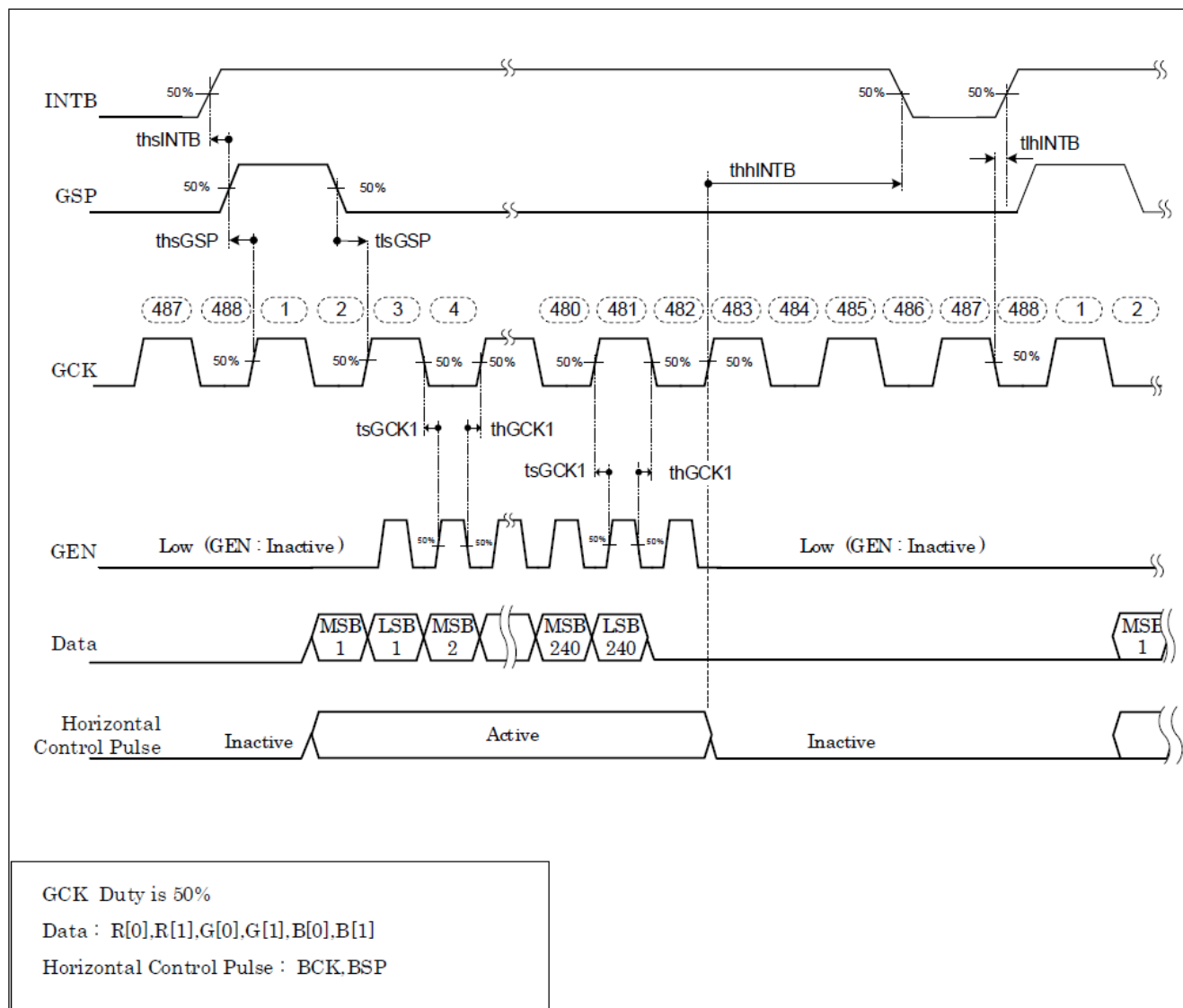


Figure: AC Timing 2

Horizontal Signal Timing

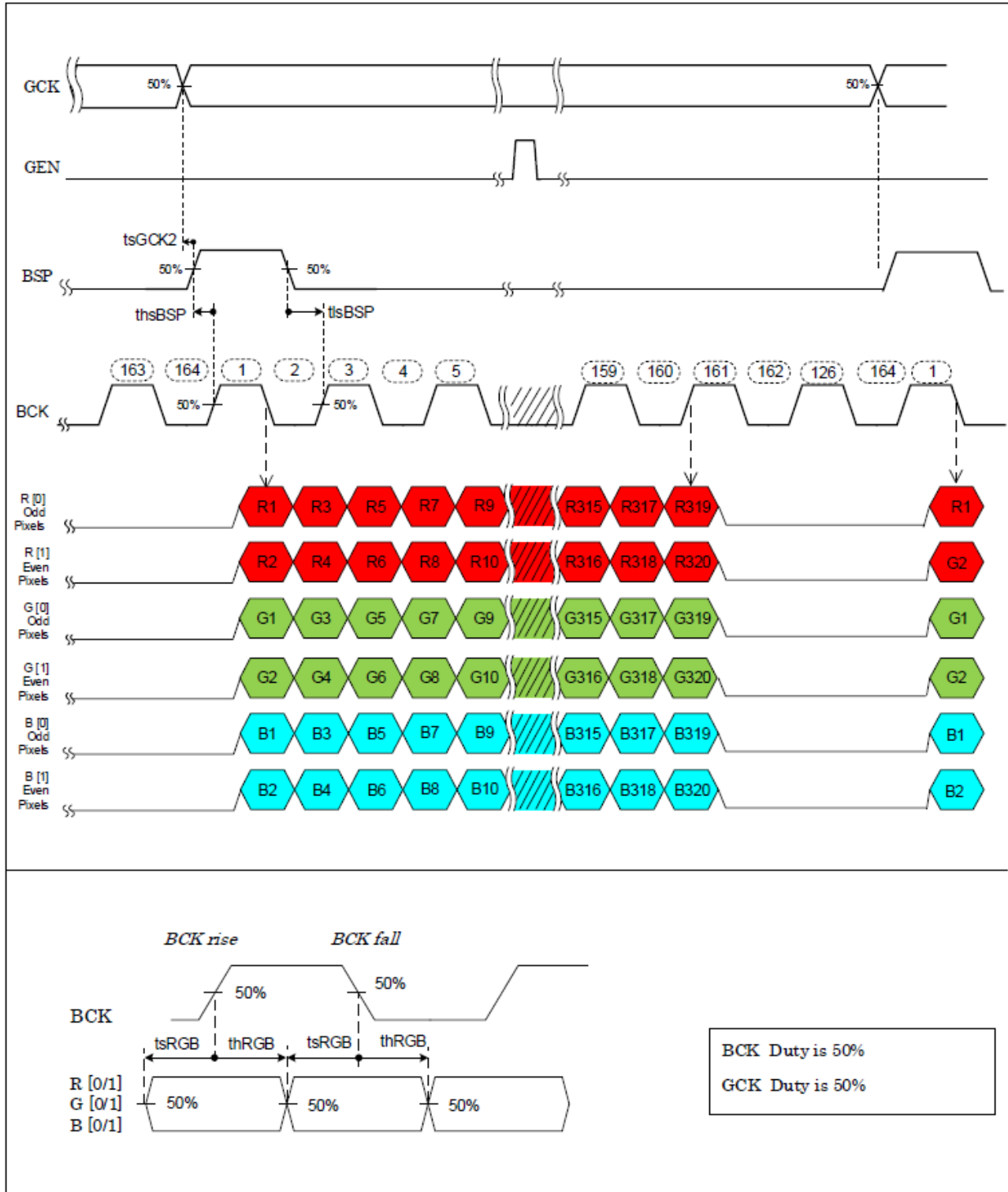


Figure: AC Timing 3

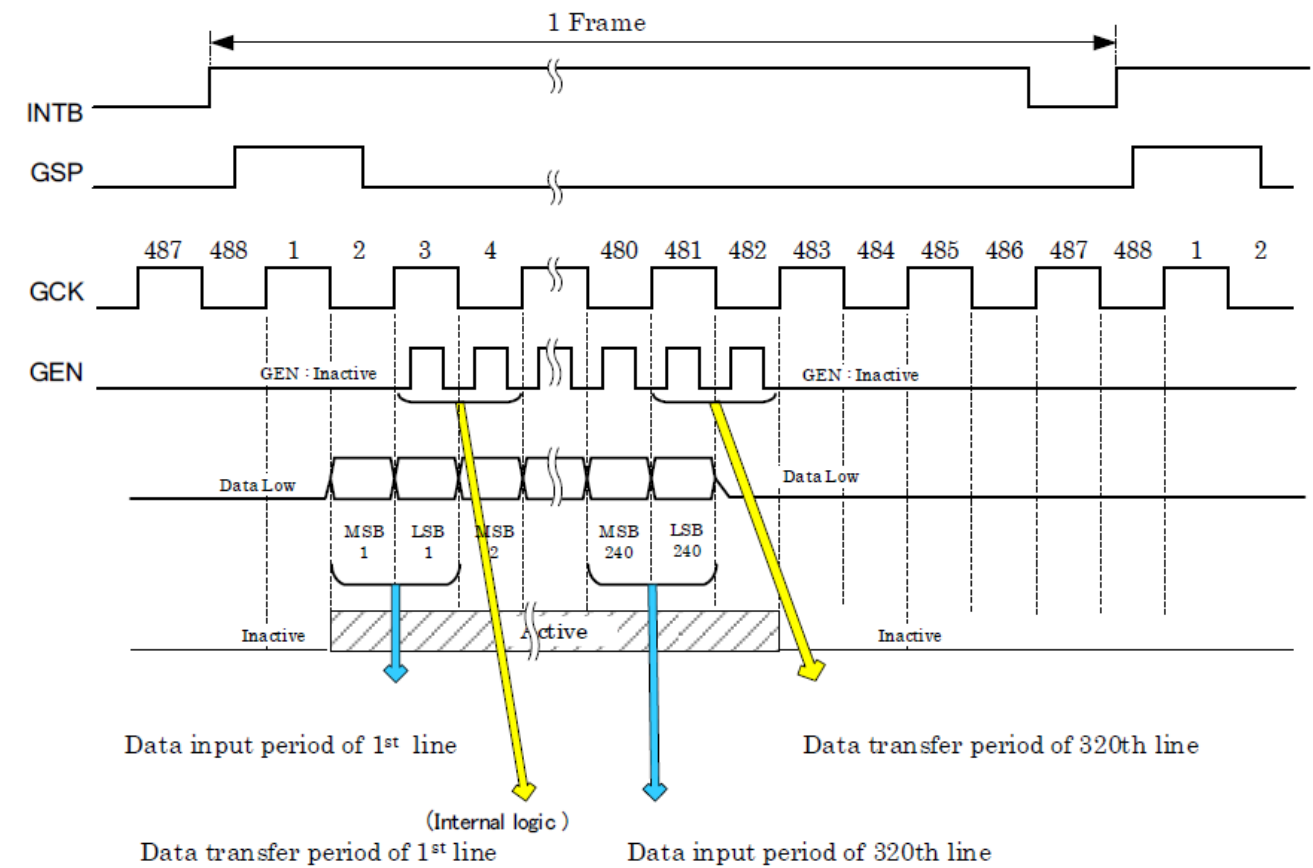
Input Signal and the transfer method of data.

Example: Updates Gate Line 1

- (1) First: Transfer MSB data of 1 line, Second: Transfer LSB data of 1 line
- (2) Repeat 1) from 1st line to 240th line, can update full screen.

Input Signal Timing Chart

Vertical Standard Timing.



Data : R[0],R[1],G[0],G[1],B[0],B[1]
Horizontal Control Pulse : BCK,BSP

Figure: Vertical Diagram

Horizontal Standard Timing

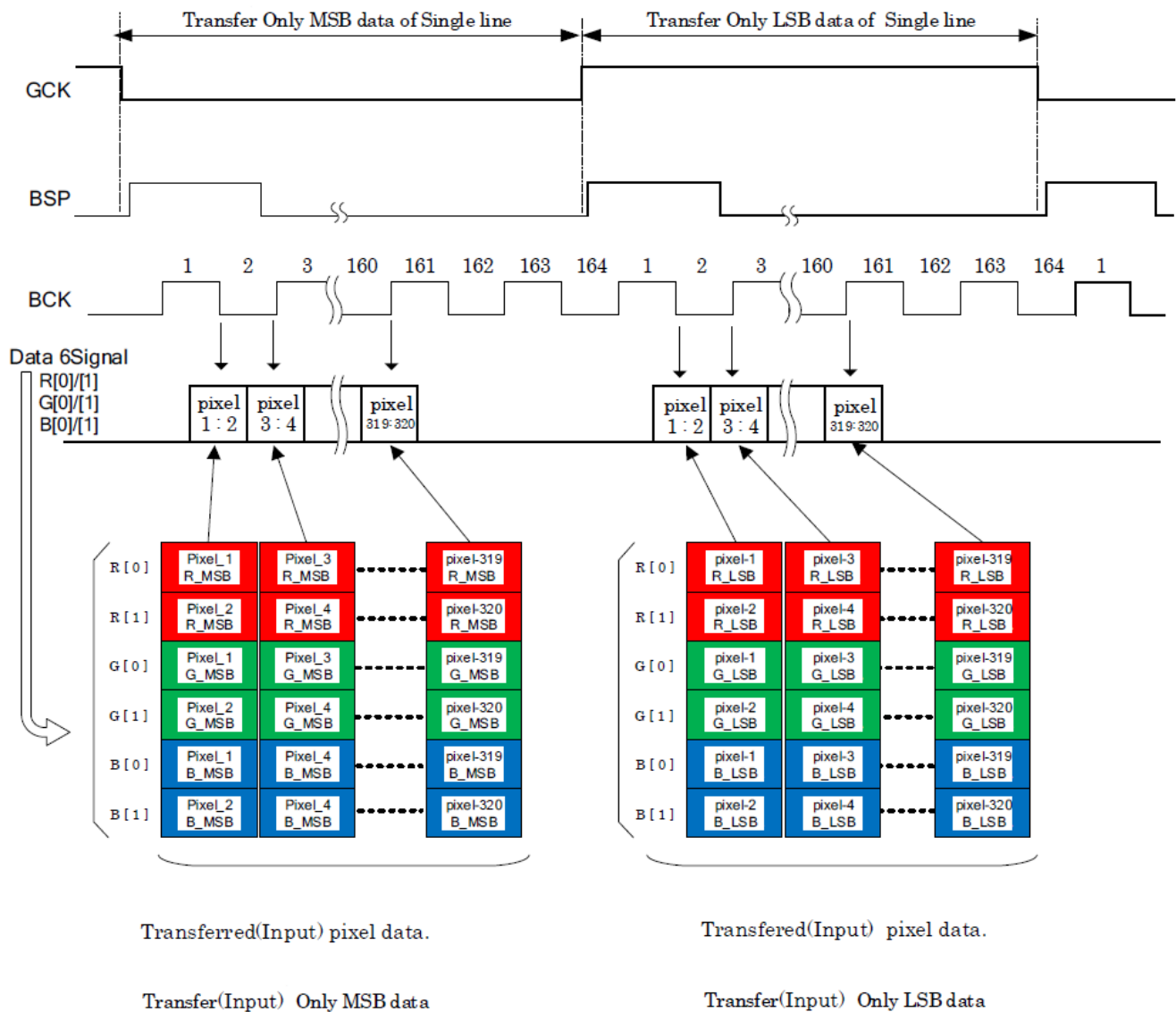


Figure: Horizontal Diagram

Partial Update Mode (AC Timing & Diagram)

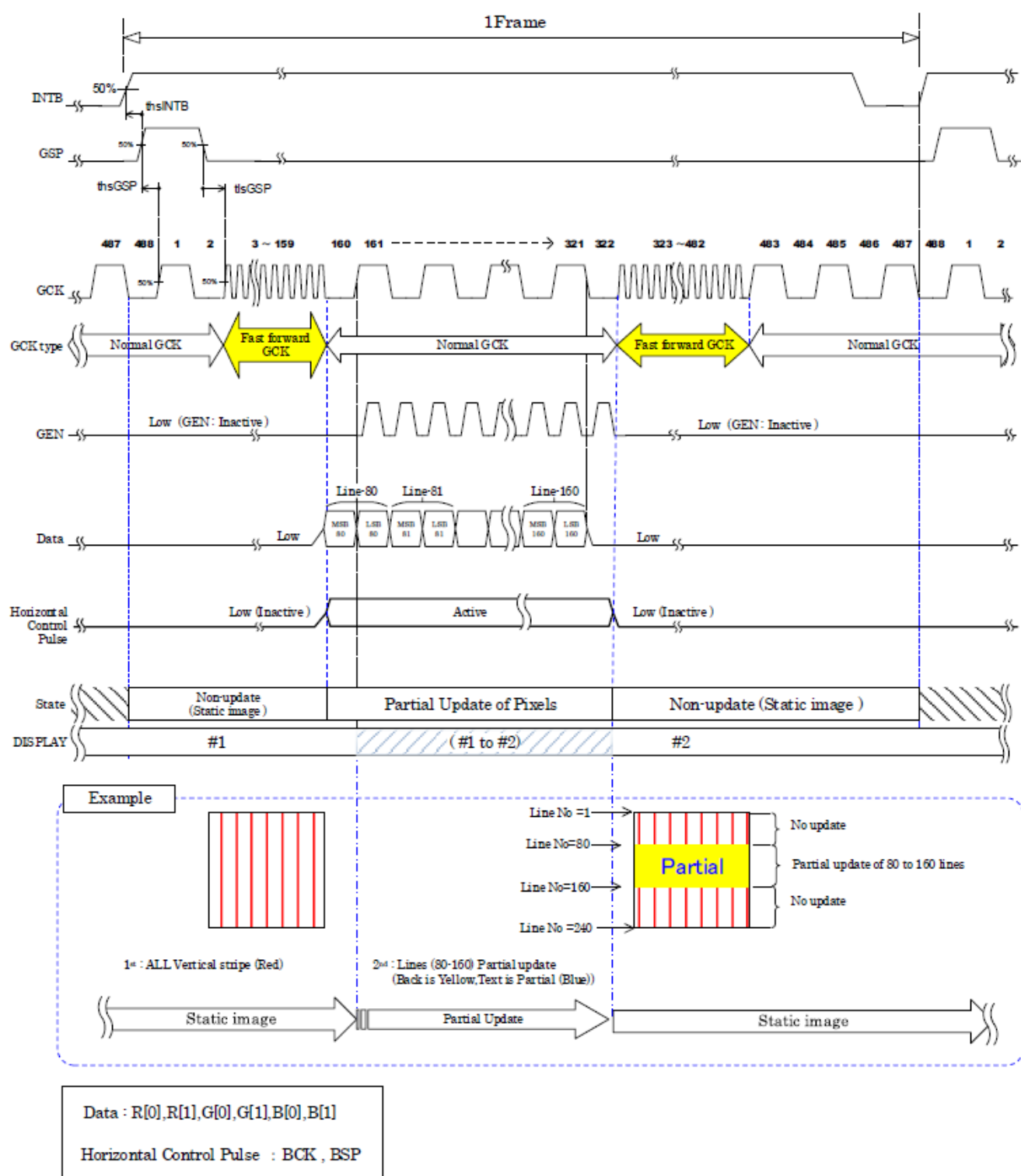


Figure: Partial Update

3.3 Power Supply Sequence

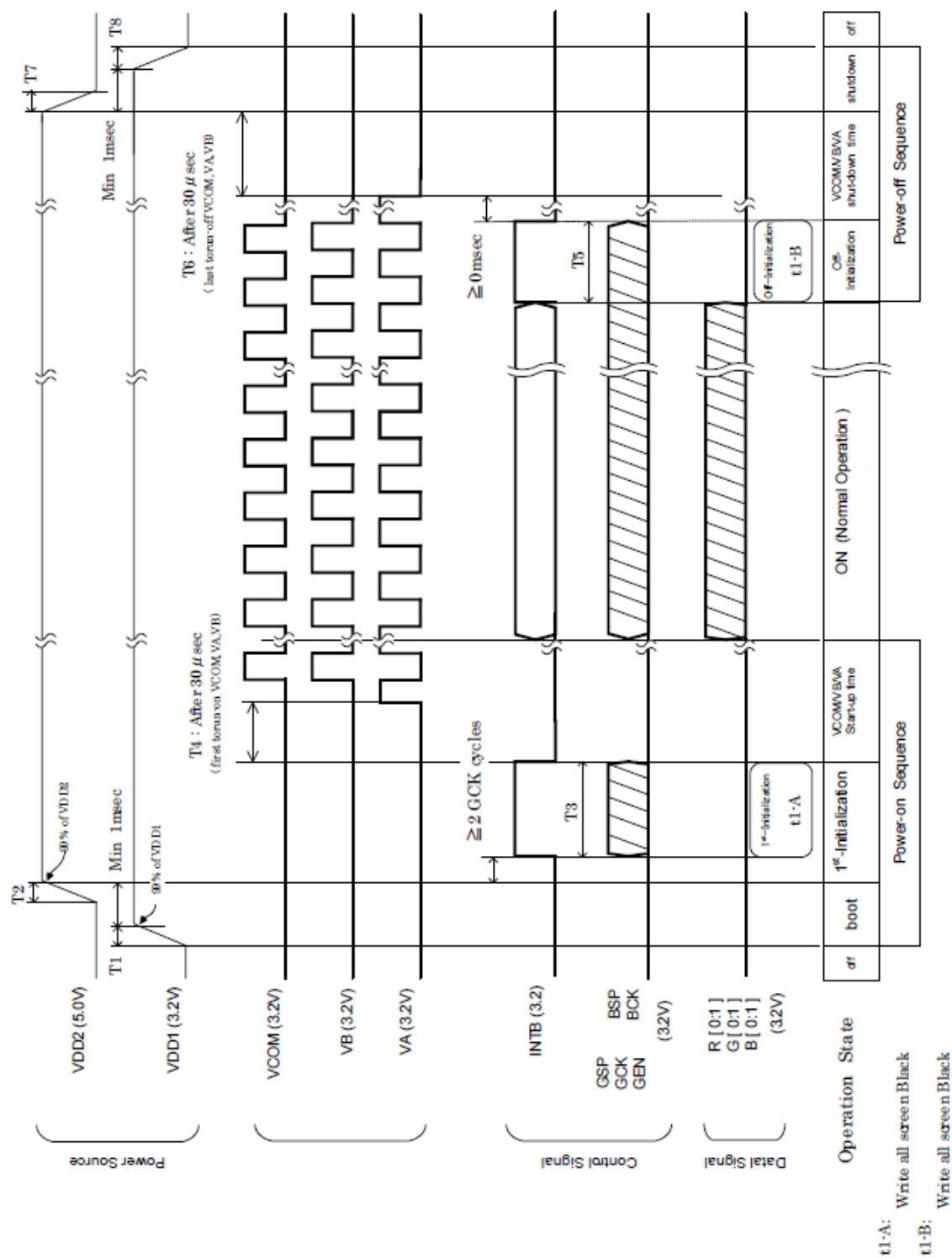


Figure: Power Supply Sequence

【ON Sequence】

T1 :

: VDD1 rise time(depend on IC) . Please not use extremely slow power source

T2 :

: VDD2 rise time(depend on IC) . Please not use extremely slow power source

T3 :

: Pixel memory initialization(write all screen black). T3 $\geq$ 1 frame

T4 :

: VCOM,VA,VB rise time T4 $\geq$ 30 μ s

Release time for initialization of the latch for common control.

【Normal Operation】

Duration of normal driving.

【Off Sequence】

T5 :

: Pixel memory initialization(write all screen black). T5: same T3

T6 :

: VCOM,VA,VB fall time T6 $\geq$ 30 μ s

T7 :

: VDD2 fall time(depend on IC) . Please not use extremely slow power source

If necessary use discharge circuit.

T8 :

: VDD1 fall time(depend on IC). Please not use extremely slow power source

If necessary use discharge circuit.

4. Optical Characteristics

4.1 Optical characteristic of the LCD

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

Measuring equipment: BM-7A

(Ta=25±2°C , VDD =3.3V, I_f=40mA)

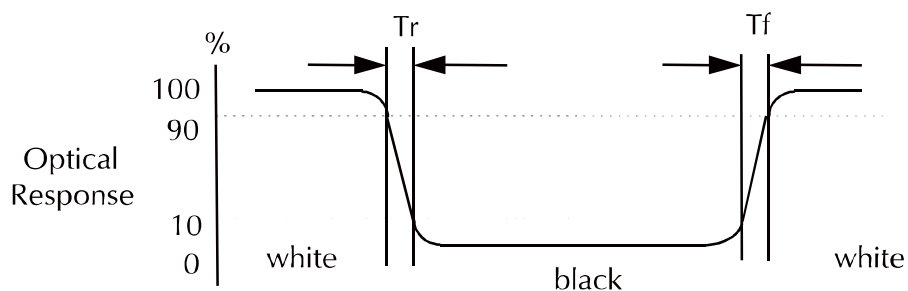
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	--	120	150	--	cd/m ²	--
Response Time		T _R	θ=0°	--	20	40	ms	--
		T _F		--	20	40	ms	
Contrast Ratio		CR	At optimized viewing angle	15	25	--	--	--
Luminance Uniformity		ΔL	--	70	80	--	%	
Transmissivity Ratio		T	--	--	1.4	--	%	
Reflectivity Ratio		R	--	6.5	9.0	--	%	
Color Chromaticity	White	W _x	θ=0° Normal Viewing Angle	0.25	0.30	0.35	--	--
		W _y		0.26	0.31	0.36		
	Red	R _x		0.32	0.37	0.42	--	
		R _y		0.26	0.31	0.36		
	Green	G _x		0.27	0.32	0.37	--	
		G _y		0.35	0.40	0.45		
	Blue	B _x		0.12	0.17	0.22	--	
		B _y		0.15	0.20	0.25		
Viewing Angle (6H)	Hor.	θ _R	CR≥10	40	60	--	Degree	--
		θ _L		40	60	--		
	Ver.	θ _U		40	60	--		
		θ _D		40	60	--		

Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

a. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

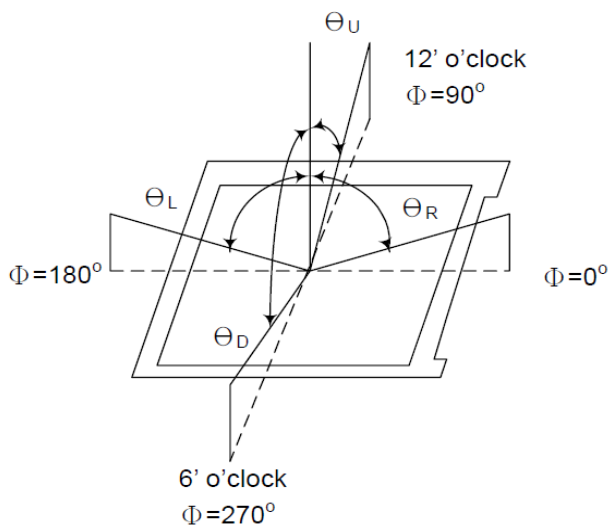


- b. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

- c. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

- d. View Angle



- e. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
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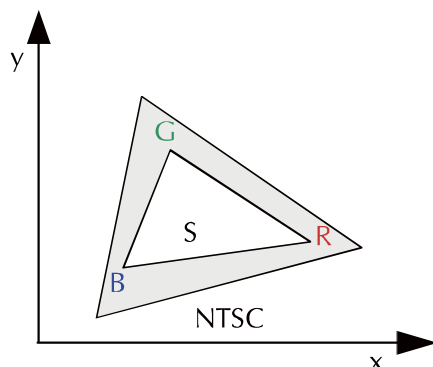
- f. Definition of White Uniformity

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

- g. The definition of Color Gamut -Color Chromaticity CIE 1931

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

Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100



5. I/O Terminal

5.1 LCM Pin Definition (Connector: Molex 503566-2100 or equivalent)

Pin No	Symbol	I/O	Configuration	Function	NOTE
1	VDD2	Power	—	Power supply for the Vertical Driver	
2	(NC)	—	—	Open (No connection)	
3	GSP	Input	NoPull	Start signal for the Gate-Driver	
4	GCK	Input	NoPull	Clock for signal for the Gate-Driver	
5	GEN	Input	NoPull	Gate enable signal	
6	INTB	Input	NoPull	Initial signal for Binary/Gate-Driver	
7	VB	Input	—	Black signal voltage of LCD Inphase signal to VCOM / Duty=50% Square wave	Note 4-1 (Note 4-2)
8	VA	Input	—	White signal voltage of LCD Opposite phase signal to VCOM / Duty=50% Square wave	Note 4-1
9	VDD1	Power	—	Power supply for the Horizontal driver and the Pixels mem	
10	VSS	Power	—	GND	
11	BSP	Input	NoPull	Start signal for the Binary-Driver	
12	BCK	Input	NoPull	Clock for driving of Binary-Driver	
13	R [0]	Input	NoPull	Red signal for odd Pixels	
14	R [1]	Input	NoPull	Red signal for even Pixels	
15	G [0]	Input	NoPull	Green signal for odd Pixels	
16	G [1]	Input	NoPull	Green signal for even Pixels	
17	B [0]	Input	NoPull	Blue signal for odd Pixels	
18	B [1]	Input	NoPull	Blue signal for even Pixels	
19	(NC)	—	—	Open (No connection)	
20	VCOM	Input	—	Common terminal voltage for LCD / Duty=50% Square wave	Note 4-1
21	(NC)	—	—	Open (No connection)	

NoPull :

Neither Pulled up nor Pulled down.

Note 4-1:

Because of direct connecting to internal common electrode,
Please don't be static electricity/ripple/etc applied.

VB is the same signal as VCOM and VA is the inverse signal of VCOM and VB

Pin No	Symbol	I/O	Signal (type)	Voltage	Boot	Initial	(Update mode)	(Hold mode)
1	VDD2	Power	DC Power	5.0V	5.0V	5.0V	5.0V	5.0V
3	GSP	Input	Pulse Signal	0 / 3.2	0V	0V	Hi / Lo	0V
4	GCK	Input	CLK	0 / 3.2	0V	0V	CLK	0V
5	GEN	Input	Pulse Signal / Hi or Lo	0 / 3.2	0V	0V	Hi / Lo	0V
6	INTB	Input	Pulse Signal	0 / 3.2	0V	0V	Hi / Lo	0V
7	VB	Input	Square pulse	0 / 3.2	0V	0V	0 / 3.2	0 / 3.2
8	VA	Input	Square pulse	0 / 3.2	0V	0V	0 / 3.2	0 / 3.2
9	VDD1	Power	DC Power	3.2V	3.2V	3.2V	3.2V	3.2V
10	VSS	Power	GND	0V	0V	0V	0V	0V
11	BSP	Input	Pulse Signal	0 / 3.2	0V	0V	Hi / Lo	0V
12	BCK	Input	CLK	0 / 3.2	0V	0V	CLK	0V
13	R [0]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
14	R [1]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
15	G [0]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
16	G [1]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
17	B [0]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
18	B [1]	Input	Logic Signal	0 / 3.2	0V	0V	Hi / Lo	0V
20	VCOM	Input	Square pulse	0 / 3.2	0V	0V	0 / 3.2	0 / 3.2

※ Above each Voltage value is typical.

※Boot : When just input Power

※Initial : Between PowerON and Input Signal.

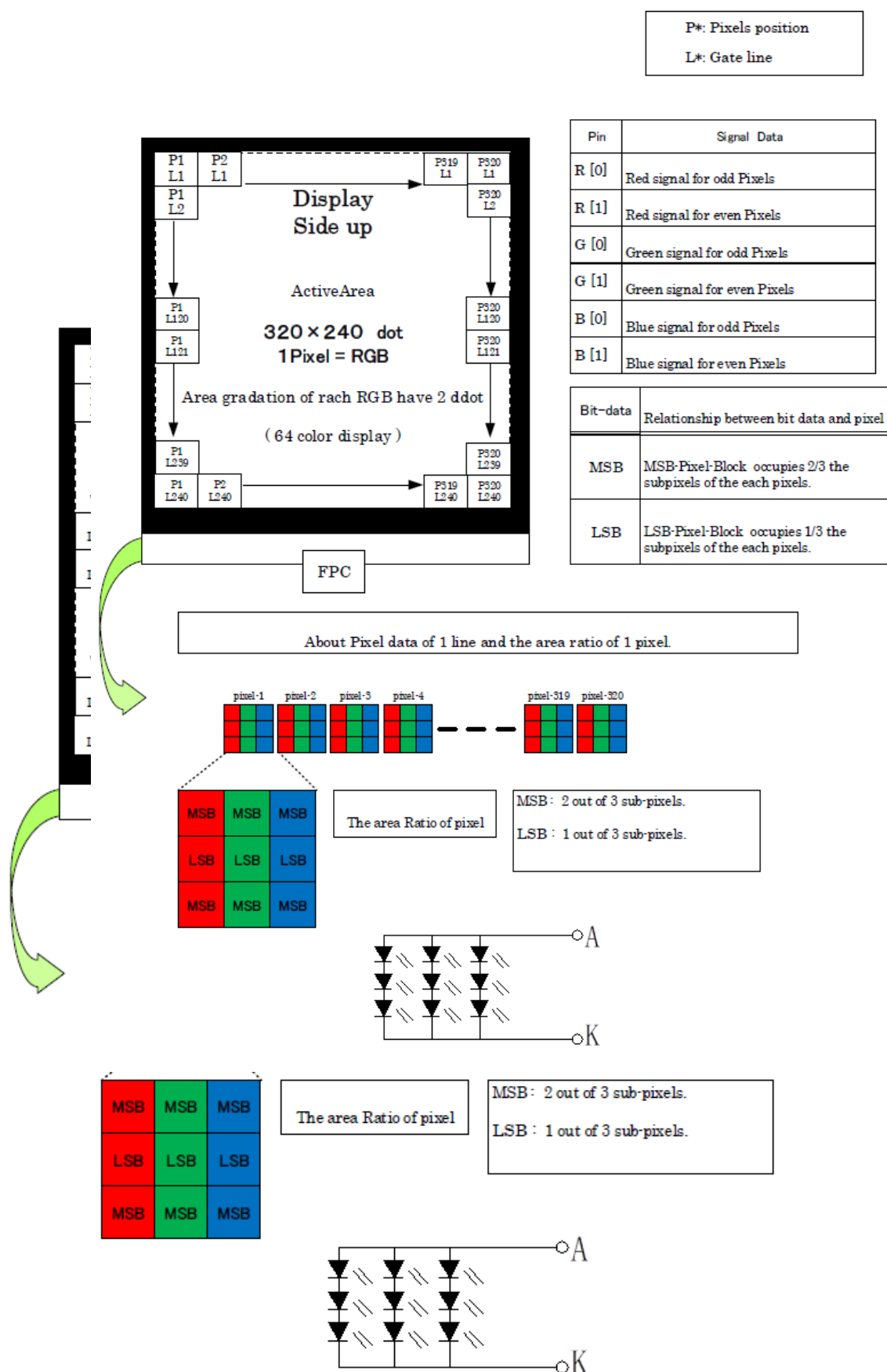
※Data Update mode : Updates data in pixel memory.

※Hold mode : Maintains memory internal data and maintain current display

5.2 Backlight Pin Assignment

Pin No.	Symbol	Function	Remark
1	K	Power for LED backlight cathode	--
2	K	Power for LED backlight cathode	--
3	A	Power for LED backlight anode	--
4	A	Power for LED backlight anode	--

5.2 Block Diagram



6. Reliability Condition

No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

Humidity: $65\% \pm 5\%\text{RH}$.

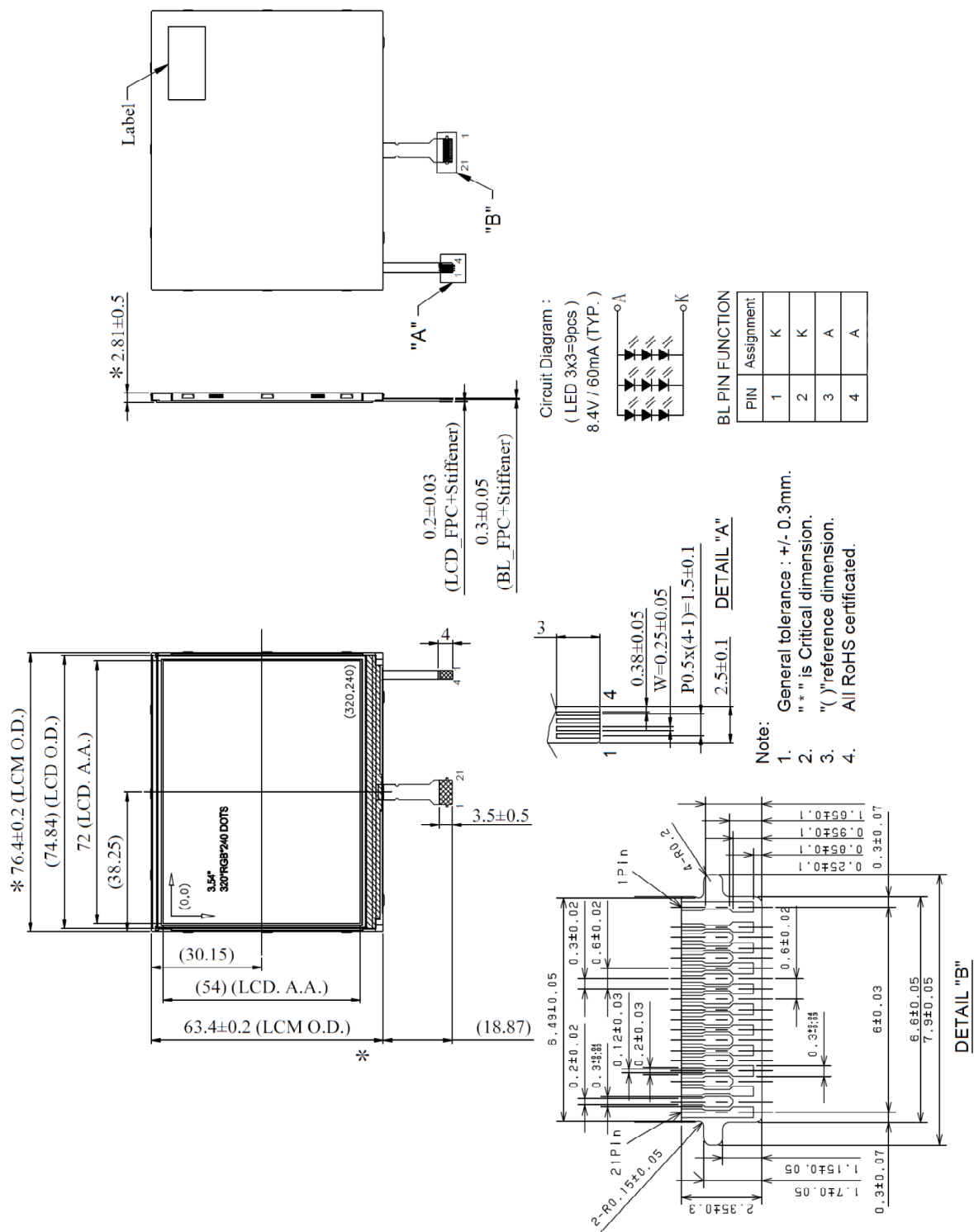
Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	--
2	Low Temperature Operating	$-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	1
3	High Temperature Storage	$80^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	2
4	Low Temperature Storage	$-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	$40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 95%, 240hrs.	1,2

Notes:

1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.

7. Dimensional Outlines



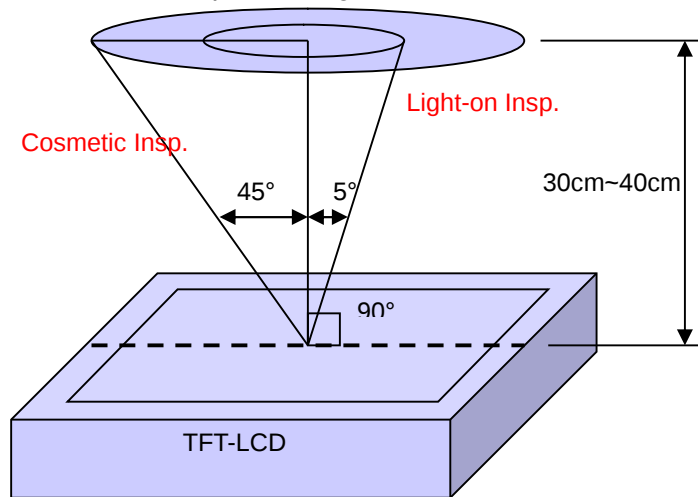
8 Incoming Inspection Standards

8.1 Inspection and Environment Conditions

8.1.1 Inspection Conditions:

- (1) Inspection Distance: 35 cm $\pm$ 5cm
 (2) View Angle : Light-on Inspection Angle : $\pm 5^\circ$

Cosmetic Inspection Angle : $\pm 45^\circ$



(perpendicular to LCD panel surface)

8.1.2 Environment Conditions:

Ambient Temperature		20~25°C
Ambient Humidity		50~80%RH
Ambient Illumination	Cosmetic Inspection	125 $\pm$ 25 Lux
	Functional Inspection	125 $\pm$ 25 Lux

8.1.3 Sampling Conditions:

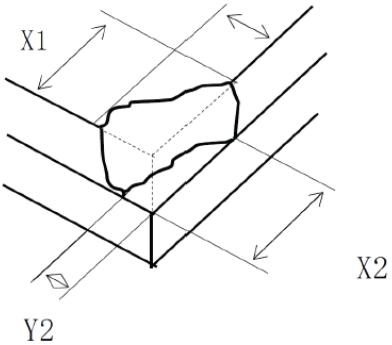
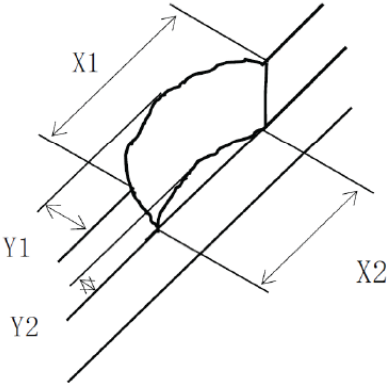
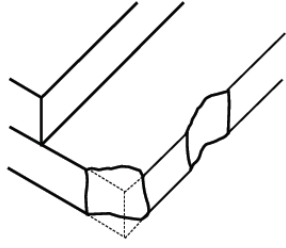
- (1) Lot Size: Quantity of shipment lot per model
 (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

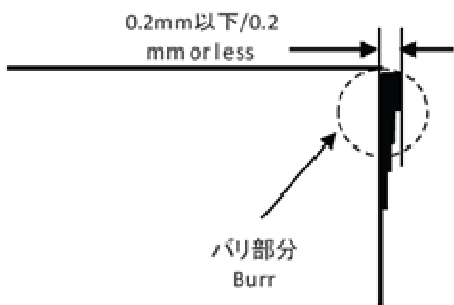
- (3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

8.1.4 Inspection Criteria

8.1.4.1 Glass edge crack/chip

Items	Inspection criteria (Acceptable level)
① Chip on glass corner (except terminal part) 	• $X1 \leq 0.5\text{mm}$ and $Y1 \leq 5.0\text{mm}$ or $X1 \leq 5.0\text{mm}$ and $Y1 \leq 0.5\text{mm}$ (However, $X1+Y1 \leq 5.0\text{mm}$) • $X2 \leq 0.5\text{mm}$ and $Y2 \leq 5.0\text{mm}$ or $X2 \leq 5.0\text{mm}$ and $Y2 \leq 0.5\text{mm}$ (However, $X2+Y2 \leq 5.0\text{mm}$) • No crack/chip at BM area
② Chip on glass edge (except terminal part) 	• $X1 \leq 10.0\text{mm}$ and $X2 \leq 10.0\text{mm}$ • $Y1 \leq 0.3\text{mm}$ and $Y2 \leq 0.3\text{mm}$
③ Chip on the terminal glass 	• FPC and/or circuit pattern shall not be affected. • Crack and/or Chip shall not reach the circuit pattern.

8.1.4.2 Panel burr

Items	Judgment criteria
Panel burr (common to all the edges of the front and rear sides) 	Included in the dimensional tolerance.

8.1.4.3 Dot Defect

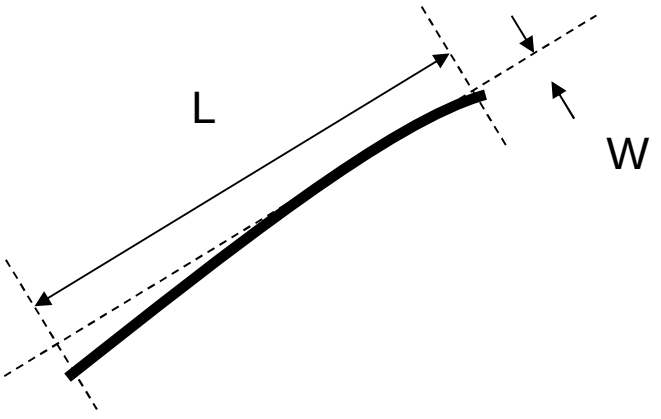
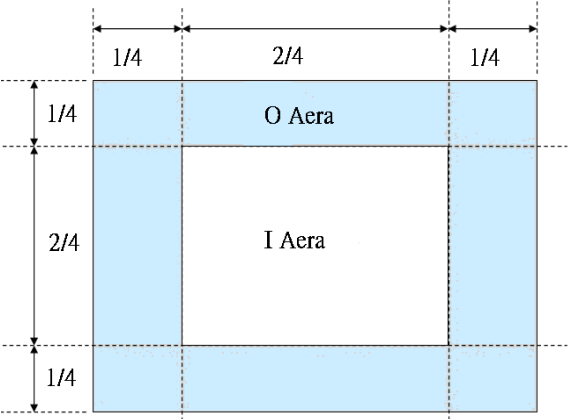
Item	Allowable number
White dot	1
Black dot	1
Total(White dot+Black dot)	2

8.1.4.4 Cosmetic items

Item	Judgment Criteria				Classification
	Area(Note1)		I	O	
Point Defect	Bright dot	Random	2		MI
		2 dots adjacent	0	0	
		3 dots adjacent or more	0	0	
	Dark dot	Random	3		
		2 dots adjacent	0		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot	L≥5mm		
		Distance between Bright and Dark dot	L≥5mm		
		Distance between Dark dot	L≥5mm		
	(1) It is defined as Point Defect if defect area > 0.5dot (2) It is ignored if defect area≤0.5dot (3)Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5%(Full Screen Black Inspection)				
	Line Defect	Obvious vertical or horizontal line defect is not allowed.			
Mura	Not allowed if it can be observed through ND Filter 5 %			MI	
Foreign Material in spot shape *Note-3	D≤0.1mm: Ignored 0.1mm<D≤0.3mm: N≤3 D>0.3mm: Not allowed			MI	
Foreign Material in line or spiral shape *Note-4	W≤0.1mm or L≤3mm: Ignored 0.1mm<W≤0.2mm and 3.0mm< L≤5mm: N≤3 W>0.2mm or L>5mm: Not allowed			MI	
Display Function Abnormal	No Malfunction can be allowed			MA	

Note-1 : I/O Area Definition

Note-2 : Polarizer Scratch



Note-3 : Spot Foreign Material
($W \geq L / 4$)

Note-4 : Line or Spiral Foreign Material
($W < L / 4$)

