

TFT-DISPLAY DATASHEET

ONation
Model: OT035AQDDDN-06

BRIEF SPEC.:

Main Feature LandscapeType
For outdoor application

Active Screen Area	70.08 x 52.56 (mm)
Diagonal Format	3.5 " 4:3
Resolution	320 X 240
Colors	(8 Bit)
Backlight	LED
Brightness	550 cd/m ²
LED Life Time	20K (h)
Interface	TTL
Viewing Angle	60/60 L/R 50/55
Touchscreen	No
Power Supply	3.3 V (Typ.)
Module Outline	76.9 x 63.9 x 2.6 (mm)
Operation Temperature	-20... +70 °C
Storage Temperature	-30... +80 °C
Surface Treatment	



ONation Corporation

CUSTOMER' S APPROVAL SPECIFICATIONS

MODEL: OT035AQDDDN-06
(Complied With RoHS)

CUSTOMER: _____

Version: P0.1

C O N T E N T S

ISSUE: JUL.02.2012

Spec Condition: preliminary

No.	ITEM	PAGE
1	COVER	--
2	RECORD OF REVISION	0-1
3	MECHANICAL SPECIFICATIONS	1
4	OUTLINE DIMENSIONS	2
5	INTERFACE PIN CONNECTION	3~4
6	BLOCK DIAGRAM	5
7	ABSOLUTE MAXIMUM RATINGS	5
8	ELECTRICAL CHARACTERISTICS	6
9	OPTICAL CHARACTERISTICS	7 ~ 9
10	AC CHARACTERISTICS	10 ~ 13
11	RELIABILITY TEST	14
12	LCM INSPECTION SPECIFICATION	15~20

CUSTOMER	ONATION		
APPROVAL	APPROVAL	CHECKER	PREPARE
	<i>ch lee</i>	<i>ch lee</i>	<i>Carl</i>

2.RECORD OF REVISION

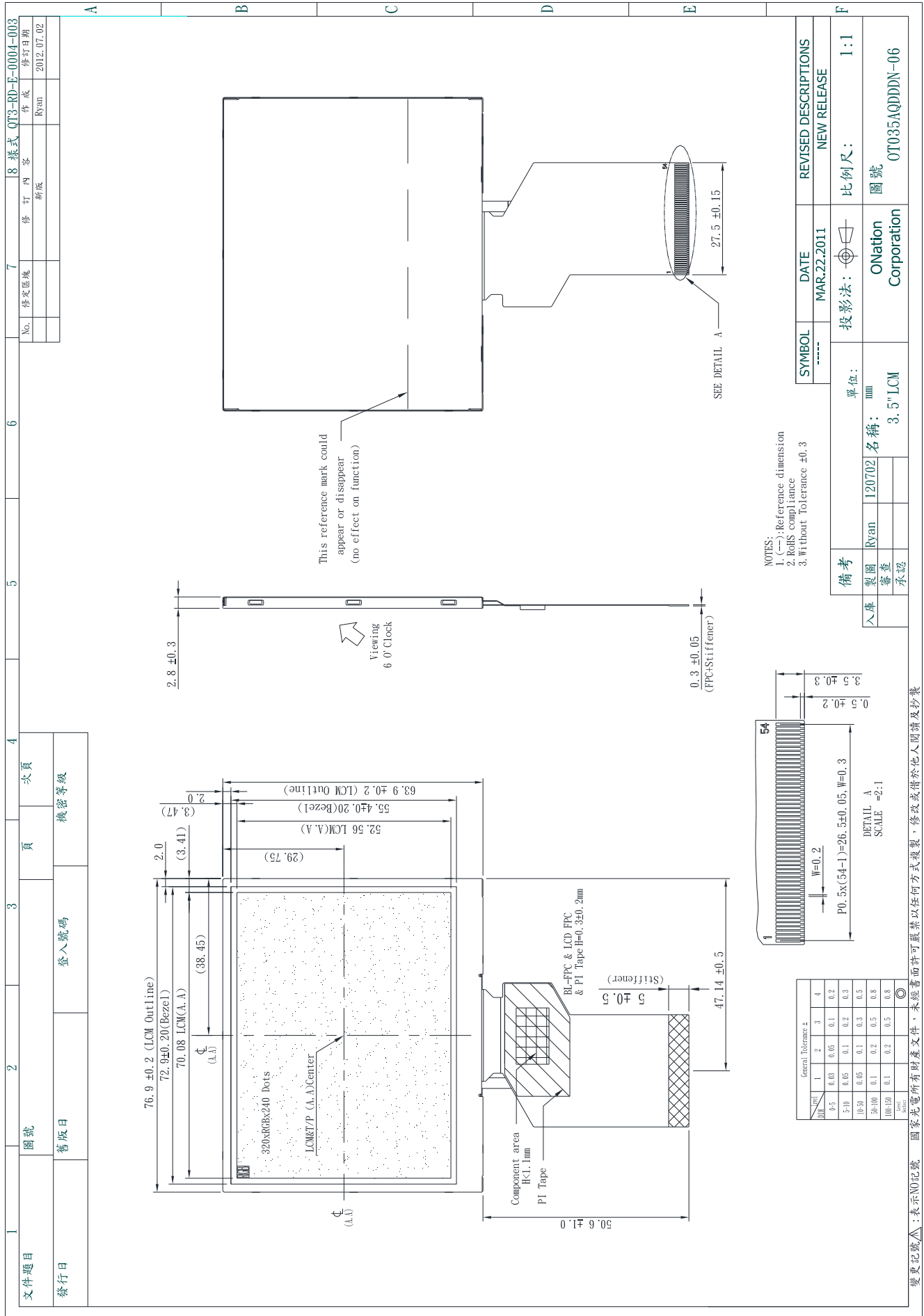
REV	DATE	PAGE	SUMMARY
0.1	2012.07.02	--	Preliminary specification was first issued.

3.MECHANICAL SPECIFICATIONS

(1)	Number Of Dots (Dots)	320(R.G.B) X 240
(2)	Module Size(mm)	76.9(H) X 63.9(V) X 2.8(D)
(3)	Active Area(mm)	70.08(H) X 52.56(V)
(4)	Pixel Pitch(mm)	0.219(H) X 0.219(V)
(5)	LCD Model	TFT , Transmissive , Normally white
(6)	LED Backlight Color	White
(7)	Color Configuration	R.G.B Vertical Stripe
(8)	Viewing Direction	12 O'clock
(9)	Gray Scale Inversion Direction	6 O'clock
(10)	Driving Method	COG TYPE
(11)	Driver IC	HX8238D
(12)	Module Weight(g)	(29)±5%

*Viewing direction for best image quality is different from TFT definition, there is the 180 degrees shift.

4. OUTLINE DIMENSIONS



SYMBOL	DATE	REVISED DESCRIPTIONS
----	MAR.22.2011	NEW RELEASE
投影法:	比例尺: 1:1	
單位: mm	名稱: 3.5" LCM	圖號: OT035AQDDDN-06
製圖: Ryan	審圖: Ryan	承認: Ryan
備考		

NOTES:
 1. (---): Reference dimension
 2. RoHS compliance
 3. Without Tolerance ±0.3

General Tolerance ±				
mm	1	2	3	4
0.5	0.03	0.05	0.1	0.2
0.5-10	0.05	0.1	0.2	0.3
10-50	0.05	0.1	0.3	0.5
50-100	0.1	0.2	0.5	0.8
100-500	0.1	0.2	0.5	0.8
500-1000	0.1	0.2	0.5	0.8

DETAIL A
 SCALE = 2:1
 P0.5x(54-1)=26.5±0.05, W=0.3
 W=0.2

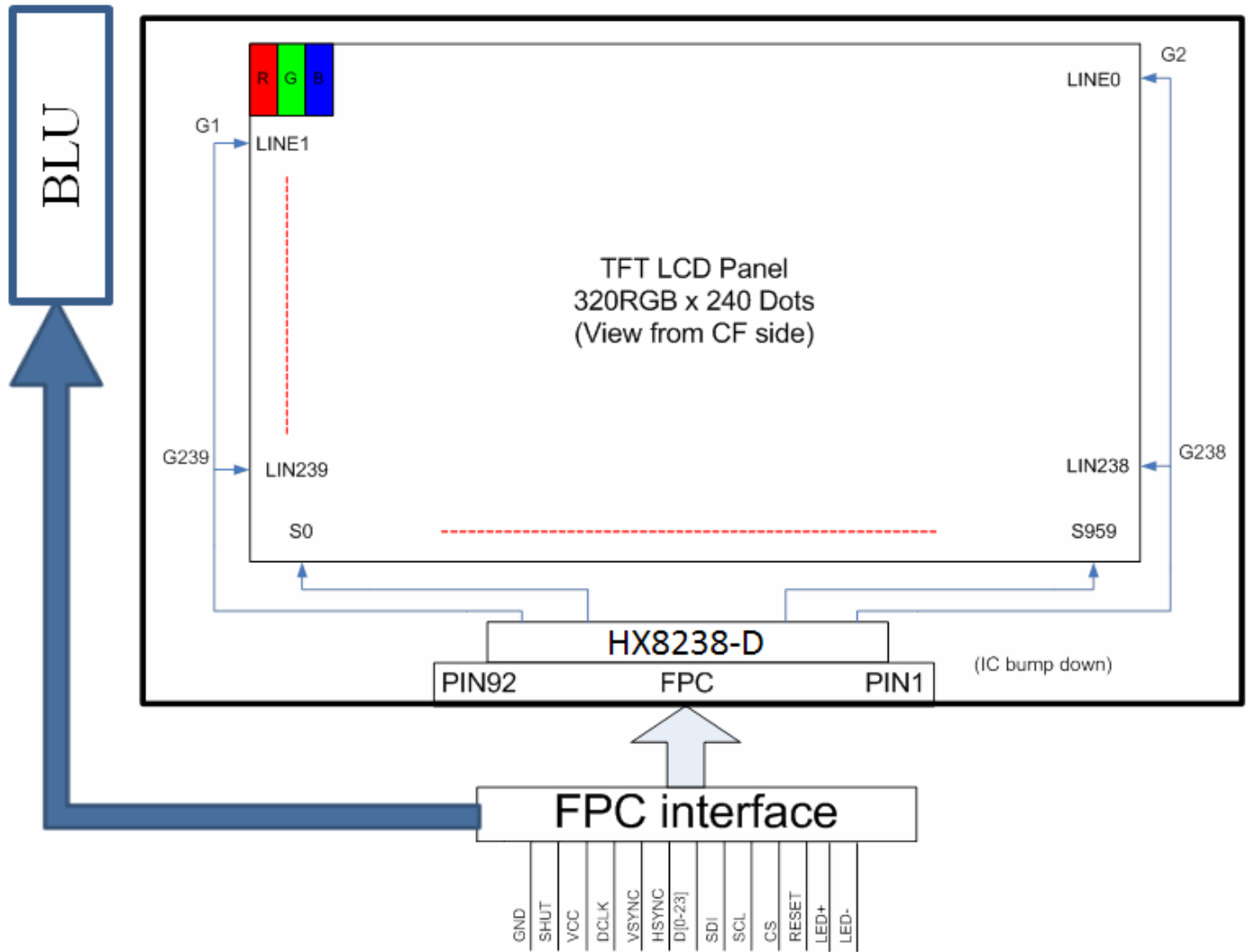
變更記號△: 表示NO記號 國家光電所有財產文件, 未經書面許可嚴禁以任何方式複製, 修改或借於他人閱讀及抄襲

5. INTERFACE PIN CONNECTION

PIN NO.	SIGNAL	I/O	FUNCTION
1	LED-	P	Cathode for LED
2	LED-	P	Cathode for LED
3	LED+	P	Anode for LED
4	LED+	P	Anode for LED
5	NC	-	NA
6	NC	-	NA
7	POL	O	Polarity signal to monitor VCOM signal
8	RESET	I	Hardware reset
9	CS	I	Chip select pin of serial interface
10	SCL	I	Clock pin of serial interface
11	SDI	I	Data input pin in serial mode
12	D0	I	Blue signal data bus (LSB)
13	D1	I	Blue signal data bus
14	D2	I	Blue signal data bus
15	D3	I	Blue signal data bus
16	D4	I	Blue signal data bus
17	D5	I	Blue signal data bus
18	D6	I	Blue signal data bus
19	D7	I	Blue signal data bus (MSB)
20	D8	I	Green signal data bus (LSB)
21	D9	I	Green signal data bus
22	D10	I	Green signal data bus
23	D11	I	Green signal data bus
24	D12	I	Green signal data bus
25	D13	I	Green signal data bus
26	D14	I	Green signal data bus
27	D15	I	Green signal data bus (MSB)
28	D16	I	Red signal data bus (LSB)
29	D17	I	Red signal data bus
30	D18	I	Red signal data bus
31	D19	I	Red signal data bus
32	D20	I	Red signal data bus
33	D21	I	Red signal data bus
34	D22	I	Red signal data bus
35	D23	I	Red signal data bus (MSB)
36	HSYNC	I	Horizontal synchronous signal
37	VSYNC	I	Vertical synchronous signal
38	DCLK	I	Dot clock signal

PIN NO.	SIGNAL	I/O	FUNCTION
39	NC	-	NA
40	NC	-	NA
41	V _{CC}	P	Power supply
42	V _{CC}	P	Power supply
43	NC	-	NA
44	NC	-	NA
45	ID	-	Open
46	SHUT	I	Sleep mode (V _{CC} =sleep ; GND=normal operating)
47	NC	-	NA
48	NC	-	NA
49	NC	-	NA
50	NC	-	NA
51	NC	-	NA
52	DE	I	Data enable signal
53	GND	P	Ground
54	GND	P	Ground

6. BLOCK DIAGRAM



7. ABSOLUTE MAXIMUM RATINGS

7.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Supply Voltages	V_{CI}	-0.3	4.0	V	GND=0
LCD Supply Voltage range	$V_{GH}-V_{GL}$	-0.3	25	V	GND=0
Input Voltage	V_I	-0.3	$V_{CI}+0.3$	V	GND=0

7.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature(°C)	-20	70	-30	80	Note 1,2,3

Note 1 : The response time will become lower when operated at low temperature.

Note 2 : Background color changes slightly depending on ambient temperature.

Note 3 : Can operating display when $T_a > 70^\circ\text{C} \sim 80^\circ\text{C}$ 、 $T_a < -20^\circ\text{C} \sim -30^\circ\text{C}$, but display contrast ratio drop.

8.ELECTRICAL CHARACTERISTICS

8.1 LCM ELECTRICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Power Voltage	V _{CC}	2.5	3.3	3.6	V
Current Consumption**	I _{CC}	-	14	17	mA
Input High Voltage	V _{IH}	0.8*V _{CC}	-	V _{CC}	V
Input Low Voltage	V _{IL}	0	-	0.2*V _{CC}	V
Output High Voltage	V _{OH}	0.9*V _{CC}	-	V _{CC}	V
Output Low Voltage	V _{OL}	0	-	0.1*V _{CC}	V

** Test pattern:black

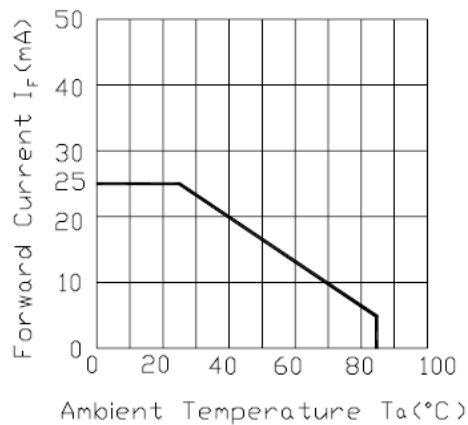
8.2 LED BACKLIGHT ELECTRICAL CHARACTERISTICS

Ta=25°C

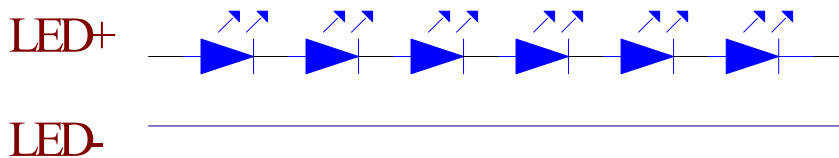
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LED Voltage	V _{LED}	(17.4)	(19.2)	(19.8)	V	Note2
Forward Current	I _{LED}	-	20	-	mA	
Power Consumption	P _{LED}	-	(384)	-	mW	

Note 1: LED Forward Current

Forward Current Derating Curve



Note 2: LED Number



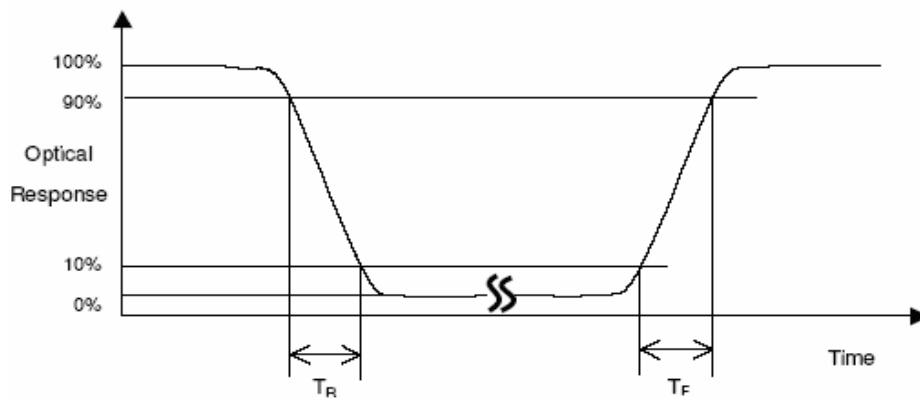
9.OPTICAL CHARACTERISTICS

9.1 OPTICAL CHARACTERISTICS OF LCM PANEL

Ta=25°C

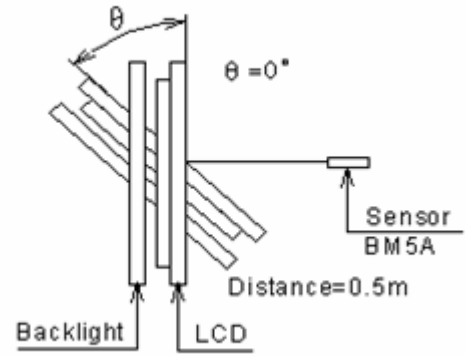
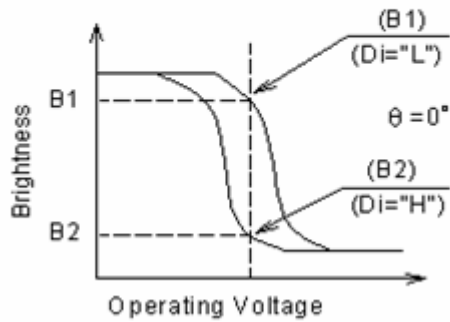
ITEM	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	REMARK
Contrast ratio	CR	At optimized Viewing angle	230	250	-	-	Note(2)
Response time(TR+TF)		T=0	-	50	-	ms	Note(1)
Brightness		Center	500	550	-	cd/m ²	Note(4)
Uniformity		-	-	80	-	%	Note(5)
Chromaticity	Red	X _R	(0.60)	(0.65)	(0.70)	-	-
		Y _R	(0.30)	(0.35)	(0.40)	-	
	Green	X _G	(0.30)	(0.35)	(0.40)	-	-
		Y _G	(0.55)	(0.60)	(0.65)	-	
	Blue	X _B	(0.10)	(0.15)	(0.20)	-	-
		Y _B	(0.04)	(0.09)	(0.14)	-	
	White	X _W	(0.26)	(0.31)	(0.36)	-	-
		Y _W	(0.28)	(0.33)	(0.38)	-	
Viewing angle	ΘX+	CR ≥ 10	-	60	-	Deg.	Note(3)
	ΘX-		-	60	-	Deg.	
	ΘY+		-	50	-	Deg.	
	ΘY-		-	55	-	Deg.	

Note (1) Definition of Response Time (TR,TF) :



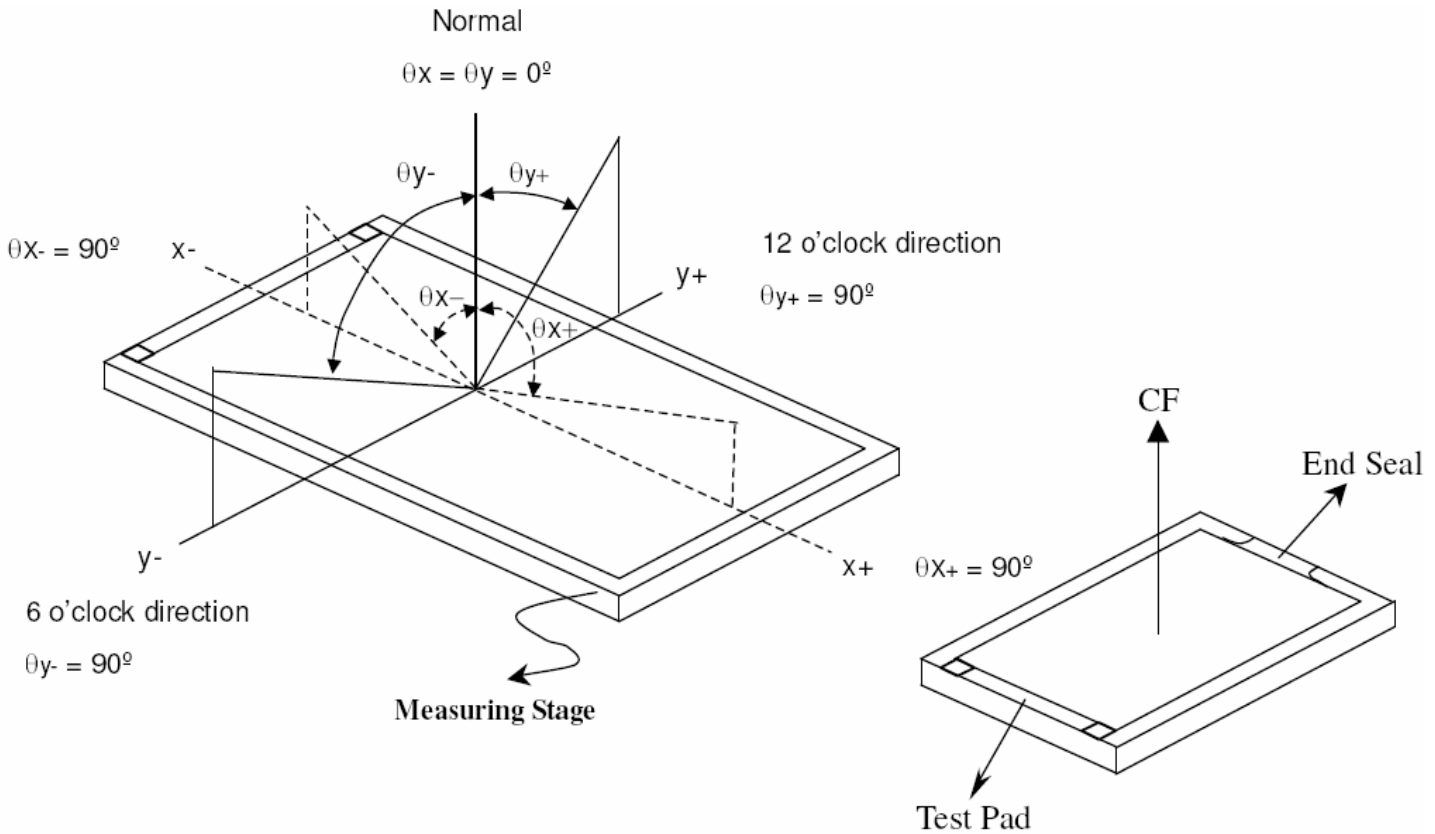
Note (2) Definition of Contrast Ratio "CR":

$$CR = \frac{\text{Brightness on non-selected dot (B1)}}{\text{Brightness on selected dot (B2)}}$$



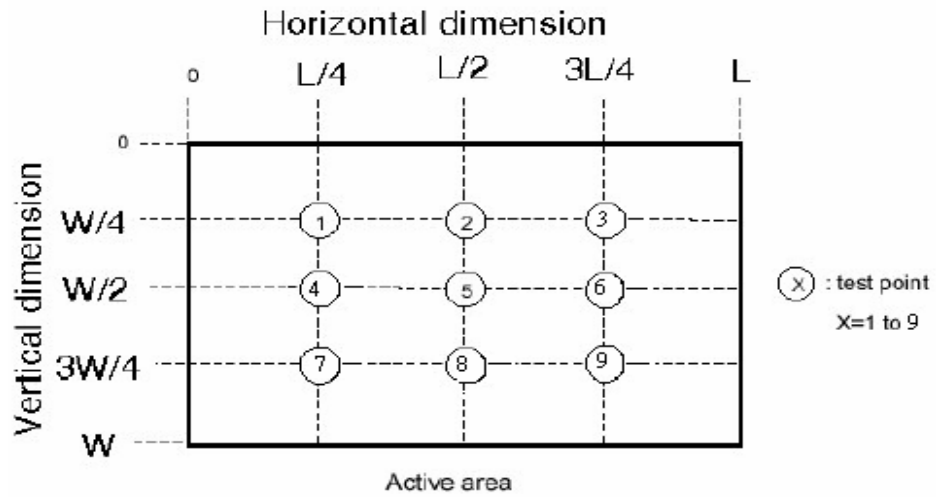
Note (3) Definition of Viewing Angle

* 6 O'clock Gray Scale Inversion Direction



Note (4) Measurement of the following 9 points on the display.

The Brightness should be the average Brightness of point ① ~ ⑨ .



Note (5) Definition of the luminance uniformity .

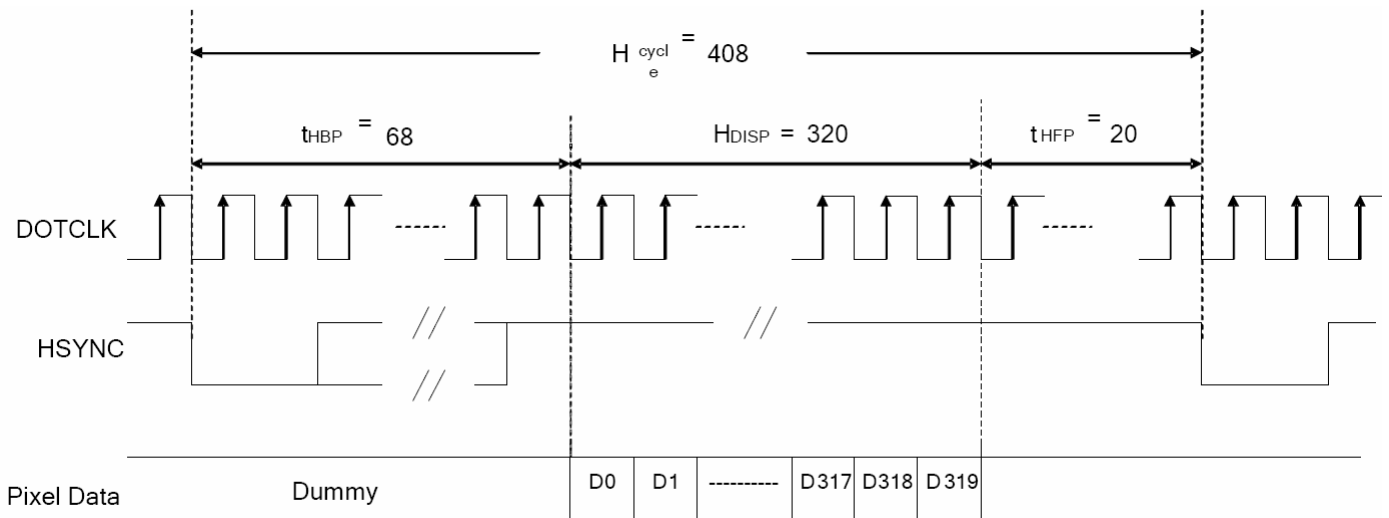
$$\left(1 - \frac{\text{MAX Luminance} - \text{Average Luminance}}{\text{Average Luminance}} \right) \times 100\% \geq 80\%$$

10. AC CHARACTERISTICS

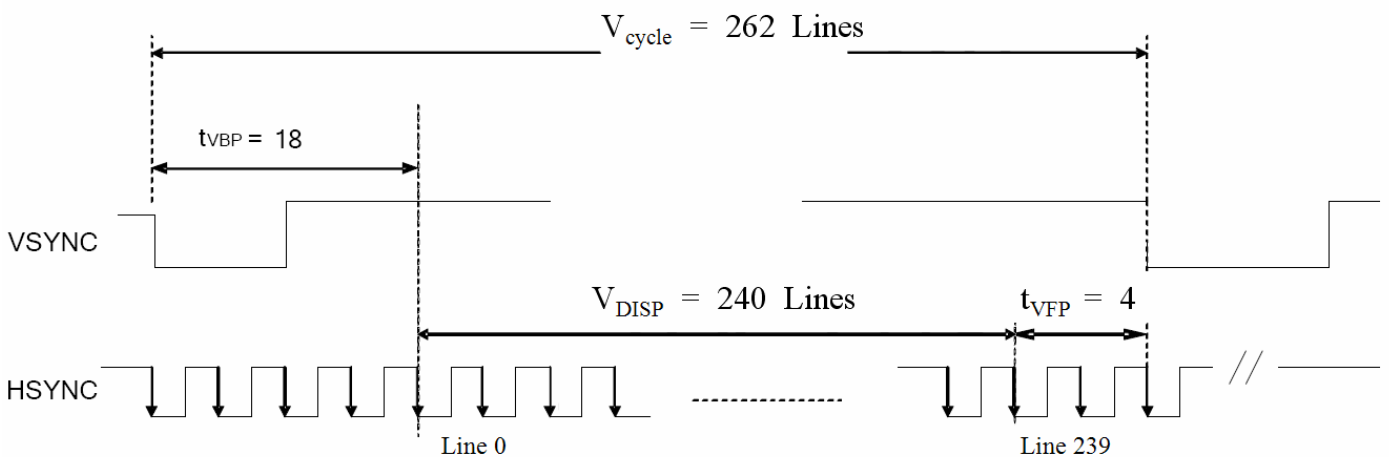
10.1 Timing Requirement

(VCC=2.5V to 3.6V)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
DOTCLK Frequency	f_{DOTCLK}	-	6.5	10	MHz	
DOTCLK Period	t_{DOTCLK}	100	154	-	ns	
Vertical Sync Setup Time	t_{vsys}	20	-	-	ns	
Vertical Sync Hold Time	t_{vsyh}	20	-	-	ns	
Horizontal Sync Setup Time	t_{hsys}	20	-	-	ns	
Horizontal Sync Hold Time	t_{hsyh}	20	-	-	ns	
Phase difference of Sync Signal Falling Edge	t_{hv}	1	-	240	t_{DOTCLK}	
DOTCLK Low Period	t_{CKL}	50	-	-	ns	
DOTCLK High Period	t_{CKH}	50	-	-	ns	
Data Setup Time	t_{ds}	12	-	-	ns	
Data Hold Time	t_{dh}	12	-	-	ns	
Reset Pulse Width	t_{RES}	10	-	-	us	



Horizontal Data Timing

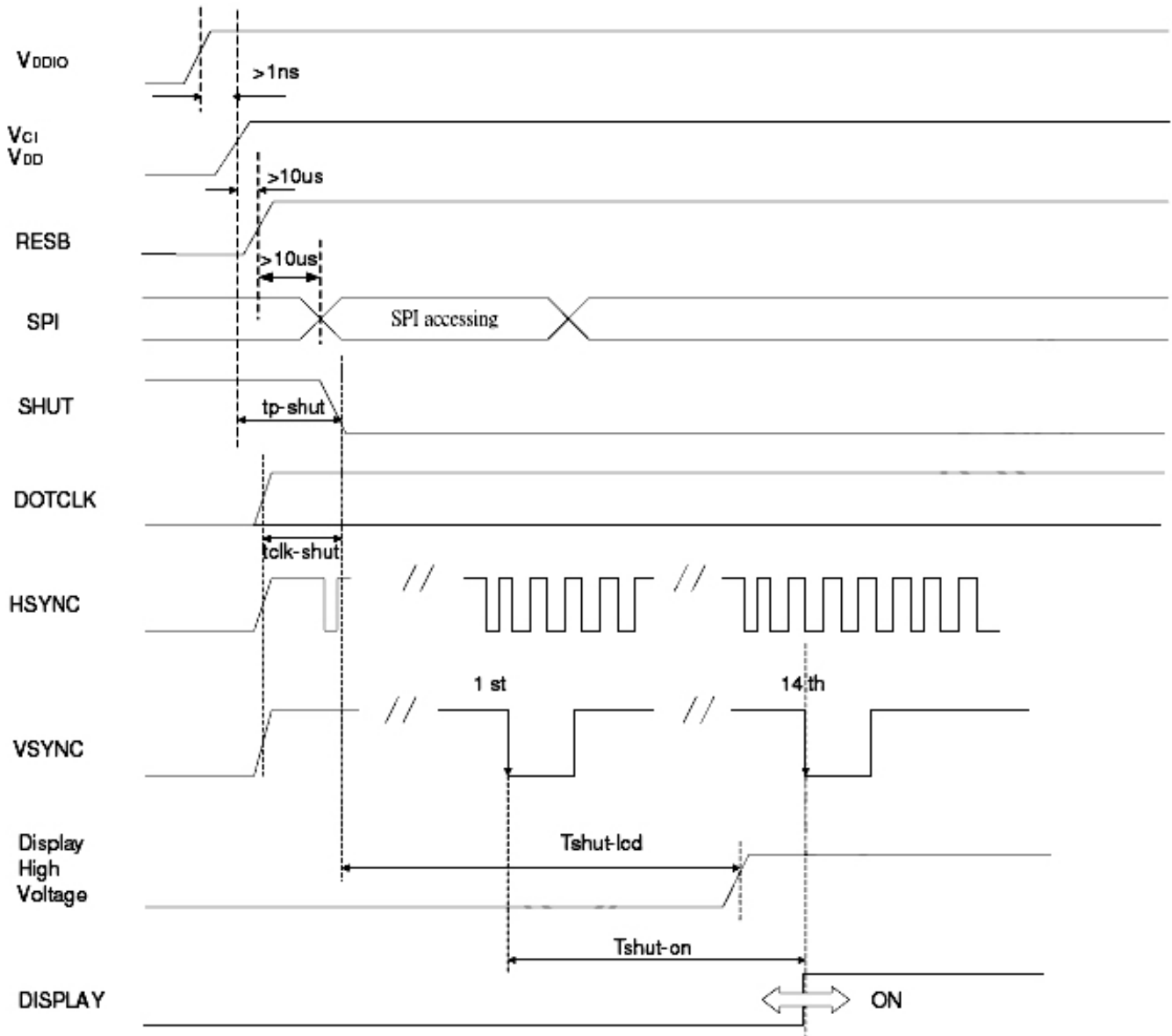


Vertical Data Timing

Data Transaction Timing in Normal Operating Mode

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
DOTCLK Frequency		f_{DOTCLK}	-	6.5	10	MHz	
DOTCLK Period		t_{DOTCLK}	100	154	-	ns	
Horizontal Frequency(Line)		f_{H}	-	14.9	22.35	KHz	
Vertical Frequency(Refresh)		f_{V}	-	60	90	Hz	
Horizontal Back Porch		t_{HBP}	-	68	-	t_{DOTCLK}	
Horizontal Front Porch		t_{HFP}	-	20	-	t_{DOTCLK}	
Horizontal Data Start Point		t_{HBP}	-	68	-	t_{DOTCLK}	
Horizontal Blanking Period		$t_{\text{HBP}}+t_{\text{HFP}}$	-	88	-	t_{DOTCLK}	
Horizontal Display Area		H_{DISP}	-	320	-	t_{DOTCLK}	
Horizontal Cycle		H_{cycle}	-	408	450	t_{DOTCLK}	
Vertical Back Porch		t_{VBP}	-	18	-	Lines	
Vertical Front Porch		t_{VFP}	-	4	-	Lines	
Vertical Data Start Point		t_{VBP}	-	18	-	Lines	
Vertical Blanking Period		$t_{\text{VBP}}+t_{\text{VFP}}$	-	22	-	Lines	
Vertical Display Area	NTSC	V_{DISP}	-	240	-	Lines	
	PAL			288	-		
Vertical Cycle	NTSC	V_{cycle}	-	262	350	Lines	
	PAL			313			

10.2 Power Sequence



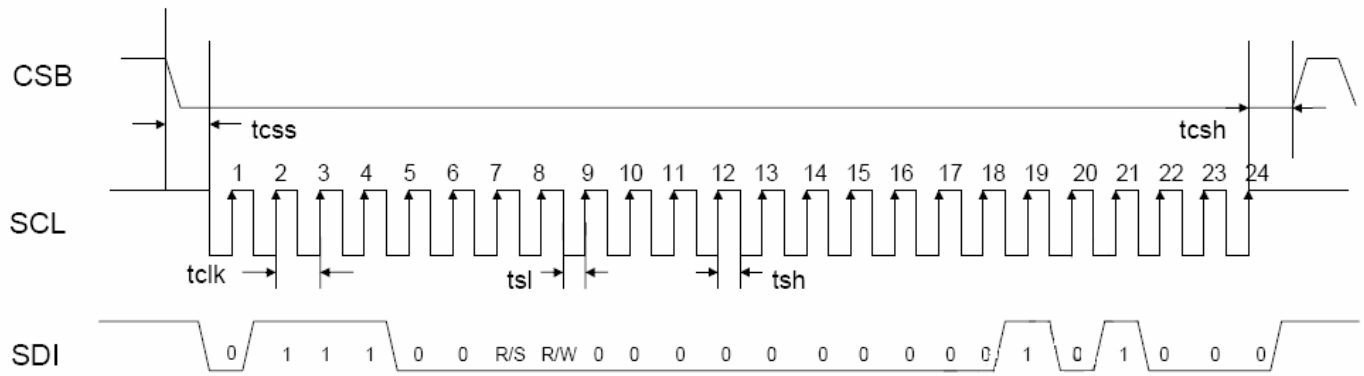
$V_{DDIO}=V_{CI}=V_{DD}=V_{CC}$

SHUT must connect to GND for normal operating mode

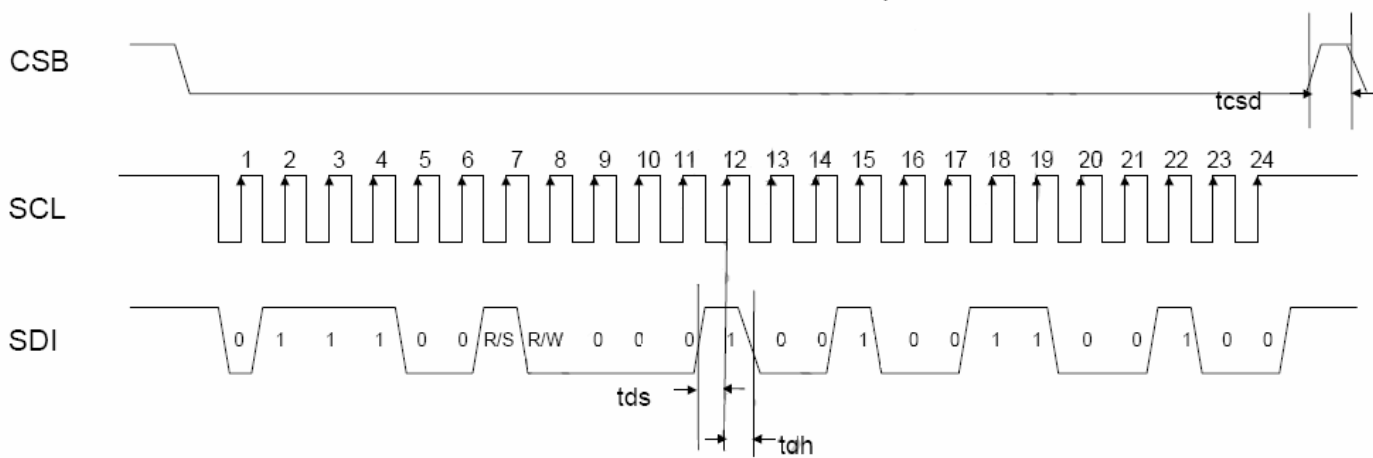
CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNIT
VDDD/VDDIO on to falling edge of SHUT	tp-shut	1	-	-	us
DOTCLK	tclk-shut	1	-	-	clk
Falling edge of SHUT to LCD power ON	tshut-lcd	-	-	128	ms
Falling edge of SHUT to display start	tshut-on	-	-	14	frame
-1 line:408 clk		-	166	232.4	ms
-1frame:262 line		-	166	232.4	ms
-DOTCLK=6.5MHz					

10.3 SPI interface timing diagram & transaction example

First Transmission (Register)



Second Transmission (Data)



CHARACTERISTICS	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
Clock Rising Time	trs	-	-	30	ns
Clock Falling Time	tfl	-	-	30	ns
Chip Select Setup Time	tcss	0	-	-	ns
Chip Select Hold Time	tcsd	10	-	-	ns
Chip Select High Delay Time	tcd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

11. RELIABILITY TEST

Environmental Test				
NO.	ITEM	CONDITIONS	TIME PERIOD	REMARK
1	High Temperature Storage	80°C	240HRS	
2	Low Temperature Storage	-30°C	240HRS	
3	High Temperature Humidity Operation	60°C/90%RH	240HRS	NOTE(2)
4	High Temperature Operation	70°C	240HRS	NOTE(2)
5	Low Temperature Operation	-20°C	240HRS	NOTE(2)
6	Temperature Cycle	-30°C ← 25°C → 80°C (30min) (5min) (30min)	100CYCLE	NOTE(2)

NOTE(1) : a. THE MODULE SHOULD WORK PROPERLY

b. BEFORE AND AFTER FUNCTION TEST, THE DIFFERENCE OF CONSUMPTIVE CURRENT. SHOULD BE WITHIN 10%

NOTE(2) : a. THE MODULE SHOULD WORK PROPERLY

b. THE MODLUE WON'T BE DEFORMATIVE, COLOR CHANGEABLE OR BOKEN.

c. THE MODULES CAN'T BE APART.

NOTE(3) : EVALUATION SHOULD BE TESTED AFTER STORAGE AT ROOM

TEMPERATURE FOR 24 HOURS

12. LCM INSPECTION SPECIFICATION

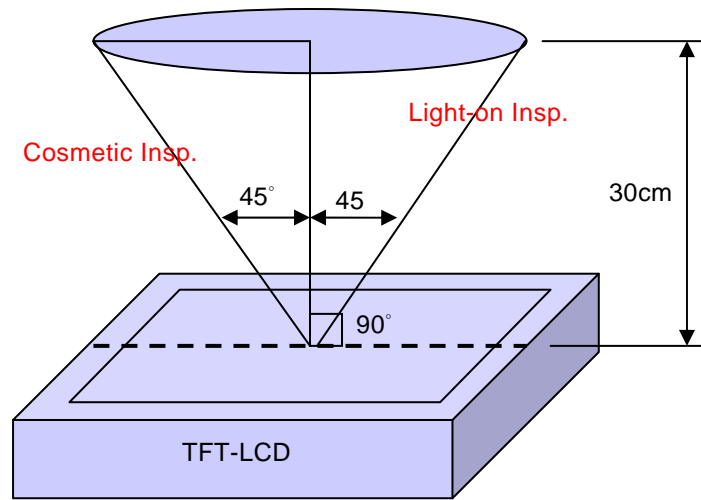
12.1 DESCRIPTION

This document shall be applied to TFT-LCD Module for OT035AQDDDN-06.

12.2 INSPECTION AND ENVIRONMENT CONDITIONS

12.2.1 Inspection Conditions:

- (1) Inspection Distance: 30cm~35cm
- (2) View Angle:
 - Light-on Inspection Angle : 45°
 - Cosmetic Inspection Angle : 45°



(perpendicular to LCD panel surface)

12.2.2 Environment Conditions:

Ambient Temperature		23±5°C
Ambient Humidity		50±20%RH
Ambient Illumination	Cosmetic Inspection	300~500Lux
	Functional Inspection	300~500Lux

12.2.3 Sampling Conditions:

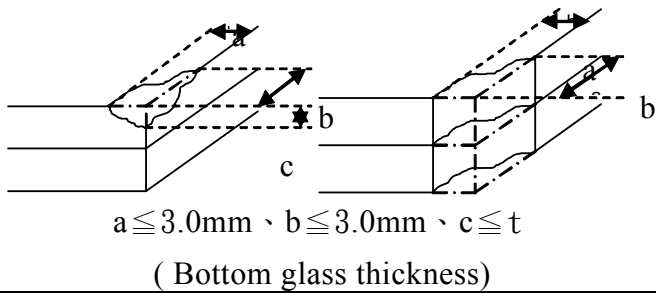
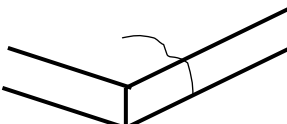
- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	0.25%
	Minor Defect	0.65%

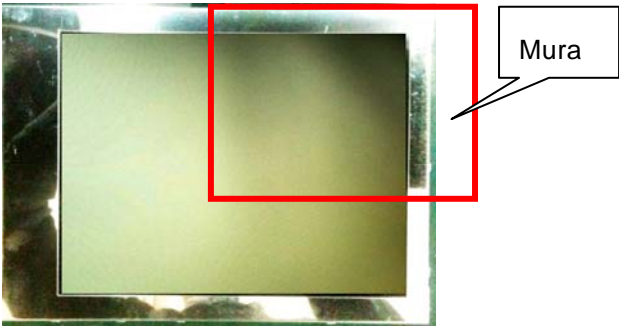
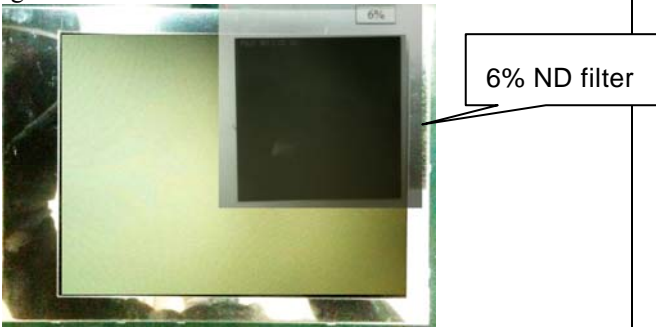
- (3) The classification of Major(MA) and Minor(MI) defects is shown as 4. Inspection Criteria.

12.3 INSPECTION CRITERIA

12.3.1 Cosmetic Inspection (Panel):

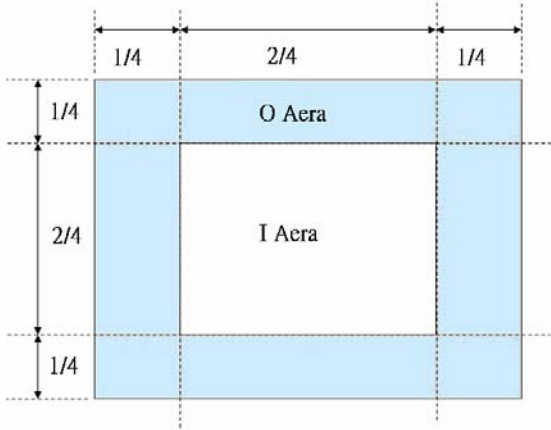
ITEM	JUDGMENT CRITERIA	CLASSIFICATION
Chipping on Panel/Touch Panel	 <p>$a \leq 3.0\text{mm}$、$b \leq 3.0\text{mm}$、$c \leq t$ (Bottom glass thickness)</p>	MA
Scratch on Panel/Touch Panel *Note-2	$W \leq 0.03\text{mm}$: Ignored $0.03\text{mm} < W \leq 0.05\text{mm}$ and $L \leq 3.0\text{mm}$: $N \leq 4$ $0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 2.0\text{mm}$: $N \leq 2$ $W > 0.1\text{mm}$: Not allowed	MI
Bubble or Dent on Panel/Touch Panel *Note-3	$D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.3\text{mm}$: $N \leq 2$ $D > 0.3\text{mm}$: Not allowed	MI
Panel/Touch Panel Crack	 <p>Not Allowed crack</p>	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	$L \leq 20\text{mm}$, $W \leq 0.3 \text{ mm}$, $N \leq 7$	MI
Metal Squash Dent /Flange(Front Side)	$D(W) \leq 1 \text{ mm}$, $L \leq 3$, $N \leq 4$;	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

12.3.2 Functional Inspection:

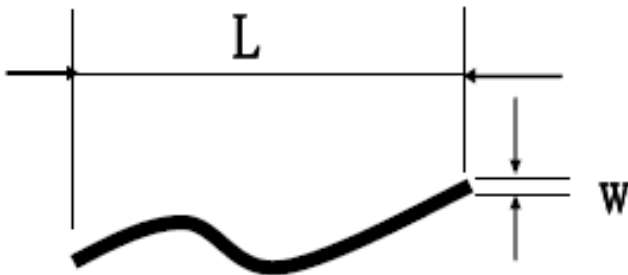
ITEM	JUDGMENT CRITERIA			CLASSIFICATION
Point Defect	Bright dot	Random	2	MI
		2 dots adjacent	1	
		3 dots adjacent or more	0	
	Dark dot	Random	3	
		2 dots adjacent	2	
		3 dots adjacent or more	0	
	Total Dot Defect	4		
Distance	Distance between Bright and Bright dot	$L \geq 5\text{mm}$		
	Distance between Bright and Dark dot	$L \geq 5\text{mm}$		
	Distance between Dark dot	$L \geq 5\text{mm}$		
Line Defect	Obvious vertical or horizontal line defect is not allowed.			MA
Mura	1. Mura Definition: Under the normal examination angle of view, the picture has the non-uniform phenomenon.			MI
				
	2. Weak defect will be defined as Mura if it can be Observed through ND filter 6%			
				
Foreign Material in spot shape	$D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.3\text{mm}$: $N \leq 4$, $0.3\text{mm} < D \leq 0.5\text{mm}$: $N \leq 3$ $D > 0.5\text{mm}$: Not allowed			MI
Foreign Material in line or spiral shape	$W \leq 0.03\text{mm}$: Ignored $0.03\text{mm} < W \leq 0.05\text{mm}$ and $L \leq 3.0\text{mm}$: $N \leq 4$ $0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 2.0\text{mm}$: $N \leq 2$ $W > 0.1\text{mm}$ Not allowed			MI

ITEM	JUDGMENT CRITERIA	CLASSIFICATION
Display Function Abnormal	No Malfunction can be allowed	MA
Touch panel Malfunction	No Malfunction can be allowed in AA area.	MA

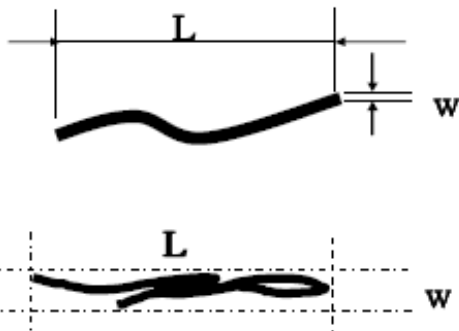
Note 1 : I/O Area Definition



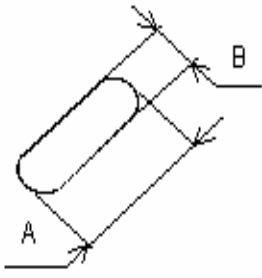
Note 2 : Polarizer Scratch



Note 3 : Line or Spiral Foreign Material

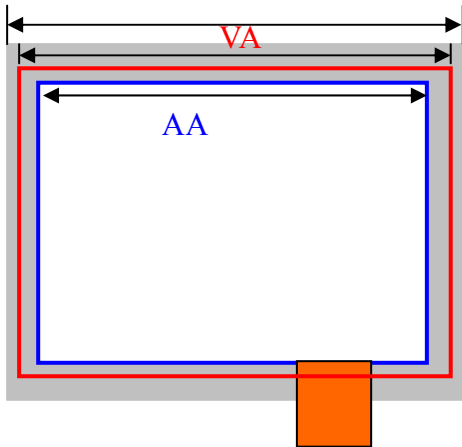


Note 4 : Spot Foreign Material

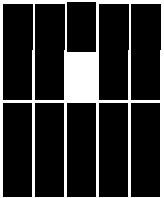


$$D = \frac{A+B}{2}$$

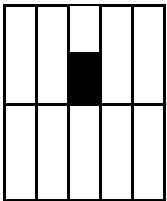
Note 5 : TP Inspection Area Definition



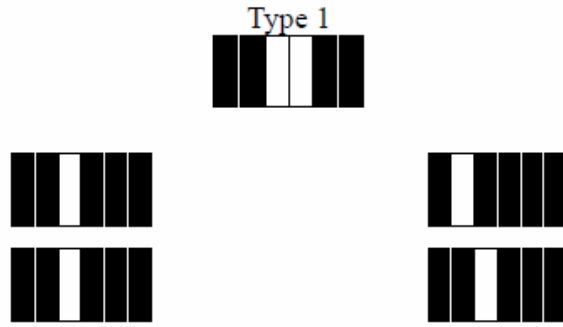
Note 6 :Bright dot defect description:



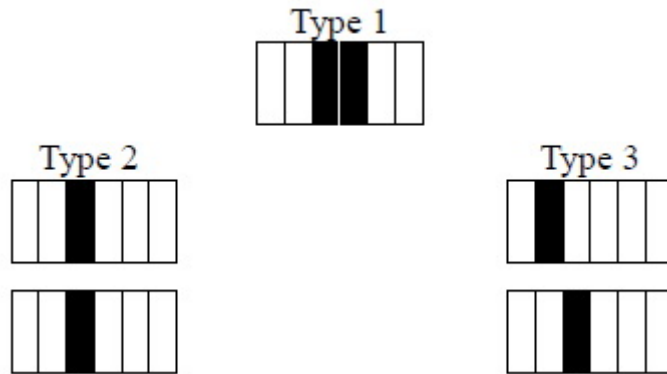
Note 7 : Dark dot defect description:



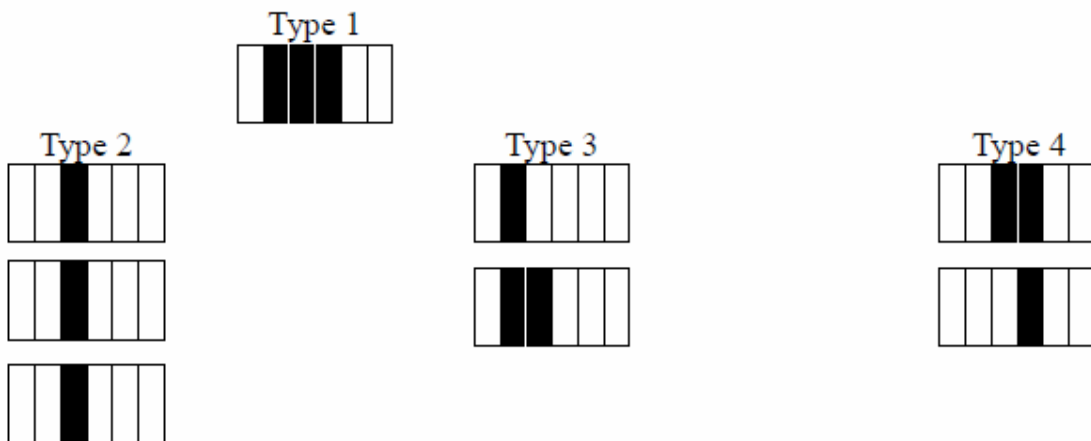
Note 8 : Bright dot defect description- Two adjacent.



Note 9 : Dark dot defect description- Two adjacent.

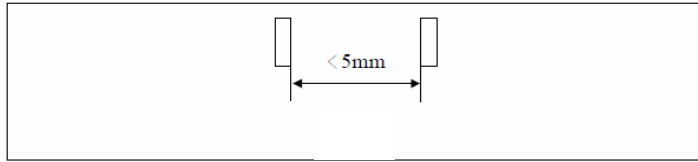


Note 10 : Dark dot defect description- Three adjacent.

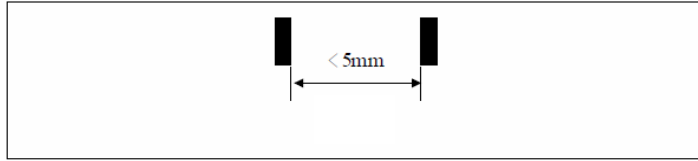


Note 11 : Minimum distance between dot defects

Bright dot to bright dot.



Dark dot to dark dot



Bright dot to dark dot

