

TFT-DISPLAY DATASHEET

ONation
Model: OT050BGDDDT-00

BRIEF SPEC.:

Main Feature	Landscape Type White LED Backlight
Active Screen Area	108 x 64.8 (mm)
Diagonal Format	4.3 " 15:9
Resolution	800 x 480
Colors	16,7M (8-bit)
Backlight	LED
Brightness	300 cd/m ²
LED Life Time	20,000 h
Interface	TTL
Viewing Angle	-60~70(H), -40~50(V)
Touchscreen	no
Power Supply	3,3V (Typ.)
Module Outline	113,5 x 73 x 6,5 Typ (mm)
Operation Temperature	-10... +60 °C
Storage Temperature	-20... +70 °C
Surface Treatment	N/A



ONation Corporation

TFT COLOR LCD MODULE

MODEL: OT050BGDDDT-00

WVGA
TTL interface
CTP I2C interface

Version: P0.3

Customer : _____
Approved By : _____
Date: _____

ONATION		
APPROVAL	CHECKER	PREPARE
Ian	Ian	Josh

All information is subject to change without notice.
Please confirm the sales representative before starting to design your system

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1.RECORD OF REVISION

REV	DATE	PAGE	SUMMARY
0.1	2014.08.01	ALL	Preliminary specification was first issued.
0.2	2014.08.15	5	Modify: RST PIN External reset, High is active → External reset, Low is active
0.3	2015.10.14	1	2.MECHANICAL SPECIFICATIONS (15)Module Weight(g): TBD ± 5%→88± 5%
		2	Modify: 3. OUTLINE DIMENSIONS

2.MECHANICAL SPECIFICATIONS

(1)	Number Of Dots (Dots)	800(R.G.B) X 480
(2)	Module Size(mm)	120.7(H) X 76.3(V) X 4.95(D)
(3)	Active Area(mm)	108(H) X 64.8(V)
(4)	Pixel Pitch(mm)	0.135 (H) X 0.135(V)
(5)	LCD / Polarizer Model	TFT , Transmissive, Normally/ White
(6)	Backlight Color	White, LED
(7)	Viewing Direction	12 O'clock Horizontal : Right side 70°(typ.), Left side 70°(typ.) Vertical : Up side 50°(typ.), Down side 70°(typ.)
(8)	Gray Scale Inversion Direction	6 O'clock
(9)	Electrical Interface	TTL Interface
(10)	CTP Interface	I2C Interface
(11)	CTP Controller IC	FT6306DMP
(12)	CTP Sensing	2 points
(13)	Surface Hardness	6H
(14)	Color Configuration	R.G.B Stripe
(15)	Module Weight(g)	88±5%

4. INTERFACE PIN CONNECTION

4.1 LCM PANEL DRIVING SECTION

The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

PIN NO.	SIGNAL	FUNCTION	REMARK
1	LED +	LED Anode	
2	LED +	LED Anode	
3	LED -	LED Cathode	
4	LED -	LED Cathode	
5	GND	Power ground	
6	VCOM	Common voltage	
7	DVDD	Power for Digital circuit	
8	MODE	DE/SYNC mode select	Note 1
9	DE	Data Input Enable	
10	VS	Vertical Sync Input	
11	HS	Horizontal Sync Input	
12	B7	Blue data(MSB)	
13	B6	Blue data	
14	B5	Blue data	
15	B4	Blue data	
16	B3	Blue data	
17	B2	Blue data	
18	B1	Blue data	Note 2
19	B0	Blue data(LSB)	Note 2
20	G7	Green data (MSB)	
21	G6	Green data	
22	G5	Green data	
23	G4	Green data	
24	G3	Green data	
25	G2	Green data	
26	G1	Green data	Note 2
27	G0	Green data (LSB)	Note 2
28	R7	Red data (MSB)	
29	R6	Red data	
30	R5	Red data	
31	R4	Red data	
32	R3	Red data	
33	R2	Red data	
34	R1	Red data	Note 2
35	R0	Red data (LSB)	Note 2
36	GND	Power ground	

PIN NO.	SIGNAL	FUNCTION	REMARK
37	DCLK	Sample clock	Note 3
38	GND	Power ground	
39	L/R	Right/ left selection	Note 4,5
40	U/D	Up/down selection	Note 4,5
41	VGH	Gate ON voltage	
42	VGL	Gate OFF voltage	
43	AVDD	Power for Analog circuit	
44	RESET	Global reset pin	Note 6
45	NC	No connection	
46	VCOM	Common voltage	
47	DITHB	Dithering function	Note 7
48	GND	Power ground	
49	NC	No connection	
50	NC	No connection	

Note 1: DE/SYNC mode select. Normally pull high.
 When select DE mode, MODE="1", VS and HS must pull high.
 When select SYNC mode, MODE="0", DE must be grounded.

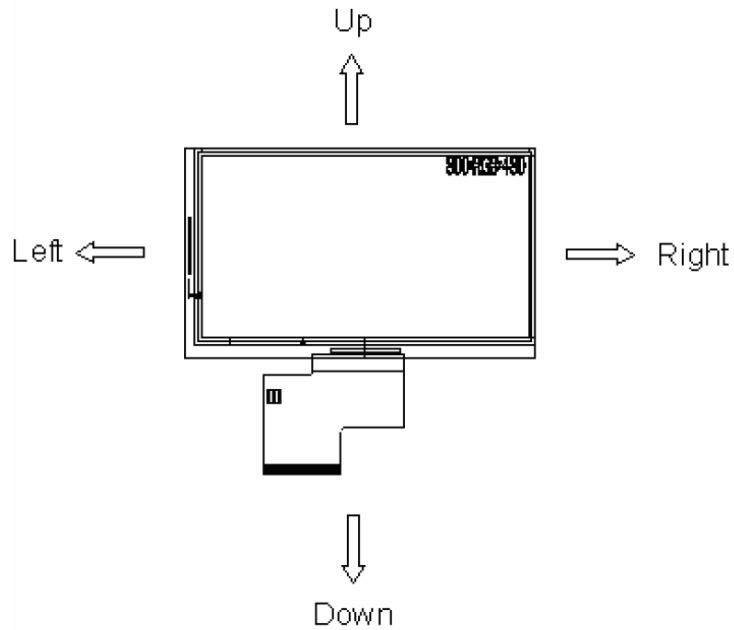
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

SETTING OF SCAN CONTROL INPUT		SCANNING DIRECTION
U/D	R/L	
GND	DVDD	Up to down, left to right
DVDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
DVDD	DVDD	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

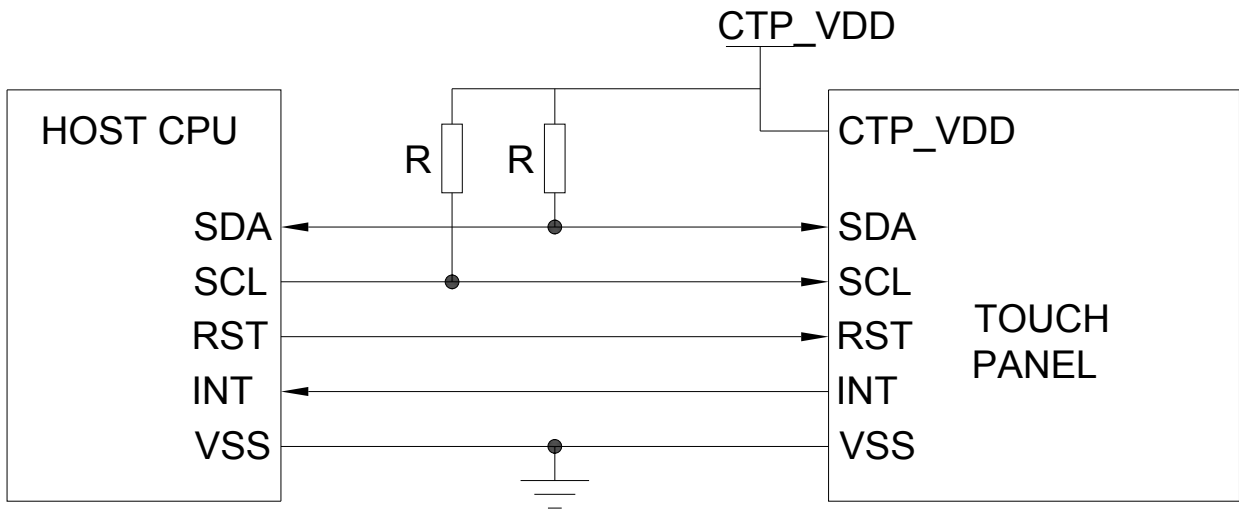
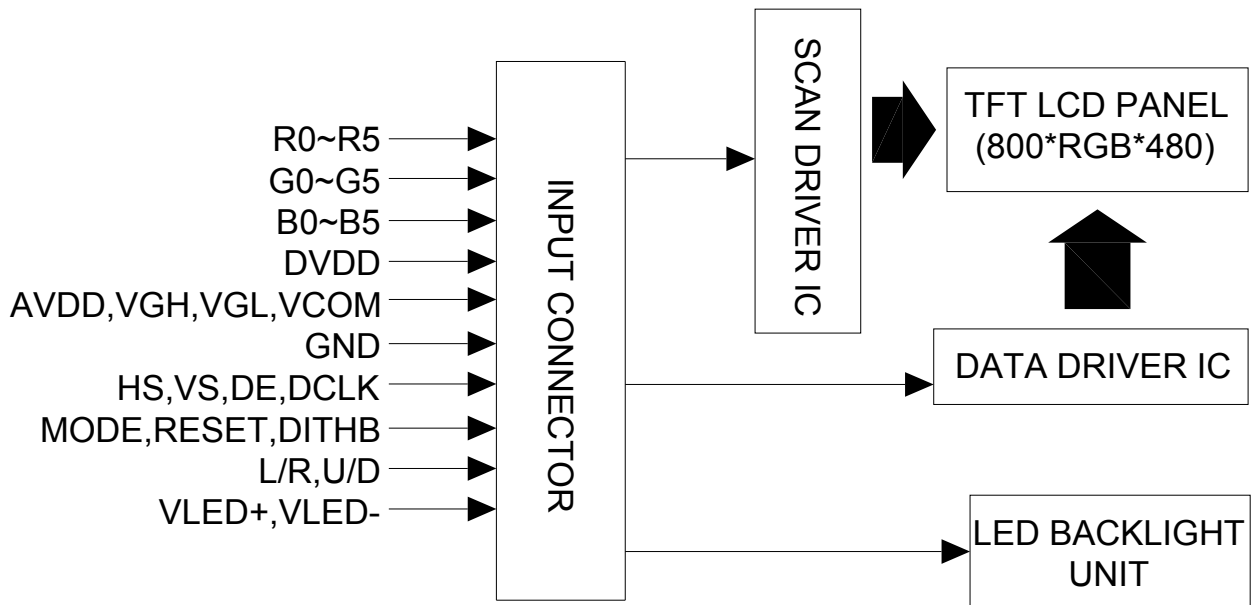
Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

4.2 LCM PANEL DRIVING SECTION

The recommended model is FH12A-05S-0.5SH manufactured by Hirose

PIN NO.	SIGNAL	FUNCTION	REMARK
1	GND	Ground	
2	INT	External interrupt to the host	
3	SDA	Serial Data	
4	SCL	Serial Clock	
5	RST	External reset, Low is active	
6	CTP_VDD	CTP Supply voltage	

5. BLOCK DIAGRAM



6. ABSOLUTE MAXIMUM RATINGS

6.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Voltage	DVDD	-0.3	5	V	
	CTP_VDD	-0.3	3.6	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	42	V	
	VGL	-20	0.3	V	
	VGH-VGL	-	40	V	
LED Reverse Voltage	VR	-	3.3	V	
LED Forward Current	IF	-	20	mA	

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

Note 2: VR Conditions: Zener Diode 20mA

6.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature(°C)	-10	60	-20	70	Note 1,2
Humidity(% RH)	20~90		10~90		Note 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 : Storage Ta=40°C & RH=90% ≤ 96Hrs.

7. ELECTRICAL CHARACTERISTICS

7.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C

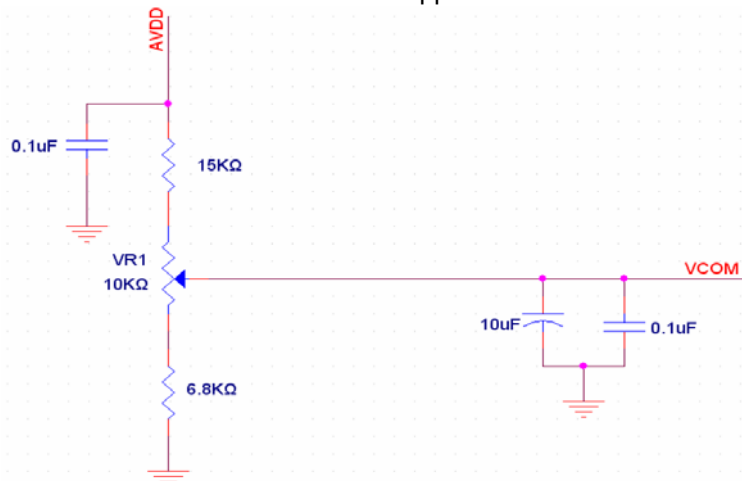
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Power Voltage For LCD	DVDD	3.0	3.3	3.6	V	Note 2
	CTP_VDD	3.0	3.3	3.6	V	
	IDVDD	-	(4.2)	10	mA	
	AVDD	10.2	10.4	10.6	V	
	IAVDD	-	(19)	50	mA	
	VGH	15.3	16.0	16.7	V	
	IGH	-	(0.50)	1	mA	
	VGL	-6.7	-6.0	-5.3	V	
	IGL	-	(0.54)	1	mA	
	VCOM	3.09	4.09	5.09	V	Note 4
	VIH	0.7DVDD	-	DVDD	V	Note 3
	VIL	0	-	0.3DVDD	V	Note 3
Voltage For LED Backlight	VL	19.6	21.7	23.8	V	Note 5
Current For LED Backlight	IL	36	40	44	mA	
LED Life Time	-	20,000	-	-	Hr	Note 6

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical VCOM is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.



Note 5: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL =40mA.

Note 6: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=40\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 40 mA.

8. OPTICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	REMARK
Contrast Ratio	CR	Viewing Normal Angle $\Theta_x=\Theta_y=0^\circ$	400	500	-	-	Note 1
Response Time	TR		-	10	20	ms	Note 2
	TF		-	15	30		
Chromaticity	White	x	0.260	0.310	0.360	-	Note 4
		y	0.280	0.330	0.380	-	
Viewing Angle	Hor.	θ_{x+}	60	70	-	Deg.	Note 3
		θ_{x-}	60	70	-		
	Ver.	θ_{y+}	40	50	-		
		θ_{y-}	60	70	-		
Luminance	L	ILED=40mA	200	240	-	cd/m ²	-
Uniformity	-	-	70	75	-	%	Note 5

Note 1 : Definition of Contrast Ratio (CR) :

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63}/L_0$$

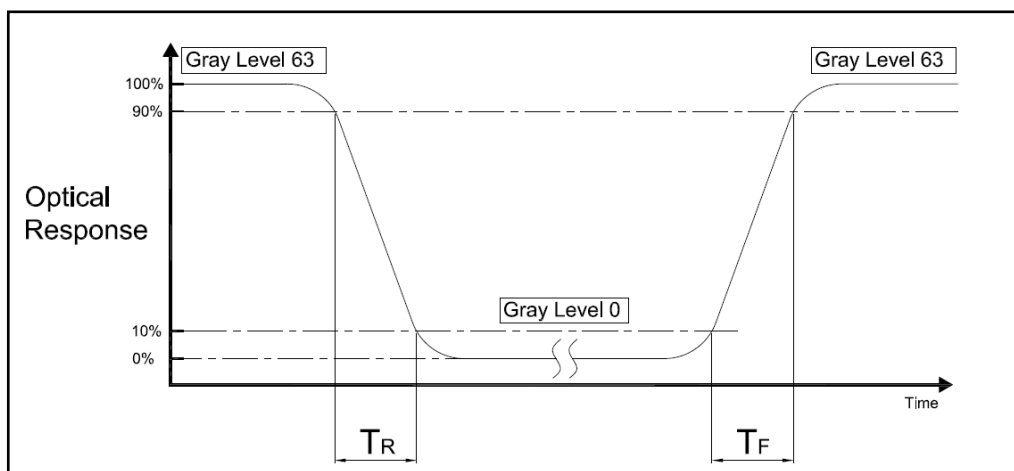
L63 : Luminance of gray level 63

L0 : Luminance of gray level 0

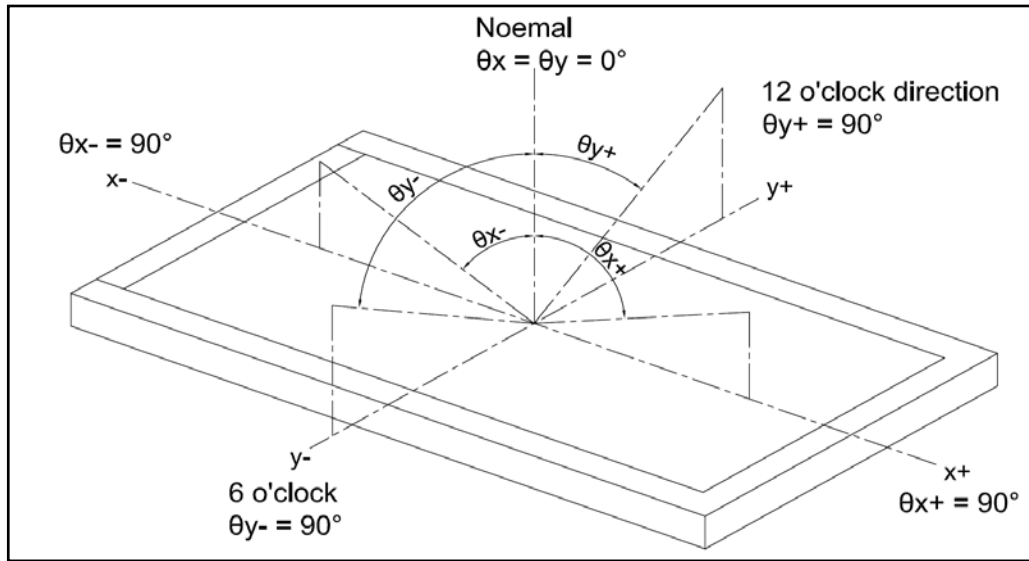
$$CR = CR(5)$$

CR(X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5

Note 2 : Definition of Response Time (TR.TF)

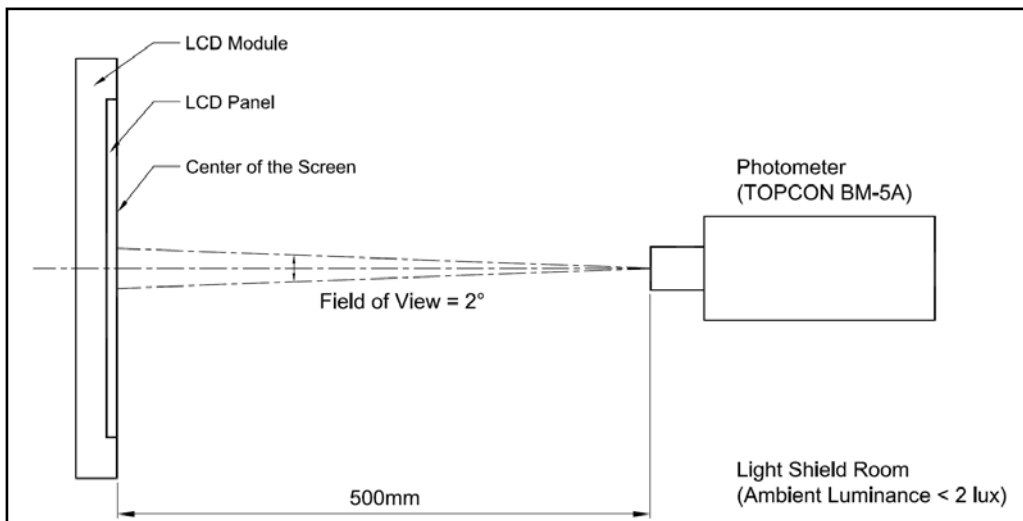


Note 3 : Definition of Viewing Angle

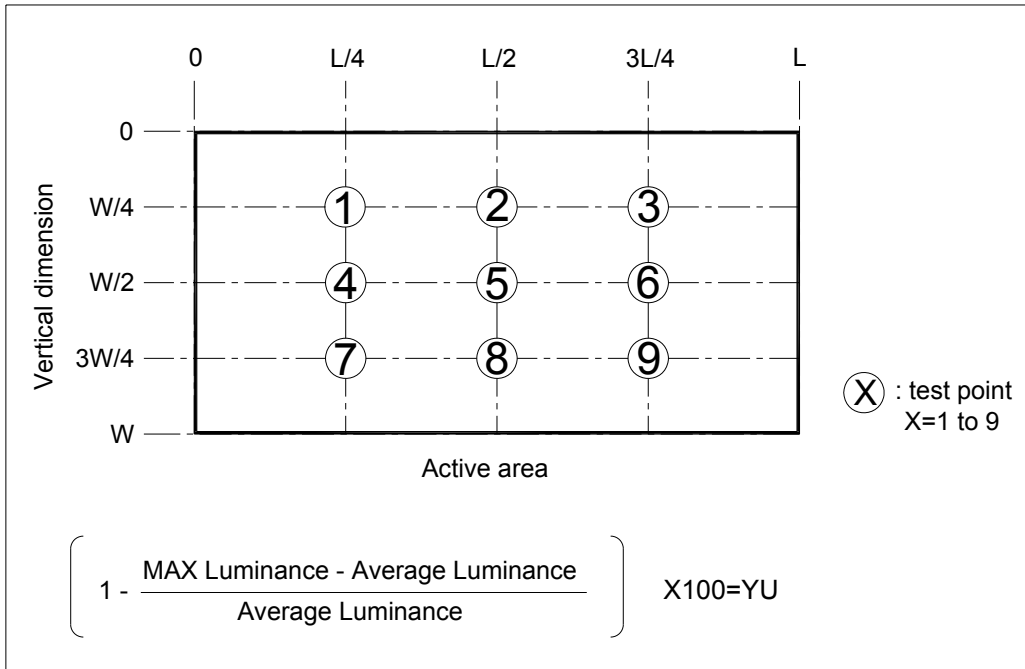


Note 4 : Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note 5 :

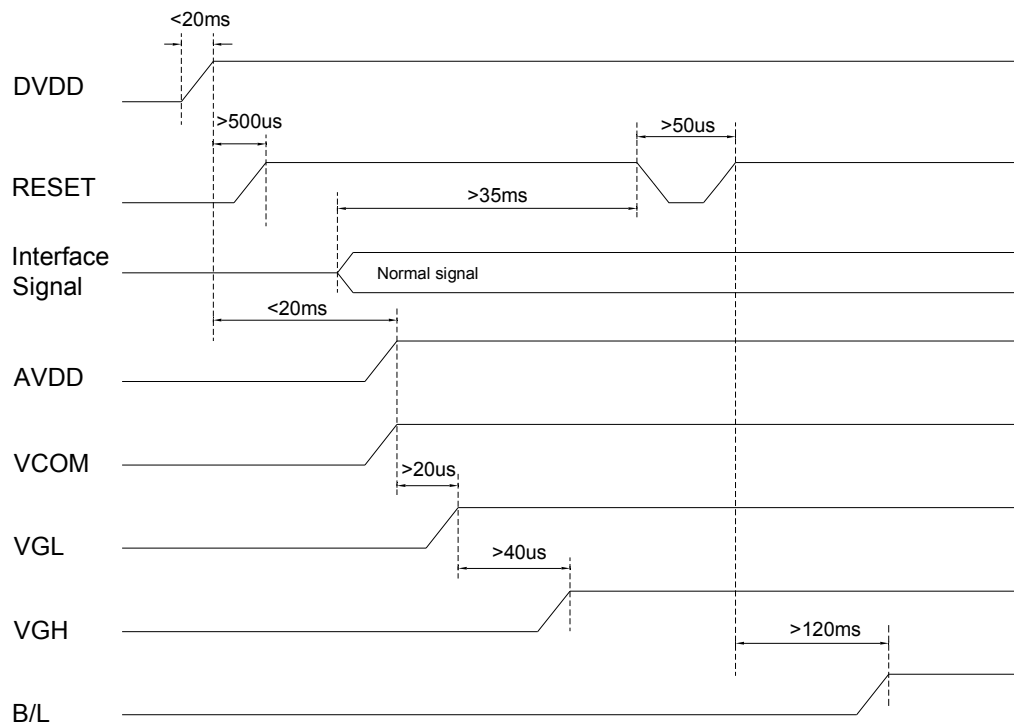


9. TIMING SPECIFICATIONS

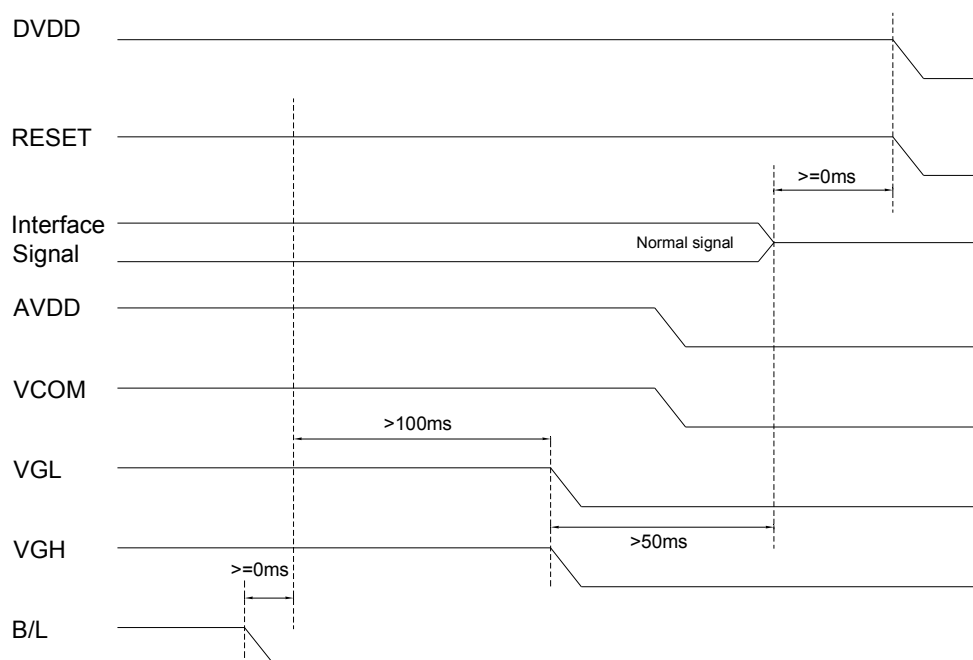
9.1 POWER SIGNAL SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

a. Power on sequence:



b. Power off sequence:

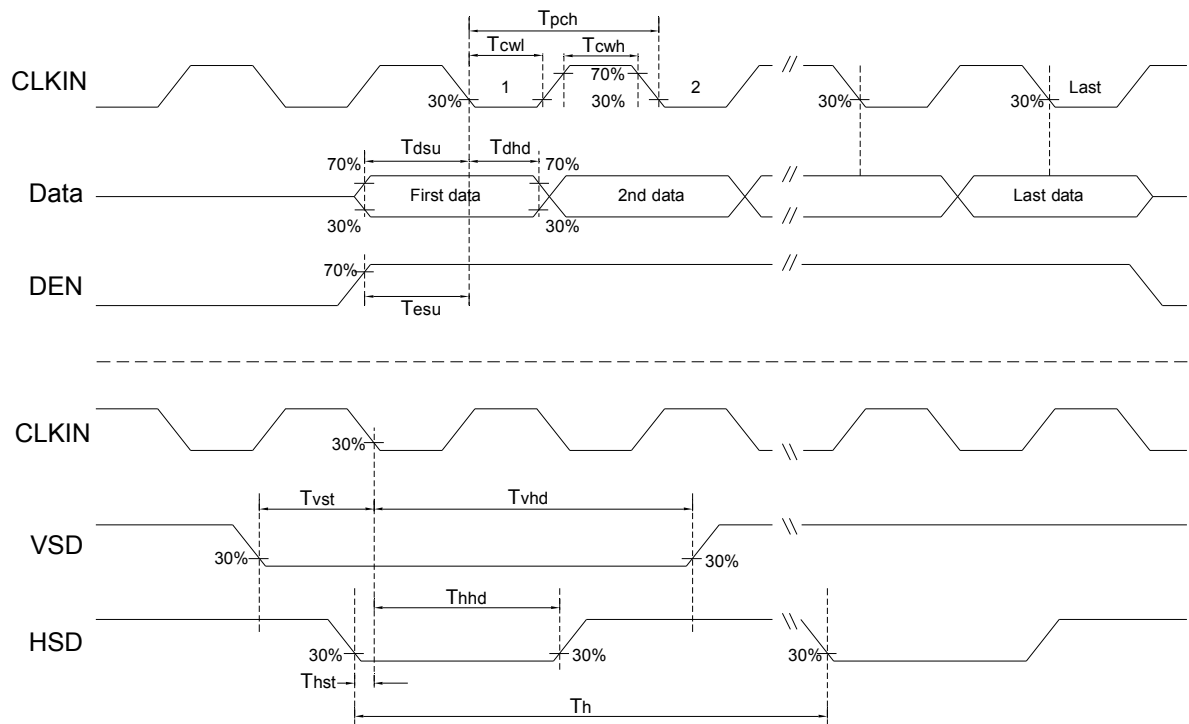


9.2 TIMING CHARACTERISTICS

9.2.1. Timing Conditions

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	-	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DVDD Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DVDD
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{coh}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

10.2.2. Timing Diagram

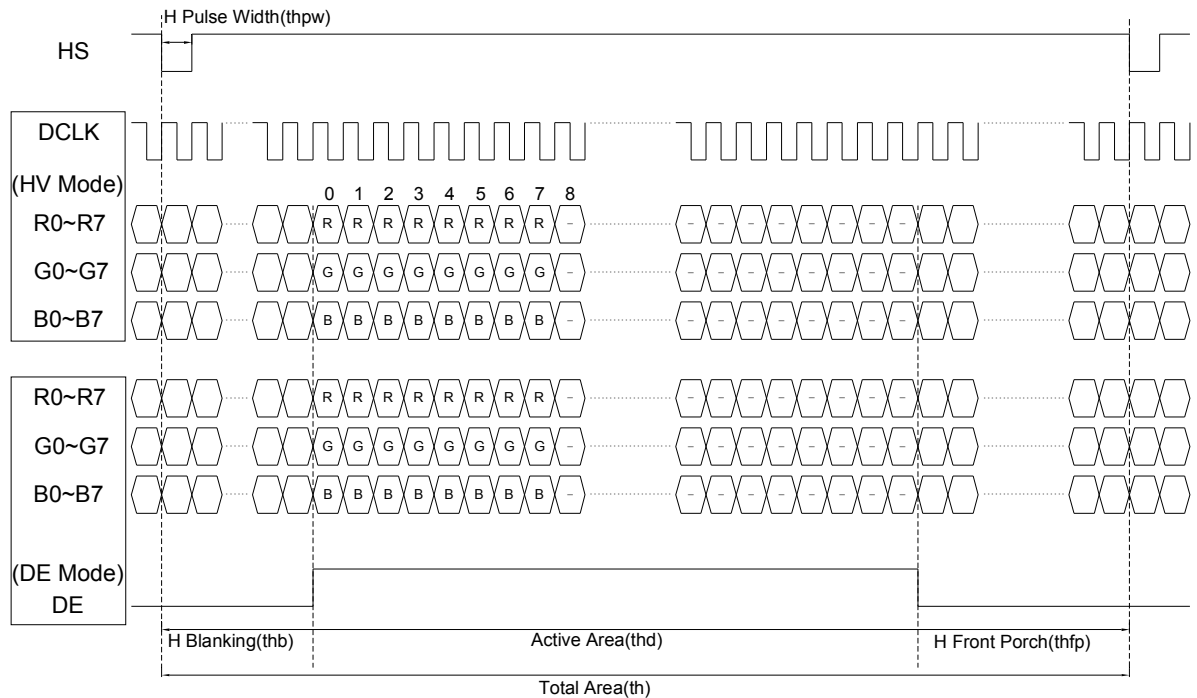


10.2.3. Timing

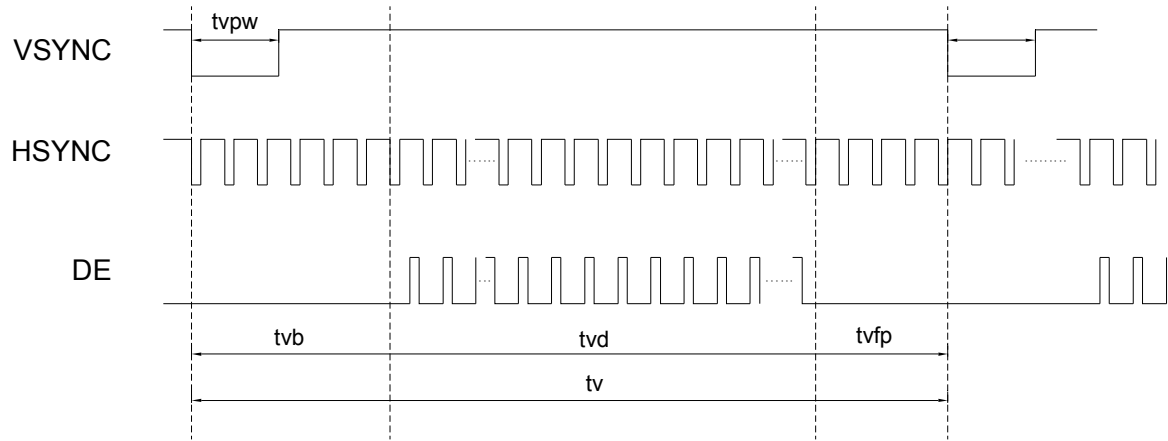
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

10.2.4. Data Input Format



Horizontal input timing diagram



Vertical input timing diagram

10. RELIABILITY TEST

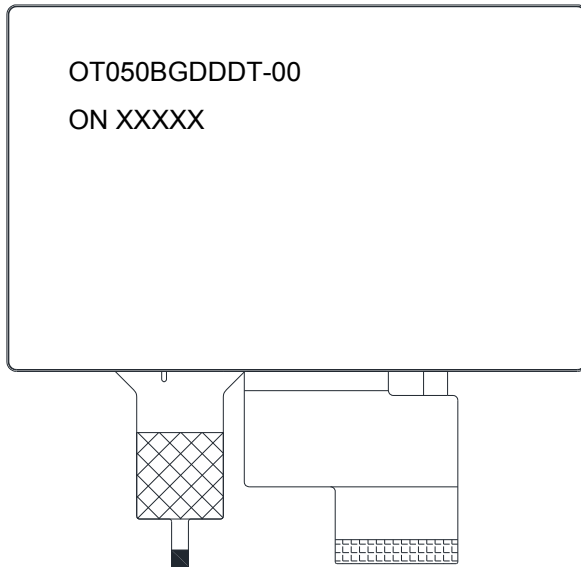
ENVIRONMENTAL TEST				
NO.	ITEM	CONDITIONS	TIME PERIOD	REMARK
1	High Temperature Storage	(60)°C	96HRS	
2	Low Temperature Storage	(-20)°C	96HRS	
3	High Temperature Operation	(50)°C	96HRS	
4	Low Temperature Operation	(-10)°C	96HRS	
5	Temperature Cycle	-20°C → 60°C (30min) (30min)	20CYCLE	
6	High Temperature Humidity Storage	40°C 90%RH (No condensation)	96HRS	

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 broken.
 c. The modules can't be apart.

Note 3: a. Before cosmetic and function test, The product must have enough recovery time, At least 24 hours at room temperature.

11.MODEL NUMBER SYSTEM



(a) MODEL NAME : OT050BGDDDT-00

(b) LOT NO : XX XX X

CODE	MEANING	DESCRIPTION
<u>XX</u>	Year	2014=14, 2015=15,
<u>XX</u>	Month	01,02,03,04,05,06,07,08,09,10,11,12
<u>X</u>	Week	1,2,3,4,5,6

12. LCM INSPECTION STANDARD

Inspection specifications refer ONation Corporation LCM INSPECTION STANDARD Document.
Document Number : QT3-QC-A-I002

13. PACKAGE INFORMATION

LCM MODEL	LCM QTY. IN THE BOX	INNER BOX SIZE (mm)	WEIGHT	REMARK
OT050BGDDDT-00	TBD	TBD	TBD	

14.PRECAUTIONS FOR USE

14.1 SAFETY

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

14.2 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\%\text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.

14.3 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) When the module is assembled, it should be attached to the system firmly, Be careful not to twist and bend the module.
- (10) Wipe off water droplets or oil immediately . If you leave the droplets for a long time, staining and discoloration may occur.
- (11) 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.

14.4 WARRANTY

- (1) Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- (2) Applicable warrant period
The period is within 12 months since the date of shipping out under normal using and storage conditions.