Thin-Film-Transistor LCD Module
Model: GDTQ35SP7G2R0

Acceptance

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Revise Records

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A	2007/08/01	Preliminary Specification	Kevin Lin	Garry Chen
-	2008/01/31	Modify Color Chromaticity	Kavinchang	Jameslu
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-	2008/9/16	Remove Appearance 12.3	Kobe su	David Lee
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E	2011/01/20	Add IIS	Kavin chang	Sychang
F	2012/02/07	Add typical value of LED lifetime.	Kavinchang	Jameslu

Special Notes

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1. General Description and Features

GDTQ35SP7G2R0 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, a back-light unit and a touch screen panel (TSP). The resolution of a 3.5" contains 320RGBx240 dots and can display up to 16.7M colors. The following table described the features of GDTQ35SP7G2R0.

1.1 Features

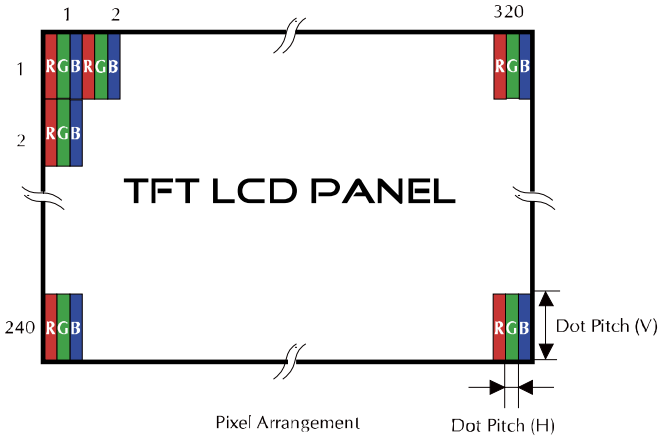
- Transmissive and back-light with six LEDs are available.
- TN (Twisted Nematic) mode.
- Programmable Frame & N-line polarity inversion.
- Using the Touch Screen Panel (Film to Glass type).
- System & Graphic interface 3-lines SPI + 8bits color RGB.
- DEN (Data Enable Input) mode, SYNC mode
- ROHS Compliance

1.2 Applications

- Display terminals for DSC (Digital Still Camera), PMP (Portable Multimedia Player) application products.

1.3 LCD Module

Item	Specification	Unit
Screen Size	3.5 inches	Diagonal
Display Resolution	320 x RGB x 240	Dot
Dot Pitch	0.219 (H) x 0.219 (V)	mm
Active Area	70.08 (H) x 52.56 (V)	mm
Outline Dimension	76.9 (W) x 63.9 (H) x 4.4 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Stripe	--
Surface Treatment	Anti-glare (AG)	--
Display Color	16.7M	--
Viewing Direction	6 o'clock	--
Input Interface	Digital 8-bits color RGB	--
Color Gamut	NTSC 60%	--

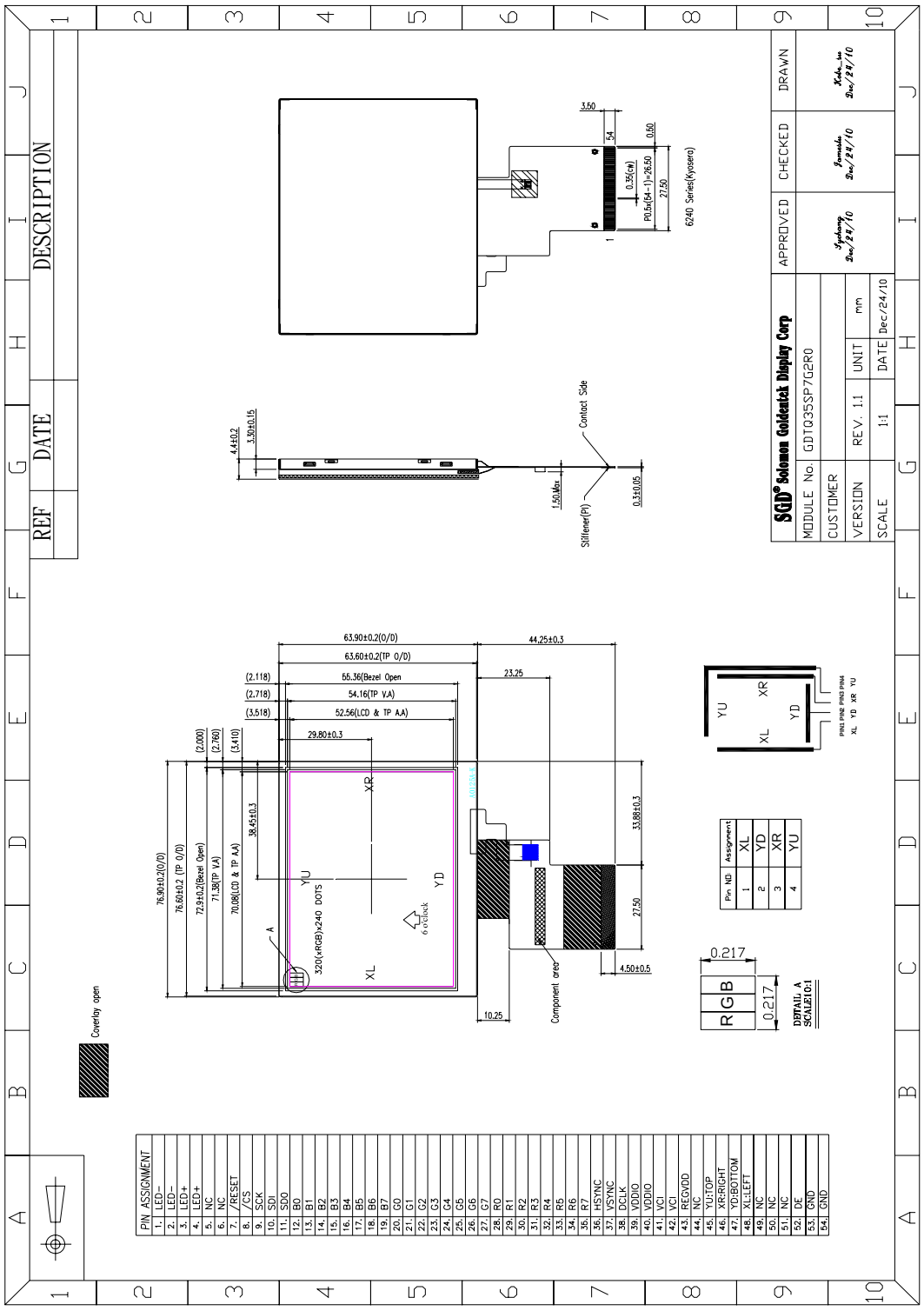


2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	76.90	--	mm	--
	Vertical (V)	--	63.90	--	mm	(1)
	Thickness (T)	--	4.40	--	mm	(2)
Weight		--	(45)	--	g	--

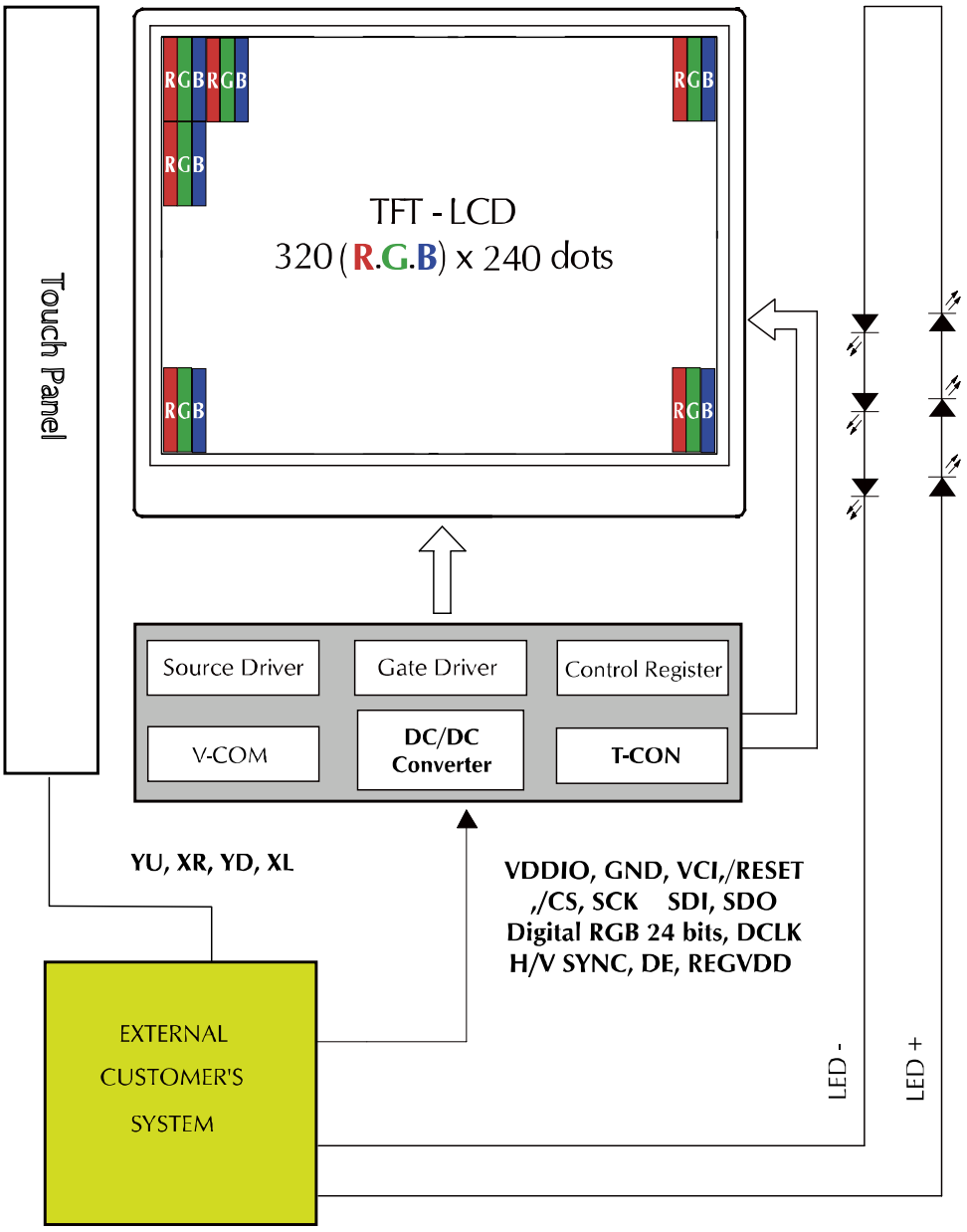
Note (1) Not include FPC.
Refer to the Outline Dimension for further information.
(2) Back-light & touch screen unit are included.

3. Dimensional Outlines



4. Block Diagram

4.1 TFT-LCD Module with BLU & TSP



5. Input Terminal Pin Assignment

5.1 Pin Assignment (LCD)

Pin No.	Symbol	I/O	Function	Remark
1	LED-	I	Backlight LED Ground	
2	LED-	I	Backlight LED Ground	
3	LED+	I	Backlight LED Power	
4	LED+	I	Backlight LED Power	
5	N/C	---	Not Connection	
6	N/C	--	Not Connection	
7	/RESET	I	Hardware Reset	
8	/CS	I	Serial Interfaces, Chip Select pin	
9	SCLK	I	SPI Interface Clock pin	
10	SDI	I	SPI Interface Data output pin	
11	SDO	O	SPI Interface Data output pin	
12	B0	I	Blue Data Bit 0	
13	B1	I	Blue Data Bit 1	
14	B2	I	Blue Data Bit 2	
15	B3	I	Blue Data Bit 3	
16	B4	I	Blue Data Bit 4	
17	B5	I	Blue Data Bit 5	
18	B6	I	Blue Data Bit 6	
19	B7	I	Blue Data Bit 7	
20	G0	I	Green Data Bit0	
21	G1	I	Green Data Bit1	
22	G2	I	Green Data Bit2	
23	G3	I	Green Data Bit3	
24	G4	I	Green Data Bit4	
25	G5	I	Green Data Bit5	
26	G6	I	Green Data Bit6	
27	G7	I	Green Data Bit7	
28	R0	I	Red Data Bit0	
29	R1	I	Red Data Bit1	
30	R2	I	Red Data Bit2	
31	R3	I	Red Data Bit3	
32	R4	I	Red Data Bit4	
33	R5	I	Red Data Bit5	

34	R6	I	Red Data Bit6	
35	R7	I	Red Data Bit7	
36	H_{SYNC}	I	Horizontal Sync Input	
37	V_{SYNC}	I	Vertical Sync Input	
38	D_{CLK}	I	Dot Data Clock	
39	V_{DDIO}	P	Voltage input pin for I/O logic. - Connect to system Vdd	
40	V_{DDIO}	P	Voltage input pin for I/O logic. - Connect to system Vdd	
41	V_{CI}	P	Booster input voltage pin. - Connect to voltage source between 2.5V to 3.6V	
42	V_{CI}	P	Positive Power Supply for Interfaces and Control lines	
43	REGVDD	I	Input pin to enable internal voltage regulation. -Connect to VDDIO if System Vdd > 2.5V -Connect to GND if 2.5V ³ System Vdd ³ 1.8V, internal regulator will be disabled	
44	N/C	--	Not Connection	
45	YU	I	Touch Panel Top Side	
46	XR	I	Touch Panel Right Side	
47	YD	I	Touch Panel Bottom Side	
48	XL	I	Touch Panel Left Side	
49	N/C	--	Not Connection	
50	N/C	--	Not Connection	
51	N/C	--	Not Connection	
52	DE	I	Data Enable Input	
53	GND	P	Ground	
54	GND	P	Ground	

6. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state.
Measuring equipment: BM-5A, BM-7A,

(Ta=25±2°C , VDDIO = V_{CI}=2.8V, I_f=20mA)

Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--		(200)	(250)	--	cd/m^2	--
Response time		T_R	θ=0°	--	15	20	ms	Note.
		T_F		--	35	50	ms	
Contrast ratio		CR	At optimized viewing angle	240	300	--	--	Note.
Color Chromaticity (CIE1931)	Red	R_X	θ=0° Normal Viewing Angle	(0.590)	(0.640)	(0.690)	--	Note.
		R_Y		(0.294)	(0.344)	(0.394)		
	Green	G_X		(0.248)	(0.298)	(0.348)	--	
		G_Y		(0.532)	(0.583)	(0.633)		
	Blue	B_X		(0.090)	(0.140)	(0.190)	--	
		B_Y		(0.080)	(0.130)	(0.180)		
	White	Wx		(0.262)	(0.312)	(0.362)	--	
		Wy		(0.299)	(0.349)	(0.399)		
Viewing Angle (6H)	Hor.	θ_R	CR≥10	50	60	--	Degree	Note.
		θ_L		50	60	--		
	Ver.	ϕ_H		40	50	--		
		ϕ_L		50	60	--		

Note : Definition of Transmittance (T%)

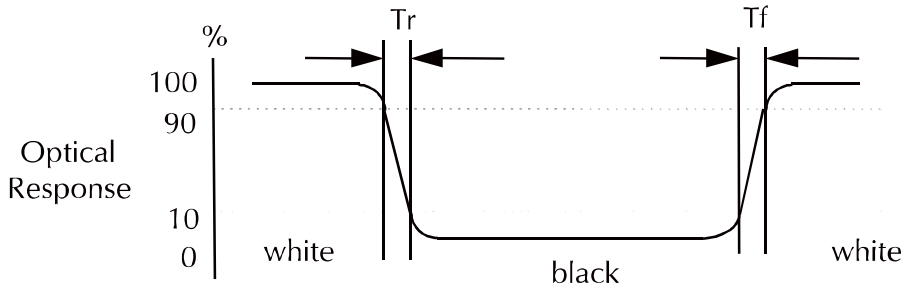
T = Aperture Ratio (TFT) x W_Y (CF)

a. 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.

b. 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".

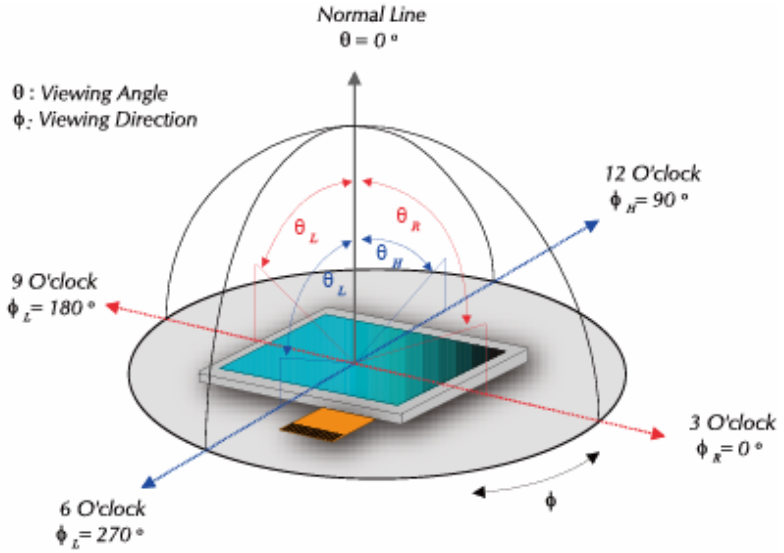


c. Definition of contrast ratio:

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

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

e. View Angle



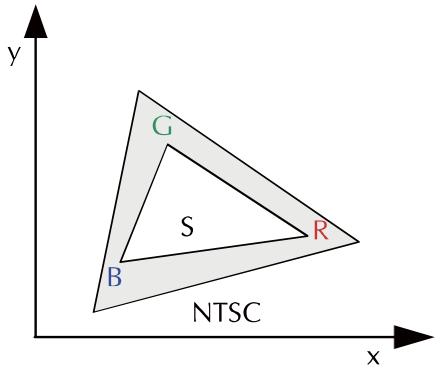
f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

g. Definition of White Uniformity

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

h. 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



7. Touch Screen Panel Specifications

7.1 Touch Panel

7.1.1 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal resistance	200	-	700	Ω	X(Glass side)
	200	-	900	Ω	Y(Film side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	-	5.0	7.0	V	DC
Chattering	-	-	10	ms	100kΩ pull-up
Transparency	-	82	-	%	Non-glare

Caution (1) : Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

7.1.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	-		80	g	(1)
Durability-surface scratching	Write 100,000	-	-	characters	(2)
Durability-surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	JIS K5400,ASTM D3363

Note (1) Stylus pen Input : R0.8mm polyacetal pen or Finger

Note (2) Measurement for Surface area - Scratch 100,000 times straight line on the Film with a stylus change every 20,000times

- Force : 150gf
- Speed : 100mm/sec
- Stylus : R0.8 polyacetal tip

Note (2) Pit 1,000,000 times on the Film with a R8.0 silicon rubber.

- Force : Force : 250gf
- Speed : 3times/sec

8. Absolute Maximum Ratings

8.1 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}	-20	70	°C	(1)
Operating temperature (Ambient temperature)	T_{OPR}	-10	60	°C	(1), (2)

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°, 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.

8.2 Electrical Absolute Rating

8.2.1 TFT-LCD Module

(Voltage Referenced to VSS)

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
Supply Voltage	VDD	-0.3	+2.7	V	--
	VDDIO	-0.3	+4.0	V	--
Input Voltage	VCI	VSS-0.3	5.0	V	--
Current Drain Per Pin Excluding VDD and VSS	I	--	25	mA	--

8.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current	I_f	--	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.

9. Electrical Characteristics

9.1 TFT-LCD Module (DC Characteristics)

(TA=25°C)

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Logic Power Supply	V_{DDIO}		2.5	3.3	3.6	V
Boost Power Supply	V_{CI}		2.5	3.3	3.6	V
Logic High Input voltage	VIH		0.8 V_{DDIO}	-	V_{DDIO}	V
Logic Low Input voltage	VIL		0	-	0.2 V_{DDIO}	
Logic Power current	Iv_{DDIO}	V_{DDIO} =3.3V	-	0.5	-	mA
Boost Power current	Iv_{CI}		-	7	-	mA

9.2 Backlight Unit

The back-light system is an edge-lighting type with **six** white LEDs (Light Emitting Diode).

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
Power Consumption	P_{LED}	-	408	-	mW	(2)
Forward voltage	V_f	-	(19.8)	-		(1)
LED Current	If	-	20	-	mA	
LED Life Time(25℃)	-	(20000)	(30000)	-	hr	(3)

Note (1) Six LEDs serial type.

(2) Where If = 20mA, $V_f = P_{LED} / If$

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

10. Basic Display Color and Gray Scale

	Color & Gray Scale	Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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
	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
	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
	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
	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
	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
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
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(127)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
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
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

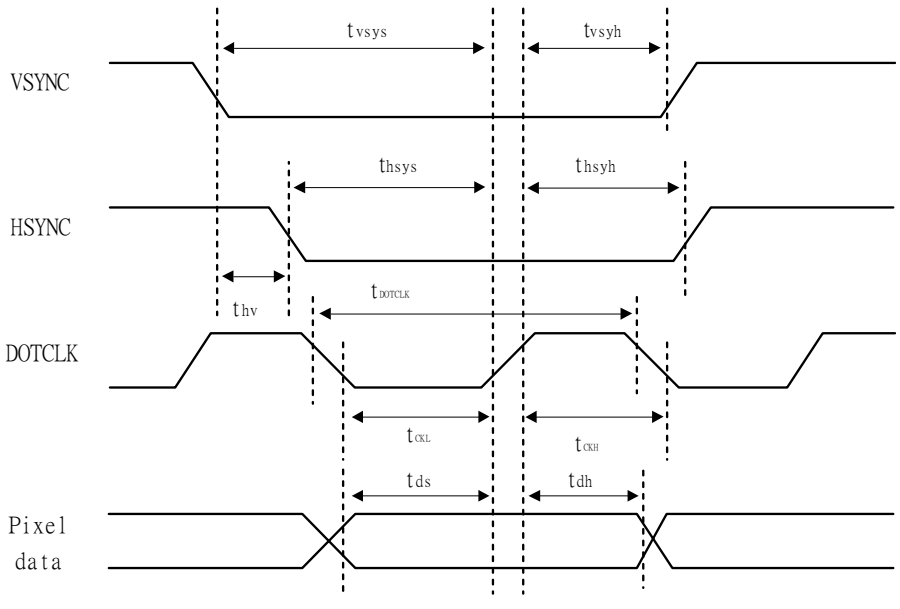
11. AC Timing

11.1 AC Characteristics (Pixel Timing)

(Unless otherwise specified, Voltage Referenced to VSS, VDDIO = 2.8V, TA = 25°C)

Item	Symbol	Min.	Typ.	Max.	Unit
DOTCLK Frequency	fDOTCLK	-	6.5	10	MHz
DOTCLK Period	tDOTCLK	100	154	-	ns
Vertical Sync Setup Time	tvsys	20	-	-	ns
Vertical Sync Hold Time	tvsyh	20	-	-	ns
Horizontal Sync Setup Time	thsys	20	-	-	ns
Horizontal Sync Hold Time	thsyh	20	-	-	ns
Phase difference of Sync Signal Falling Edge	thv	1	-	240	tDOTCLK
DOTCLK Low Period	tCKL	50	-	-	ns
DOTCLK High Period	tCKH	50	-	-	ns
Data Setup Time	tds	12	-	-	ns
Data hold Time	tdh	12	-	-	ns
Reset pulse width	tRES	10	-	-	us

Note: External clock source must be provided to DOTCLK pin of HX8238-A. The driver will not operate if absent of the clocking signal.

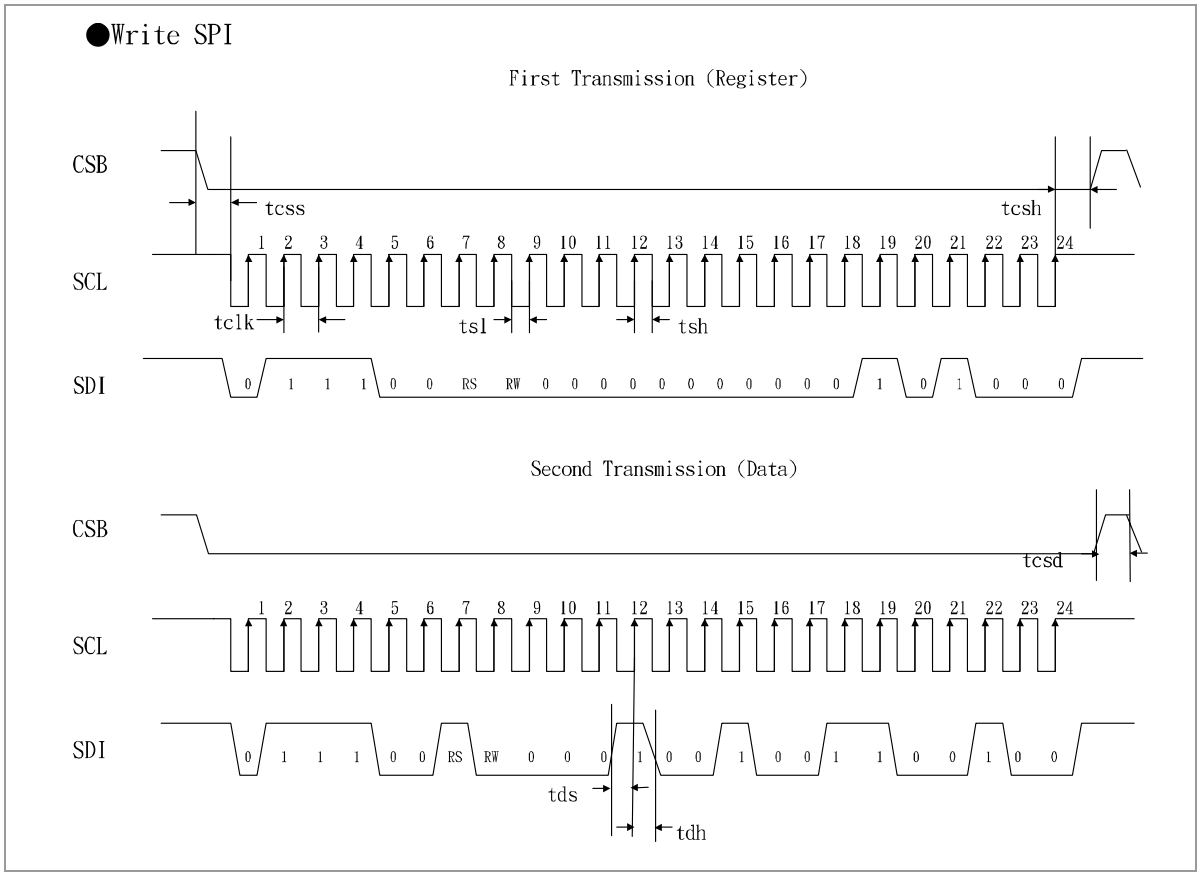


Pixel Timing

11.2 SPI Timing Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	ns
Clock Low Width	tsl	25	-	-	ns
Clock High Width	tsh	25	-	-	ns
Chip Select Setup Time	tcss	0	-	-	ns
Chip Select Hold Time	tcsh	10	-	-	ns
Chip Select High Delay Time	tcsd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

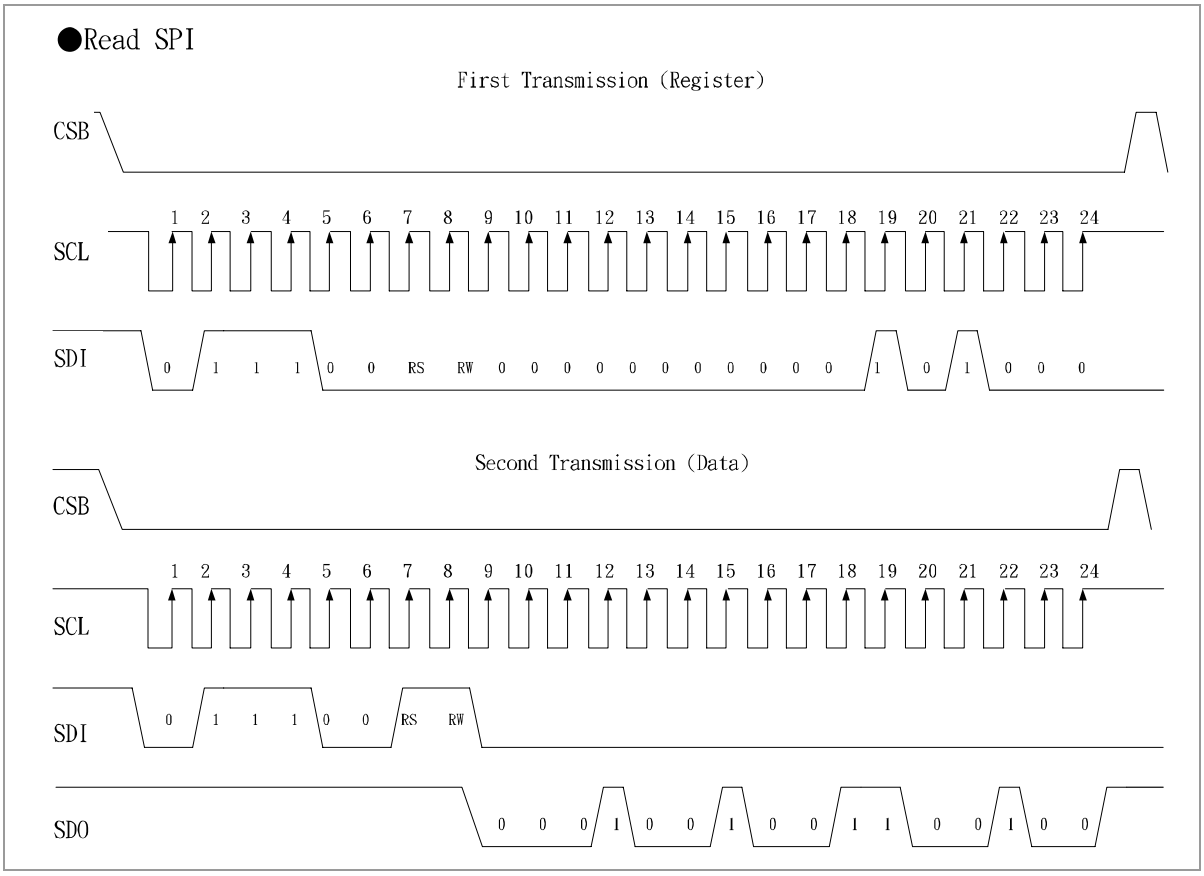
11.3 Write SPI interface Timing Diagram



Note: The example writes "0x1264h" to register R28h.

SPID connected to VSS.

11.4 Read SPI interface Timing Diagram

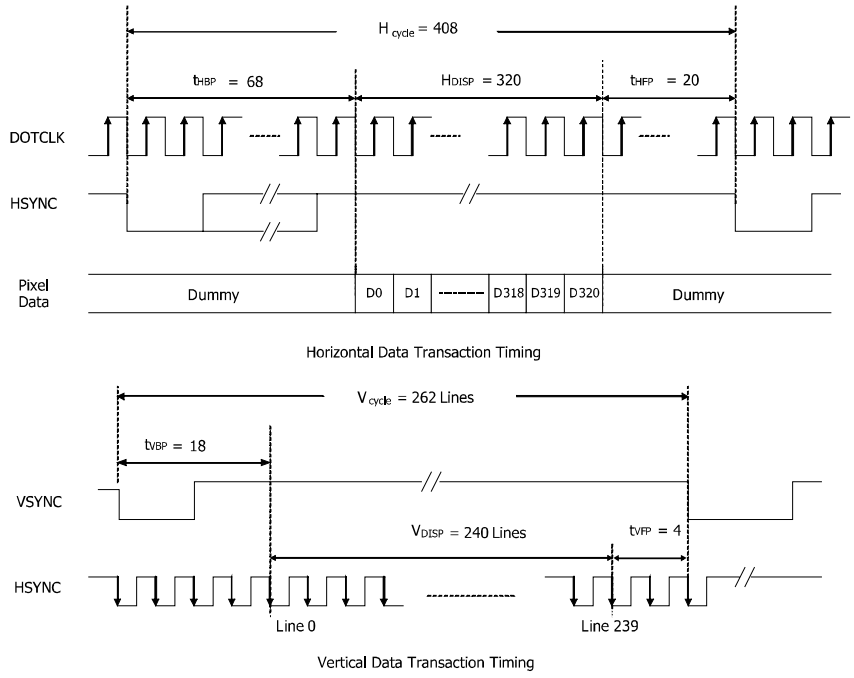


Note: The example Read "0x1264h" from register R28h.

11.5 AC Characteristics

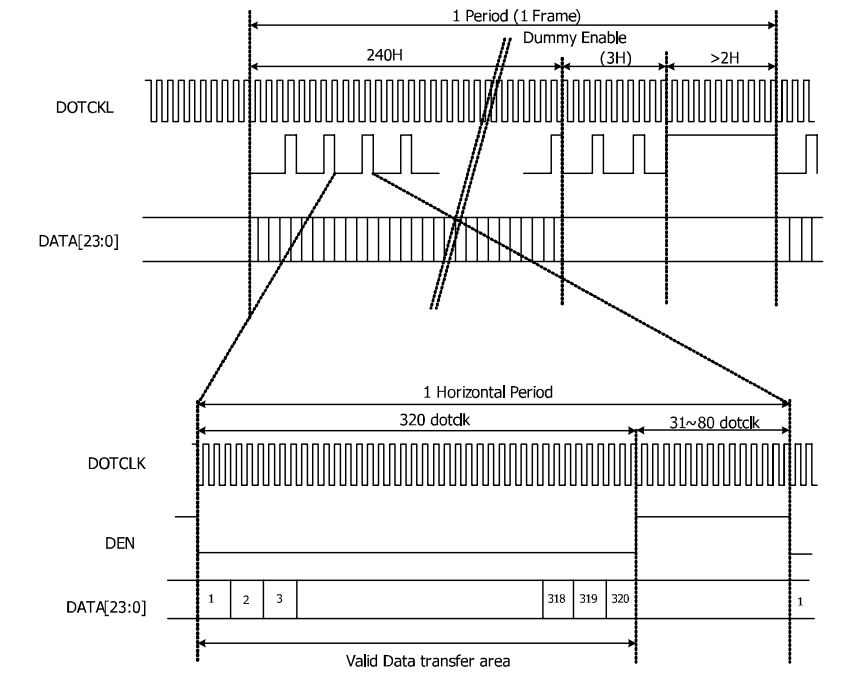
Item		Symbol	Min.	Typ.	Max.	Unit
DOTCLK Frequency		fDOTCLK	-	6.5	10	MHz
DOTCLK Period		tDOTCLK	100	154	-	ns
Horizontal Frequency (Line)		fH	-	14.9	22.35	KHz
Vertical Frequency (Refresh)		fV	-	60	90	Hz
Horizontal Back Porch		tHBP	-	68	-	tDOTCLK
Horizontal Front Porch		tHFP	-	20	-	tDOTCLK
Horizontal Data Start Point		tHBP	-	68	-	tDOTCLK
Horizontal Blanking Period		tHBP + tHFP	-	88	-	tDOTCLK
Horizontal Display Area		HDISP	-	320	-	tDOTCLK
Horizontal Cycle		Hcycle	-	408	450	tDOTCLK
Vertical Back Porch		tVBP	-	18	-	Lines
Vertical Front Porch		tVFP	-	4	-	Lines
Vertical Data Start Point		tVBP	-	18	-	Lines
Vertical Blanking Period		tVBP + tVFP	-	22	-	Lines
Vertical Display Area	NTSC	VDISP	-	240	-	Lines
	PAL			280(PALM=0)		
				288(PALM=1)		
Vertical Cycle	NTSC	Vcycle	-	262	350	Lines
	PAL			313		

11.6 Timing in Parallel RGB (24 bit SYNC Mode)



Data transaction timing in parallel RGB (24 bit) interface (SYNC mode)

11.7 Timing in Parallel RGB (24 bit DE Mode)

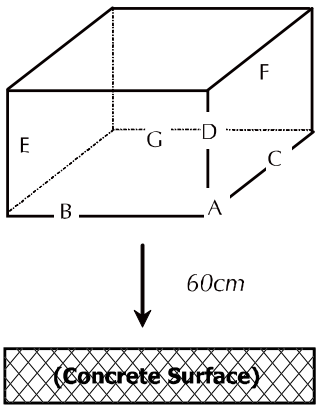


Signal timing in DE mode

12. Reliability Condition for LCD

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±5°C.
Humidity: 65±5%RH.
Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	60°C±2°C, 240hrs (Operation state).	-
2	Low Temperature Operating	-10°C±2°C, 240hrs (Operation state).	-
3	High Temperature Storage	70°C±2°C, 240hrs.	-
4	Low Temperature Storage	-20°C±2°C, 240hrs.	-
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs.	-
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	-
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state. 	-

13. Incoming Inspection Standards

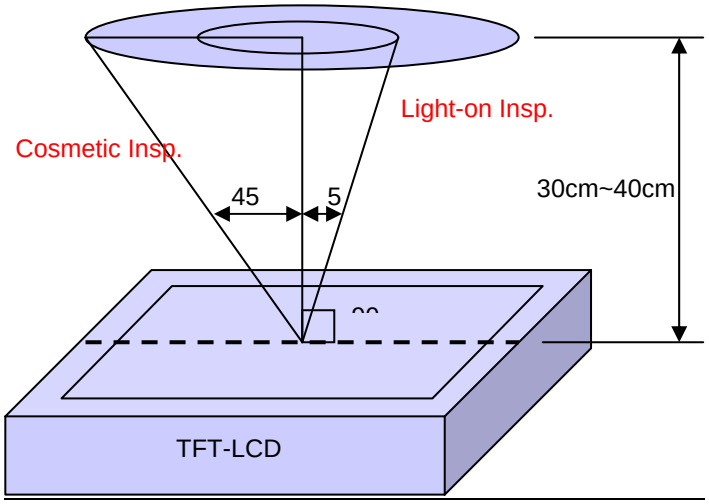
13.1 Inspection and Environment Conditions

13.1.1 Inspection Conditions:

(1)Inspection Distance: 35 cm±5cm

(2)View Angle : Light-on Inspection Angle：±5°

Cosmetic Inspection Angle：±45°



(perpendicular to LCD panel surface)

13.1.2 Environment Conditions:

Ambient Temperature		23℃±5℃
Ambient Humidity		55±10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

13.1.3 Sampling Conditions:

(1) Lot Size: Quantity of shipment lot per model

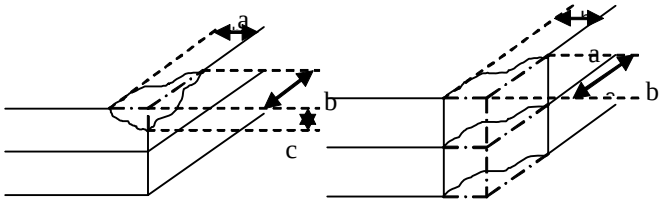
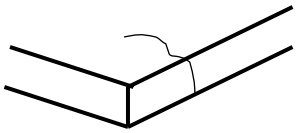
(2) Sampling Method:

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.

13.1.4 Inspection Criteria

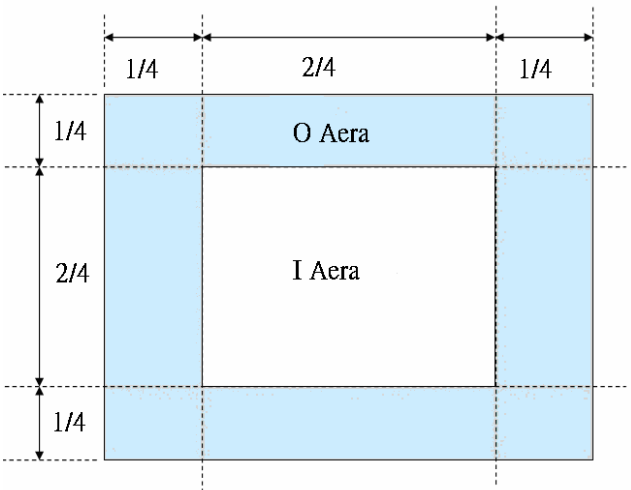
13.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 a≦3.0mm、b≦3.0mm、c≦t (Bottom glass thickness)	MA
Scratch on Panel *Note-2	W≦0.05mm or L< 5mm: Ignored 0.05mm<W≦0.1mm and L≦5mm: N≦5 W>0.1mm or L>5mm: Not allowed	MI
Bubble or Dent on Panel *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.3mm: N≦5 D>0.3mm: Not allowed	MI
Panel Crack	 Not Allowed crack	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	L≦20mm , W≦0.2 , N≦3	MI
Metal Squash Dent /Flange(Front Side)	D(W)≦1,L≦3,N≦3;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI

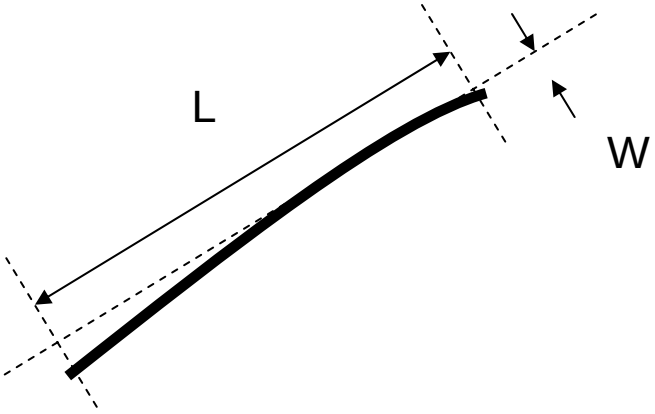
13.1.4.2 Functional Inspection:

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.				MA
Mura	Not allowed if it can be observed through ND Filter 5 %				MI
Foreign Material in spot shape *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.5mm: N≦8 D>0.5mm: Not allowed				MI
Foreign Material in line or spiral shape *Note-4	W≦0.05mm or L≦5mm: Ignored 0.05mm<W≦0.2mm and L1.0mm≦5mm: N≦8 W>0.2mm or L>5mm: Not allowed				MI
Display Function Abnormal	No Malfunction can be allowed				MA

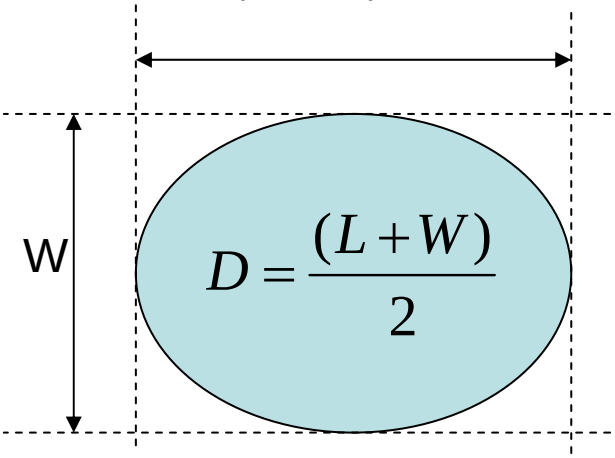
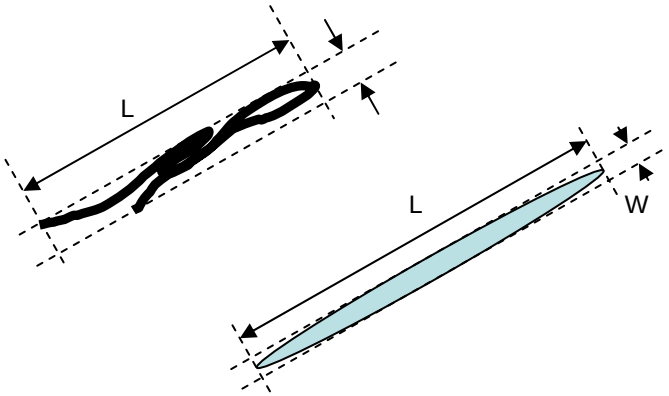
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



Note-3 : Spot Foreign Material
(W ≧L / 4)



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