

To : FOXLINK

BOE

REQ. DATE.

REF. NO.

Product Specification

Your Application Model Name : QF4307W

APPROVED BY : _____

DATE : _____

NO.	PART ON.	DESCRIPTION	REMARKS
1	BTL434880-W548L	TFT LCD Module (480 (x RGB) x 800Dots)	*24 Bits Data Bus(RGB I/F) *LDI:NT35510 *This model uses ROHS materials. *4.3"WVGA TFT LCM

CONFIRMED BY QA

PREPARED BY _____

CHECKED BY _____

CONFIRMED BY _____

BOE HYUNDAI LCD Inc.

PAGE 1 OF 30

* Records of Revision *

Rev.	Page	Description of changes	Date	prepared by
0	All	Original Release	12.01.05	Jin Mei Ling

一般事项 特殊事项

特殊事项内容:

* Contents *

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1. Features

The features of BTL434880-W548L are as follows

- * Display mode : TFT 16.7M Colors, Transmissive, Normally Black
- * Driving Condition : 480x3Ch-Source / 800Ch-Gate
- * Connection :ZIF Type
- * LCD Driver & Control IC
:NT35510(NOVATEK)
- * Back Light : White LED Back Light (8 Chips 4*2)
- * MPU Interface : 18、24bits RGB interface
- * Type of Surface Condition
:Clear Type

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2. Mechanical Specifications

Item		Specification	Unit
Resolution	Main	480(x RGB) x 800	Dot
	Sub	NA	
LCM Outline Dimension		61.06x104.25x2.08(Typ)	mm
Active Area (W × H)	Main	56.16(H)X 93.6(V)	mm
	Sub	NA	
Pixel Pitch (W x H)	Main	0.039 x 0.117	mm
	Sub	NA	
Viewing Direction (Human Eye)	Main	Wide View	O'clock
	Sub	NA	
Gray Scale Inversion Direction (Contrast Ratio)	Main	Wide View	O'clock (Rubbing Direction)
	Sub	NA	
Weight		TBD	g

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3. Absolute Maximum Ratings

(Ta=25°C Note1)

Items	Symbol	Min.	Max.	Unit	Remark
Logic voltage	I_{OVCC}	-0.3	3.3	V	
Analog voltage	V_{CC}	-0.3	4.6	V	
Input signal voltage	V_{IN}	-0.3	$I_{OVCC}+0.5$	V	
LED forward current	I_{LED}	-	25	mA	For each LED
Operation temperature	T_{OPR}	-20	70	°C	
Storage temperature	T_{STG}	-30	80	°C	
Humidity (ambient)	$T_a \leq 60^\circ\text{C}$		90% RH Max.		

Note1 : Device is subject to be damaged permanently,
if stresses beyond those absolute maximum ratings listed above.

4. Electrical Characteristics

Main		Ta=25°C					Remark
Items	Symbol	Min.	Typ.	Max.	Unit	Remark	
Logic voltage	IOVCC	1.65	1.8	3.3	V		
Analog(Power) voltage	VCC	2.72	2.8	2.88	V		
Gate voltage	High level	V_{GH}	12	-	18	V	Note 1
	Low level	V_{GL}	-6	-	-13.5	V	
Input signal voltage	High level	V_{IH}	0.7*VDDI	-	VDDI	V	
	Low level	V_{IL}	VSS	-	0.3*VCC	V	
current consumption	I_{CC}	-	30	45	mA	Note 2	
sleep current	I_S	-	25	32	uA		

Note 1) The value can be adjusted by software to optimize display quality

Note 2) Display Black Pattern

5. Recommended Software Setting Value (LDI: NT35510)

<p>#Enable Page1 REGW 0xF000,0x55 REGW 0xF001,0xAA REGW 0xF002,0x52 REGW 0xF003,0x08 REGW 0xF004,0x01</p> <p># AVDD: manual, REGW 0xB600,0x34 REGW 0xB601,0x34 REGW 0xB602,0x34</p> <p>REGW 0xB000,0x0C REGW 0xB001,0x0C REGW 0xB002,0x0C</p> <p># AVEE: manual, - 5.4V REGW 0xB700,0x34 REGW 0xB701,0x34 REGW 0xB702,0x34</p> <p>REGW 0xB100,0x0D REGW 0xB101,0x0D REGW 0xB102,0x0D</p> <p>#Power Control for VCL REGW 0xB800,0x24 REGW 0xB200,0x00</p> <p># VGH: Clamp Enable, REGW 0xBF00,0x01 REGW 0xB900,0x24 REGW 0xB901,0x24 REGW 0xB902,0x24</p> <p>REGW 0xB300,0x05 REGW 0xB301,0x05 REGW 0xB302,0x05</p> <p># VGL(LVGL): REGW 0xBA00,0x34 REGW 0xBA01,0x34 REGW 0xBA02,0x34</p> <p># VGL_REG(VGLO) REGW 0xB500,0x0B REGW 0xB501,0x0B REGW 0xB502,0x0B</p> <p># VGMP/VGSP: REGW 0xBC00,0X00 REGW 0xBC01,0x80 REGW 0xBC02,0X00</p>	<p># VGMN/VGSN REGW 0xBD00,0x00 REGW 0xBD01,0x80 REGW 0xBD02,0x00</p> <p># VCOM=-0.1 REGW 0xBE00,0x00 REGW 0xBE01,0x50</p> <p>#R+ REGW 0xD100,0x00 REGW 0xD101,0x37 REGW 0xD102,0x00 REGW 0xD103,0x53 REGW 0xD104,0x00 REGW 0xD105,0x79 REGW 0xD106,0x00 REGW 0xD107,0x97 REGW 0xD108,0x00 REGW 0xD109,0xB1 REGW 0xD10A,0x00 REGW 0xD10B,0xD5 REGW 0xD10C,0x00 REGW 0xD10D,0xF4 REGW 0xD10E,0x01 REGW 0xD10F,0x23 REGW 0xD110,0x01 REGW 0xD111,0x49 REGW 0xD112,0x01 REGW 0xD113,0x87 REGW 0xD114,0x01 REGW 0xD115,0xB6 REGW 0xD116,0x02 REGW 0xD117,0x00 REGW 0xD118,0x02 REGW 0xD119,0x3B REGW 0xD11A,0x02 REGW 0xD11B,0x3D REGW 0xD11C,0x02 REGW 0xD11D,0x75 REGW 0xD11E,0x02 REGW 0xD11F,0xB1 REGW 0xD120,0x02 REGW 0xD121,0xD5 REGW 0xD122,0x03 REGW 0xD123,0x09 REGW 0xD124,0x03 REGW 0xD125,0x28 REGW 0xD126,0x03</p>	<p>REGW 0xD127,0x52 REGW 0xD128,0x03 REGW 0xD129,0x6B REGW 0xD12A,0x03 REGW 0xD12B,0x8D REGW 0xD12C,0x03 REGW 0xD12D,0xA2 REGW 0xD12E,0x03 REGW 0xD12F,0xBB REGW 0xD130,0x03 REGW 0xD131,0xC1 REGW 0xD132,0x03 REGW 0xD133,0xC1</p> <p>#G+ REGW 0xD200,0x00 REGW 0xD201,0x37 REGW 0xD202,0x00 REGW 0xD203,0x53 REGW 0xD204,0x00 REGW 0xD205,0x79 REGW 0xD206,0x00 REGW 0xD207,0x97 REGW 0xD208,0x00 REGW 0xD209,0xB1 REGW 0xD20A,0x00 REGW 0xD20B,0xD5 REGW 0xD20C,0x00 REGW 0xD20D,0xF4 REGW 0xD20E,0x01 REGW 0xD20F,0x23 REGW 0xD210,0x01 REGW 0xD211,0x49 REGW 0xD212,0x01 REGW 0xD213,0x87 REGW 0xD214,0x01 REGW 0xD215,0xB6 REGW 0xD216,0x02 REGW 0xD217,0x00 REGW 0xD218,0x02 REGW 0xD219,0x3B REGW 0xD21A,0x02 REGW 0xD21B,0x3D REGW 0xD21C,0x02 REGW 0xD21D,0x75 REGW 0xD21E,0x02 REGW 0xD21F,0xB1 REGW 0xD220,0x02</p>	<p>REGW 0xD221,0xD5 REGW 0xD222,0x03 REGW 0xD223,0x09 REGW 0xD224,0x03 REGW 0xD225,0x28 REGW 0xD226,0x03 REGW 0xD227,0x52 REGW 0xD228,0x03 REGW 0xD229,0x6B REGW 0xD22A,0x03 REGW 0xD22B,0x8D REGW 0xD22C,0x03 REGW 0xD22D,0xA2 REGW 0xD22E,0x03 REGW 0xD22F,0xBB REGW 0xD230,0x03 REGW 0xD231,0xC1 REGW 0xD232,0x03 REGW 0xD233,0xC1</p> <p>#B+ REGW 0xD300,0x00 REGW 0xD301,0x37 REGW 0xD302,0x00 REGW 0xD303,0x53 REGW 0xD304,0x00 REGW 0xD305,0x79 REGW 0xD306,0x00 REGW 0xD307,0x97 REGW 0xD308,0x00 REGW 0xD309,0xB1 REGW 0xD30A,0x00 REGW 0xD30B,0xD5 REGW 0xD30C,0x00 REGW 0xD30D,0xF4 REGW 0xD30E,0x01 REGW 0xD30F,0x23 REGW 0xD310,0x01 REGW 0xD311,0x49 REGW 0xD312,0x01 REGW 0xD313,0x87 REGW 0xD314,0x01 REGW 0xD315,0xB6 REGW 0xD316,0x02 REGW 0xD317,0x00 REGW 0xD318,0x02 REGW 0xD319,0x3B REGW 0xD31A,0x02</p>	<p>REGW 0xD31B,0x3D REGW 0xD31C,0x02 REGW 0xD31D,0x75 REGW 0xD31E,0x02 REGW 0xD31F,0xB1 REGW 0xD320,0x02 REGW 0xD321,0xD5 REGW 0xD322,0x03 REGW 0xD323,0x09 REGW 0xD324,0x03 REGW 0xD325,0x28 REGW 0xD326,0x03 REGW 0xD327,0x52 REGW 0xD328,0x03 REGW 0xD329,0x6B REGW 0xD32A,0x03 REGW 0xD32B,0x8D REGW 0xD32C,0x03 REGW 0xD32D,0xA2 REGW 0xD32E,0x03 REGW 0xD32F,0xBB REGW 0xD330,0x03 REGW 0xD331,0xC1 REGW 0xD332,0x03 REGW 0xD333,0xC1</p> <p>#R- REGW 0xD400,0x00 REGW 0xD401,0x37 REGW 0xD402,0x00 REGW 0xD403,0x53 REGW 0xD404,0x00 REGW 0xD405,0x79 REGW 0xD406,0x00 REGW 0xD407,0x97 REGW 0xD408,0x00 REGW 0xD409,0xB1 REGW 0xD40A,0x00 REGW 0xD40B,0xD5 REGW 0xD40C,0x00 REGW 0xD40D,0xF4 REGW 0xD40E,0x01 REGW 0xD40F,0x23 REGW 0xD410,0x01 REGW 0xD411,0x49 REGW 0xD412,0x01 REGW 0xD413,0x87</p>
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REGW 0xD414,0x01
REGW 0xD415,0xB6
REGW 0xD416,0x02
REGW 0xD417,0x00
REGW 0xD418,0x02
REGW 0xD419,0x3B
REGW 0xD41A,0x02
REGW 0xD41B,0x3D
REGW 0xD41C,0x02
REGW 0xD41D,0x75
REGW 0xD41E,0x02
REGW 0xD41F,0xB1
REGW 0xD420,0x02
REGW 0xD421,0xD5
REGW 0xD422,0x03
REGW 0xD423,0x09
REGW 0xD424,0x03
REGW 0xD425,0x28
REGW 0xD426,0x03
REGW 0xD427,0x52
REGW 0xD428,0x03
REGW 0xD429,0x6B
REGW 0xD42A,0x03
REGW 0xD42B,0x8D
REGW 0xD42C,0x03
REGW 0xD42D,0xA2
REGW 0xD42E,0x03
REGW 0xD42F,0xBB
REGW 0xD430,0x03
REGW 0xD431,0xC1
REGW 0xD432,0x03
REGW 0xD433,0xC1

#G-
REGW 0xD500,0x00
REGW 0xD501,0x37
REGW 0xD502,0x00
REGW 0xD503,0x53
REGW 0xD504,0x00
REGW 0xD505,0x79
REGW 0xD506,0x00
REGW 0xD507,0x97
REGW 0xD508,0x00
REGW 0xD509,0xB1
REGW 0xD50A,0x00
REGW 0xD50B,0xD5
REGW 0xD50C,0x00

REGW 0xD50D,0xF4
REGW 0xD50E,0x01
REGW 0xD50F,0x23
REGW 0xD510,0x01
REGW 0xD511,0x49
REGW 0xD512,0x01
REGW 0xD513,0x87
REGW 0xD514,0x01
REGW 0xD515,0xB6
REGW 0xD516,0x02
REGW 0xD517,0x00
REGW 0xD518,0x02
REGW 0xD519,0x3B
REGW 0xD51A,0x02
REGW 0xD51B,0x3D
REGW 0xD51C,0x02
REGW 0xD51D,0x75
REGW 0xD51E,0x02
REGW 0xD51F,0xB1
REGW 0xD520,0x02
REGW 0xD521,0xD5
REGW 0xD522,0x03
REGW 0xD523,0x09
REGW 0xD524,0x03
REGW 0xD525,0x28
REGW 0xD526,0x03
REGW 0xD527,0x52
REGW 0xD528,0x03
REGW 0xD529,0x6B
REGW 0xD52A,0x03
REGW 0xD52B,0x8D
REGW 0xD52C,0x03
REGW 0xD52D,0xA2
REGW 0xD52E,0x03
REGW 0xD52F,0xBB
REGW 0xD530,0x03
REGW 0xD531,0xC1
REGW 0xD532,0x03
REGW 0xD533,0xC1

#B-
REGW 0xD600,0x00
REGW 0xD601,0x37
REGW 0xD602,0x00
REGW 0xD603,0x53
REGW 0xD604,0x00
REGW 0xD605,0x79

REGW 0xD606,0x00
REGW 0xD607,0x97
REGW 0xD608,0x00
REGW 0xD609,0xB1
REGW 0xD60A,0x00
REGW 0xD60B,0xD5
REGW 0xD60C,0x00
REGW 0xD60D,0xF4
REGW 0xD60E,0x01
REGW 0xD60F,0x23
REGW 0xD610,0x01
REGW 0xD611,0x49
REGW 0xD612,0x01
REGW 0xD613,0x87
REGW 0xD614,0x01
REGW 0xD615,0xB6
REGW 0xD616,0x02
REGW 0xD617,0x00
REGW 0xD618,0x02
REGW 0xD619,0x3B
REGW 0xD61A,0x02
REGW 0xD61B,0x3D
REGW 0xD61C,0x02
REGW 0xD61D,0x75
REGW 0xD61E,0x02
REGW 0xD61F,0xB1
REGW 0xD620,0x02
REGW 0xD621,0xD5
REGW 0xD622,0x03
REGW 0xD623,0x09
REGW 0xD624,0x03
REGW 0xD625,0x28
REGW 0xD626,0x03
REGW 0xD627,0x52
REGW 0xD628,0x03
REGW 0xD629,0x6B
REGW 0xD62A,0x03
REGW 0xD62B,0x8D
REGW 0xD62C,0x03
REGW 0xD62D,0xA2
REGW 0xD62E,0x03
REGW 0xD62F,0xBB
REGW 0xD630,0x03
REGW 0xD631,0xC1
REGW 0xD632,0x03
REGW 0xD633,0xC1

#Enable Page0
REGW 0xF000,0x55
REGW 0xF001,0xAA
REGW 0xF002,0x52
REGW 0xF003,0x08
REGW 0xF004,0x00

Vivid Color
REGW 0xB400,0x10

RGB I/F Setting
REGW 0xB000,0x88
REGW 0xB001,0x05
REGW 0xB002,0x04
REGW 0xB003,0x0D
REGW 0xB004,0x05

#Display Option
Control
REGW 0xB100,0x6C
REGW
0xB101,0x00/0x06

SDT:
REGW 0xB600,0x05

Gate EQ:
REGW 0xB700,0x00
REGW 0xB701,0x00

REGW 0xBA00,0x01

Source EQ:
REGW 0xB800,0x01
REGW 0xB801,0x05
REGW 0xB802,0x05
REGW 0xB803,0x05

Inversion: Column
inversion (NVT)
REGW 0xBC00,0x00
REGW 0xBC01,0x00
REGW 0xBC02,0x00

BOE's Setting
(default)
REGW 0xCC00,0x03
REGW 0xCC01,0x00
REGW 0xCC02,0x00

Display Timing:
REGW 0xBD00,0x01
REGW 0xBD01,0x84
REGW 0xBD02,0x07
REGW 0xBD03,0x31
REGW 0xBD04,0x00

REGW 0xFF00,0xAA
REGW 0xFF01,0x55
REGW 0xFF02,0x25
REGW 0xFF03,0x01

#REGW 0xF304,0x11
#REGW 0xF306,0x10
#REGW 0xF408,0x00

#REGW x3a00,0X66/0x77

REGW 0x1100
DELAY 120

REGW 0x2900

注:
(1) # RGB I/F Setting
REGW 0xB000-0xB004,
需要根据主板RGB时序
设定。
(2)
REGW x3a00,0X66/0x77
0X66—18bit,0x77—24bit
(3) #Display Option
Control
REGW 0xB101,0x00/0x06
0x06—180°翻转

NOTE: BOE requires the customer to follow the above instructions strictly. If customer would like to change the above instructions, the customer should inform BOE and get re-check from BOE, or the customer will be responsible for any unexpected result because of the change.

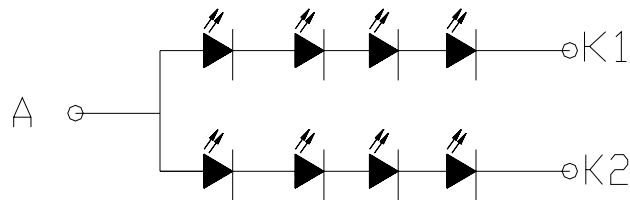
6. Back Light System Characteristics

Ta=25°C

Items	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	If	-	20	25	mA	Note1
Forward voltage	Vf	3.0	-	3.4	V	Note1
B/L Power consumption	P_{BL}	-	-	680	mW	Note2

Note 1: The Driving conditon is defined for each LED chip.

Note 2: The B/L Power consumption is defined for the backlight module.the schematic drawing of the backlight module as the figure.



Ref. Total power consumption(max) depends on LED current/ LED driver efficiency, etc.

7. Optical Characteristics

Transmissive Mode

Ta=25°C

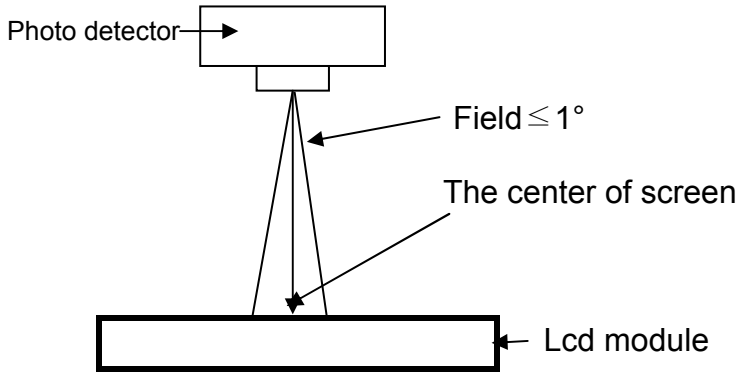
Item	Symbol	Min.	Typ.	Max.	Unit	Condition	Note	
Viewing Angle	θ	$\varnothing=0^\circ$ (X1)	70	80	-	deg.	Cr > 10	Note2
		$\varnothing=180^\circ$ (X2)	70	80	-			
		$\varnothing=90^\circ$ (Y1)	70	80	-			
		$\varnothing=270^\circ$ (Y2)	70	80	-			
Contrast ratio (transmissive)	Cr	240	450	-	-	$\theta = 0$ $\varnothing = 0$	Note1 Note4	
Response Time	Tr + Tf	-	30	55	ms	$\theta = 0$ $\varnothing = 0$	Note3	
CIE Coordinate	R	(x,y)	0.61, 0.29	0.65, 0.33	0.69, 0.37	$\theta = 0$ $\varnothing = 0$		
	G	(x,y)	0.27, 0.58	0.31, 0.62	0.35, 0.66			
	B	(x,y)	0.1, 0.01	0.14, 0.05	0.18, 0.09			
	W	(x,y)	0.25, 0.28	0.29, 0.32	0.33, 0.36			
Brightness	L	280	350	-	cd/m ²	20mA/LED	Note5	
Uniformity		80	-	-		20mA/LED	Note6	

* $\varnothing = 0^\circ$, $\varnothing = 90^\circ$, $\varnothing = 180^\circ$, $\varnothing = 270^\circ$ means viewing direction.

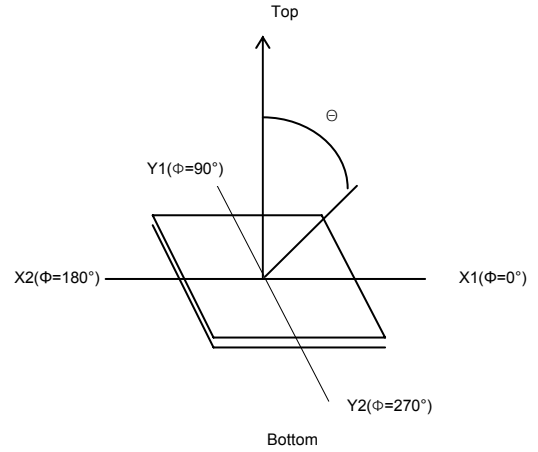
* B/L is turned on.

The optical characteristics should be measured in dark room, and after 5 minutes operation, the measurement begin.

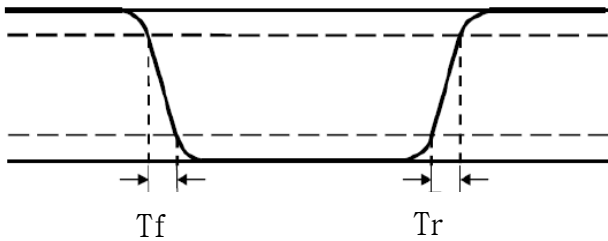
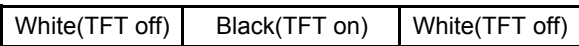
Note1. Definition of Measure System



Note2. Definition of Angle Θ .



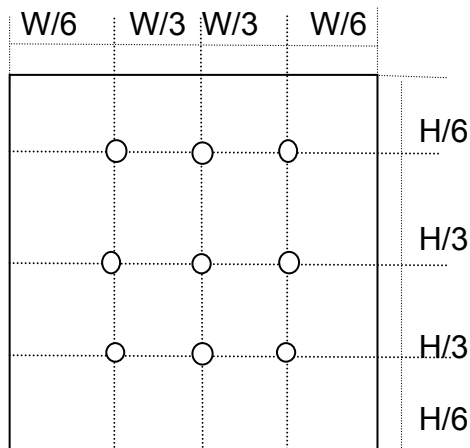
Note3. Definition of Response Time



Note4. definition of contrast ratio

$$Cr = \frac{\text{Liuminance of LCD white state}}{\text{Liuminance of LCD Black state}}$$

Note 5. Measuring Point(9 Points) (WxH)



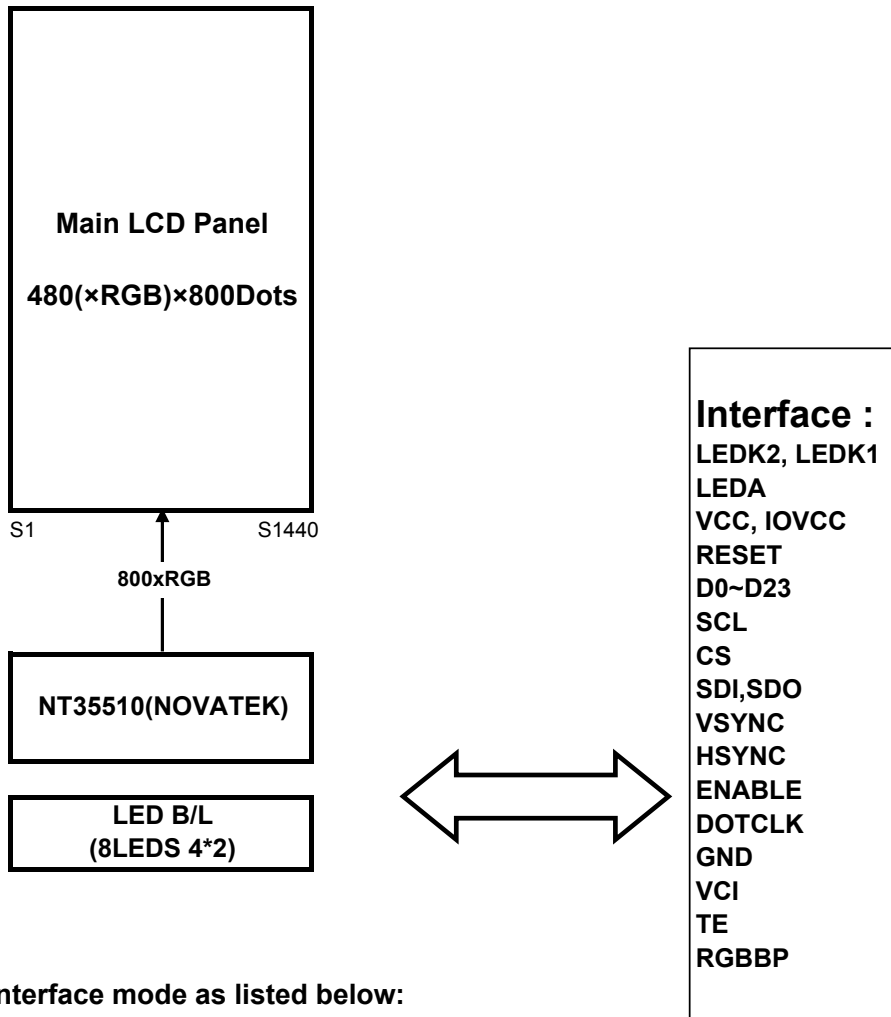
Rating is defined as the average brightness inside the viewing area

Note 6. definition of Uniformity

$$\text{Uniformity} = \frac{\text{max. Liuminance of measurede point}}{\text{max. Liuminance of measurede poin}}$$

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8. Block Diagram



Select the MPU interface mode as listed below:

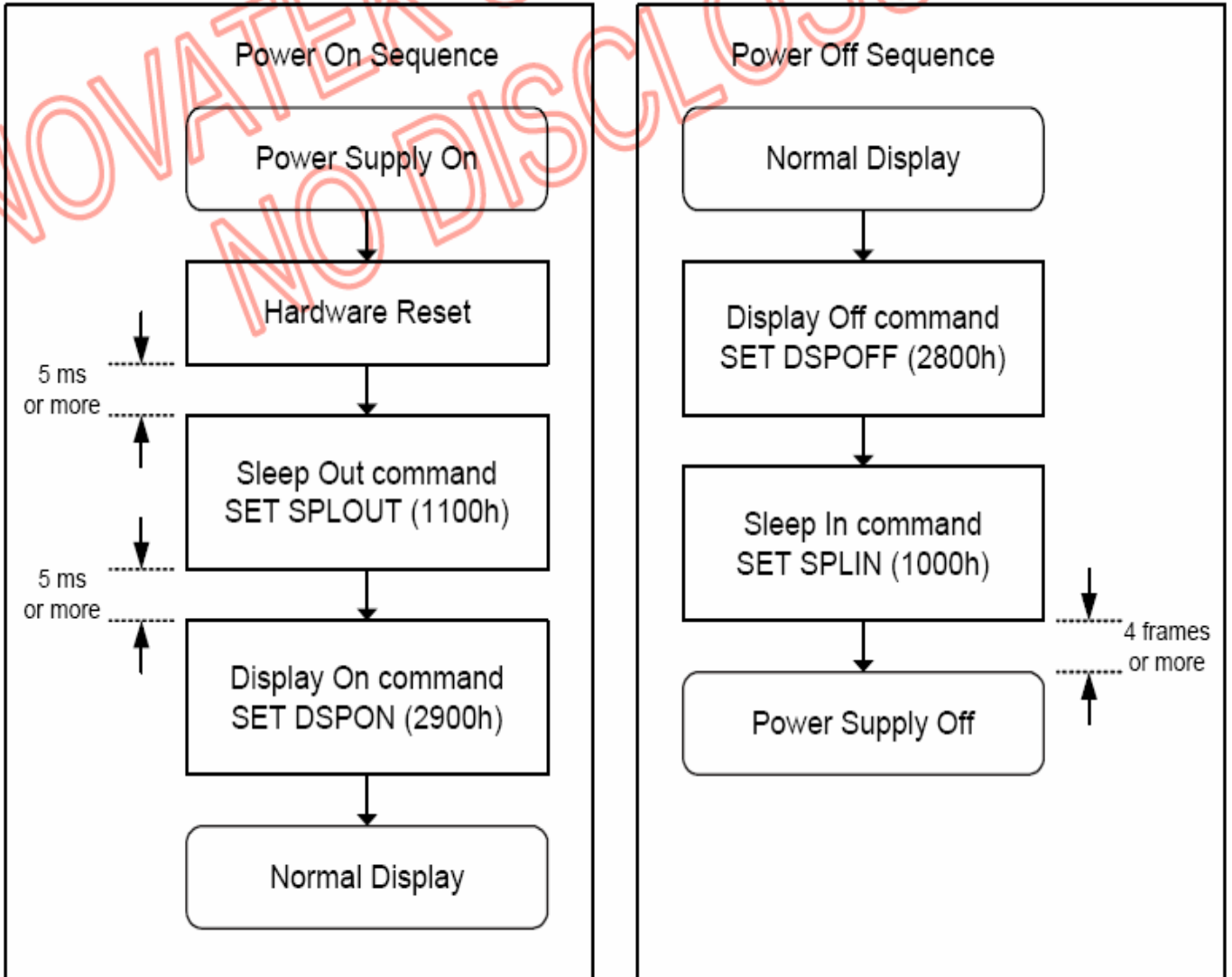
IM3	IM2	IM1	IM0	SRAM	Register
X	0	0	0	80-series 8-bit MPU interface, D[7:0]	80-series 8-bit MPU interface, D[7:0]
X	0	0	1	80-series 16-bit MPU interface, D[15:0]	80-series 16-bit MPU interface, D[15:0]
X	0	1	0	80-series 24-bit MPU interface, D[23:0]	80-series 24-bit MPU interface, D[23:0]
0	0	1	1	RGB interface, D[23:0]	SPI, SDI/SDO serial data, SCL rising trigger
1	0	1	1	RGB interface, D[23:0]	SPI, SDI/SDO serial data, SCL falling trigger
X	1	0	0	RGB interface, D[23:0]	I2C interface, I2C_SDA serial data
X	1	0	1	MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N	MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N
0	1	1	0	MDDI, HSSI_D0_P/N, HSSI_D1_P/N	MDDI, HSSI_D0_P/N, HSSI_D1_P/N SPI, SDI/SDO serial data, SCL rising trigger
1	1	1	0	MDDI, HSSI_D0_P/N, HSSI_D1_P/N	MDDI, HSSI_D0_P/N, HSSI_D1_P/N SPI, SDI/SDO serial data, SCL falling trigger
X	1	1	1	MDDI, HSSI_D0_P/N, HSSI_D1_P/N	MDDI, HSSI_D0_P/N, HSSI_D1_P/N I2C interface, I2C_SDA serial data

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9. Interface Pin Assignment

Pin NO.	Symbol	I/O or connect to	Description	When not in use
1	LEDK2	LED driver	LED CATHODE	-
2	LEDK1	LED driver	LED CATHODE	-
3	LEDA	LED driver	LED ANODE	-
4	VCC	Power supply	A power supply for the analog power. VCC=2.3 to 4.8V.VCC input level should be same as IOVCC input level to avoid the level-mismatching at internal level shifter circuit.TYPE:2.8V	-
5	IOVCC	Power supply	A power supply for the I/O circuit. IOVCC=1.65 to 3.3V. TYPE:1.8V	-
6	GND	Power supply	Groud	-
7	RESET	I Hostprocessor/reset circuit	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied (Must be connected to GND or IOVCC).	-
8	GND	Power supply	Groud	-
9~32	DB[0:23]	I/O Host processor	Data bus. For the connection condition of the MPU & RGB interface mode,please refer to NOTE1 and NOTE2	OPEN
33	GND	Power supply	Groud	-
34	SCL	I Host processor	DBI Type-A/B: Data / Command Selection pin DBI Type-C: it servers as SCL (Serial Clock)	OPEN or IOVCC
35	CS	I Host processor	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed.	GND or IOVCC
36	SDI	I Host processor	Serial data input pin in serial interface operation.	OPEN
37	SDO	I Host processor	Serial data output. Let it to open in MPU interface mode.	OPEN
38	TE	0	Tearing effect output pin to synchronize MCU to frame writing, activated by S/W command. When this pin is not activated, this pin is output low.	OPEN
39	VSYNC	I Host processor	Frame synchronization signal. Serves VS signal pin on RGB interface. (Input pad).	GND or IOVCC
40	HSYNC	I Host processor	Line synchronization signal.	GND or IOVCC
41	ENABLE	I Host processor	A data enable signal in RGB I/F mode. Has to be fixed to GND level in MPU interface mode.	GND
42	GND	Power supply	Groud	-
43	DOTCLK	I Host processor	Pixel clock signal.	GND or IOVCC
44	RGBBP	I	Display data written path control in RGB interface.	IOVCC
45	VCC	Power supply	A power supply for the analog power. VCC=2.3 to 4.8V.VCC input level should be same as IOVCC input level to avoid the level-mismatching at internal level shifter circuit.TYPE: 2.8V	-

10. Power Supply Sequence



11. Read/Write Timing characteristics (RGB+SPI I/F)

1) RGB Read/Write Timing

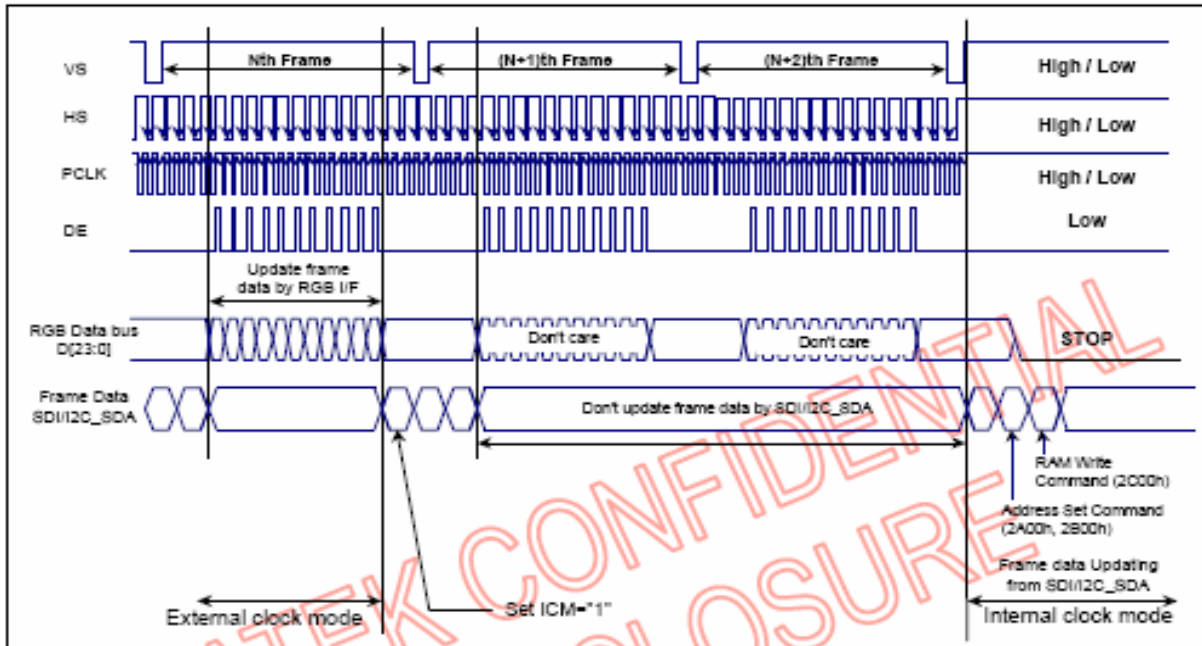


Fig. 5.8.4 RGB with SPI Timing Sequence (Enter Internal Clock Mode, ICM="1")

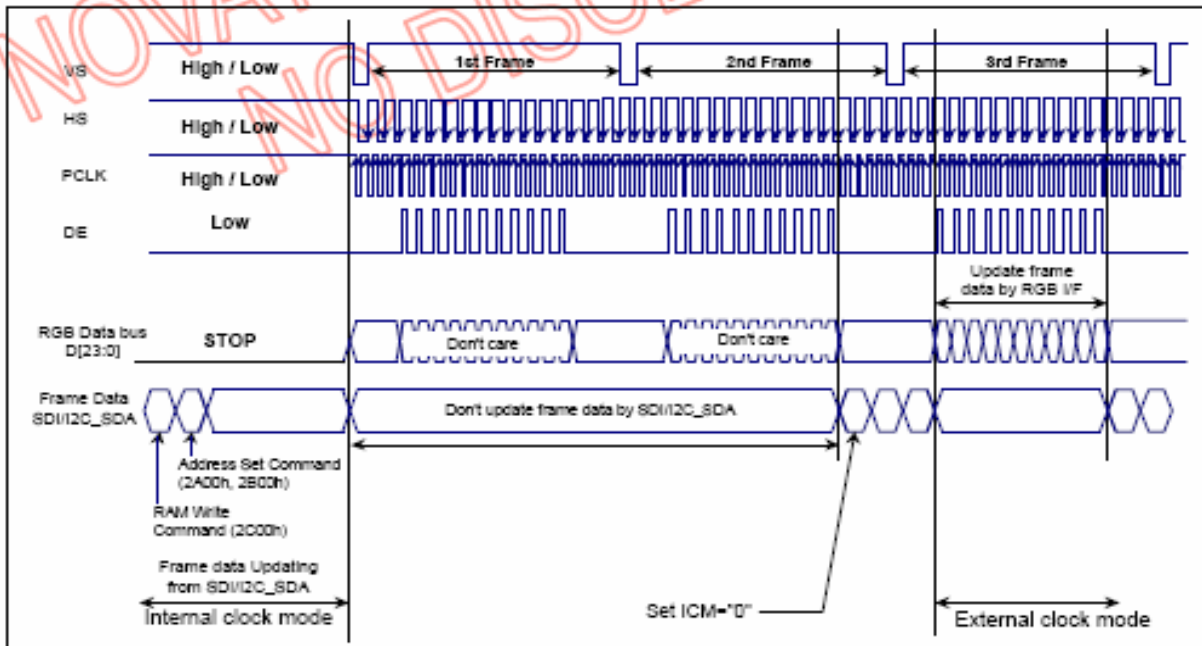


Fig. 5.8.5 RGB with SPI Timing Sequence (Exit Internal Clock Mode, ICM="0")

2) SPI Read/Write Timing

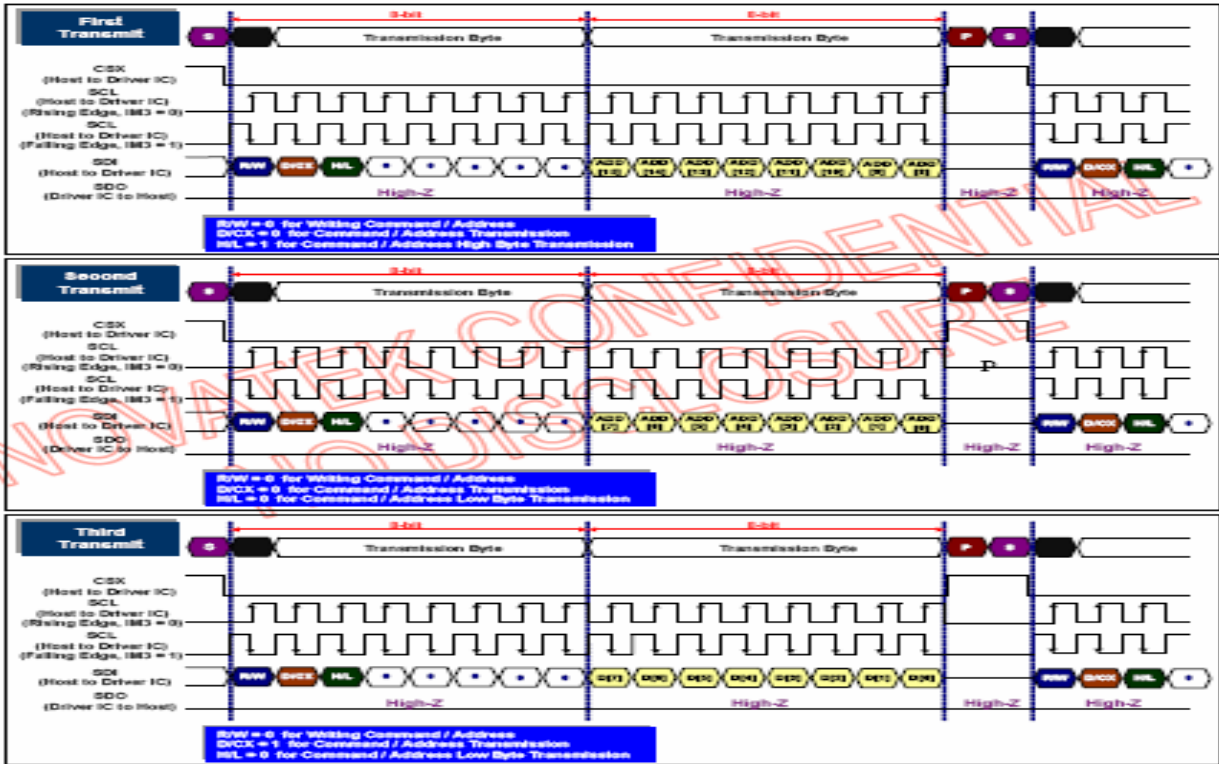


Fig. 5.1.5 Serial bus protocol for register write mode

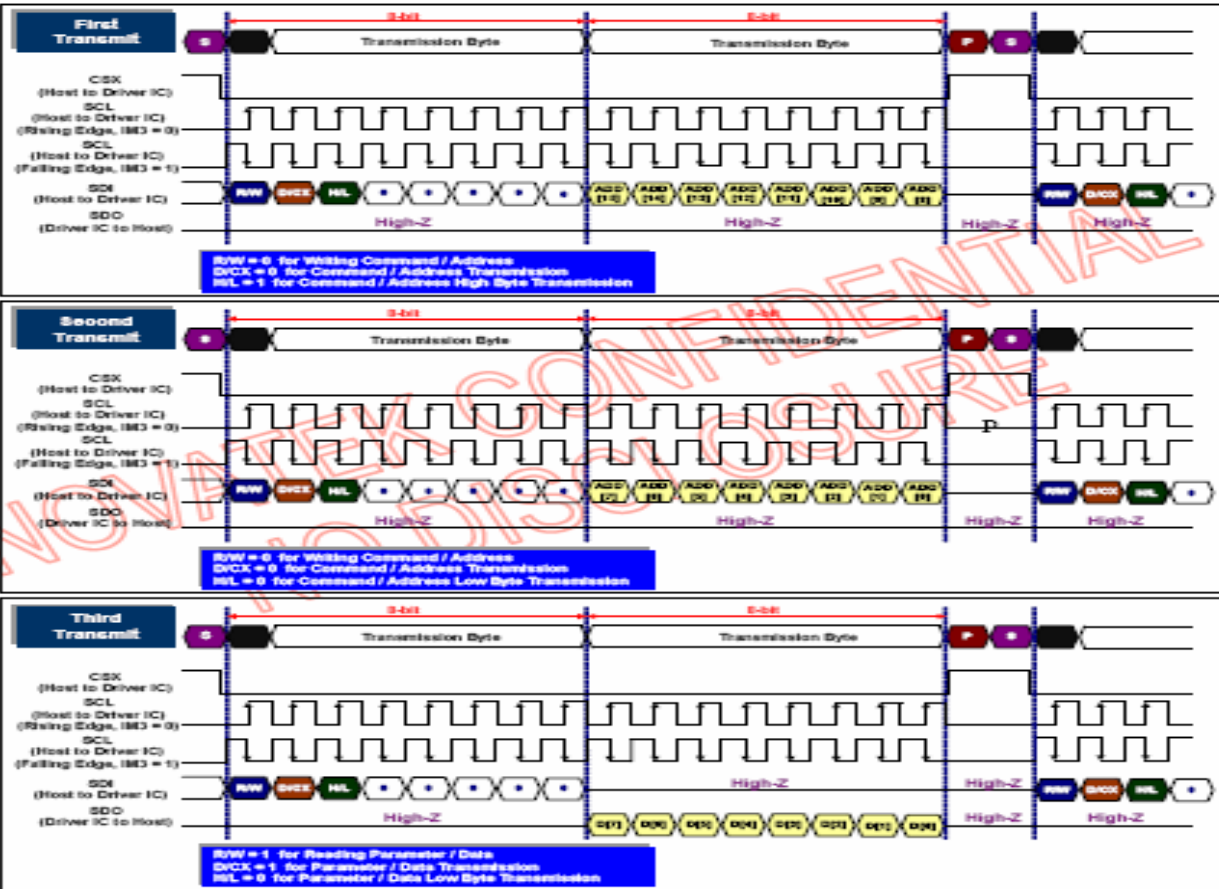


Fig. 5.1.6 Serial bus protocol for register read mode

2) Reset Timing characteristics

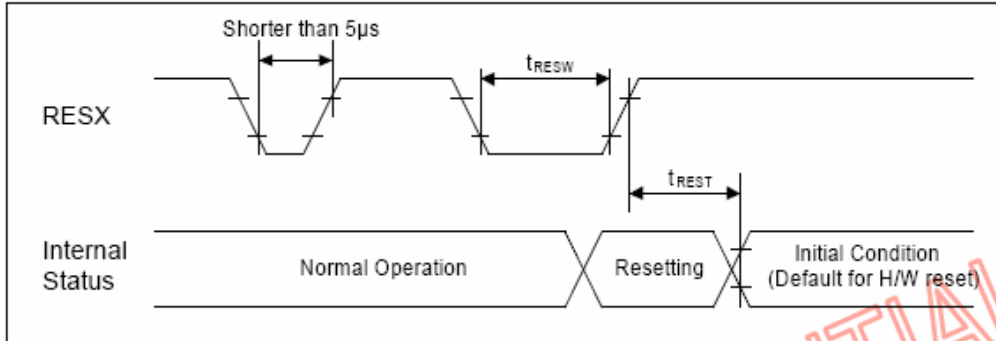
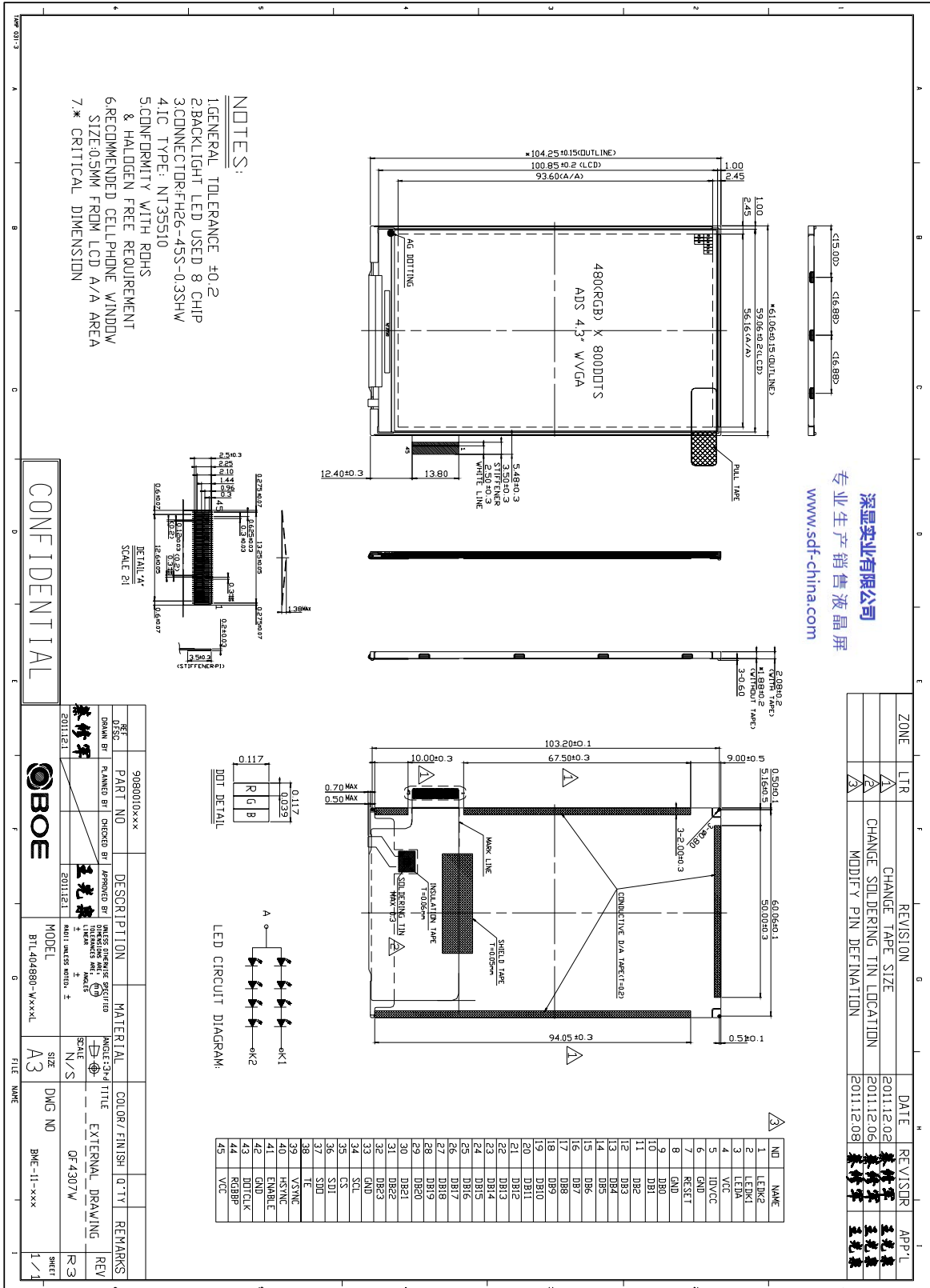


Fig. 7.6.12 Reset input timing

(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.3V, VDD=2.3V to 4.8V, Ta = -30 to 70°C)

Signal	Symbol	Parameter	MIN	TYP	MAX	Unit	Description
RESX	t_{RESW}	Reset "L" pulse width (Note 1)	10	-	-	µs	
	t_{REST}	Reset complete time (Note 2)	-	-	5	ms	When reset applied during Sleep In Mode
-			-	120	ms	When reset applied during Sleep Out Mode	

12. External Dimension



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13. COLOR LCD MODULE NUMBERING SYSTEM

B	T	L	4	3	4	8	8	0	-		W	5	4	8	L		
(1)	(2)	(3)	(4)	(5)			(6)	(7)			(8)	(9)	(10)				

(1) B: BHL

(2) Drive System

C : CSTN T : TFT E : OLED M : MONO

(3) Product Status

L: LCD Model F: FOG Model G: COG Model P: PANEL Model C: CELL Model

(4) Display size(精确到小数点后1位,四舍五入)

EX) 2.22 inch:22 1.76 inch:18 2.0 inch:20 10.1inch:A1
 1.9 inch:19 1.12 inch:11 1.8 inch:18 15.5inch:F5

(5) Resolution

Number of Row Dots * Number of column Dots(前两位有效)

EX) 128 * 128 = 1212 96 * 64 = 9664 128 * 160 = 1216 101 * 80 = 1080
 176 * 220 = 1722 128 * 96 = 1296 320 * 240 = 3224 1024*576 = 1057

(6) Viewing Direction

Nil: 6 H U: 12 H L: 9 H R: 3 H W: Wide view E: 其他

(7) Serial Number (*001-9999: 按照产品状态, 各类产品序列号实行大排行处理, *为0时省略不写)

(8) Back Light

Nil: Without backlight + Reflective H: CCFL + Transflective
 T: Without backlight + Transflective E: LED Frontlight + Reflective
 F: CCFL Frontlight + Reflective D: LED + Transflective
 L: LED + Transmissive

(9) DUAL LCD

Nil: Single LCD M: MONO C: CSTN T: TFT O: OLED

(10) TOUCH PANEL

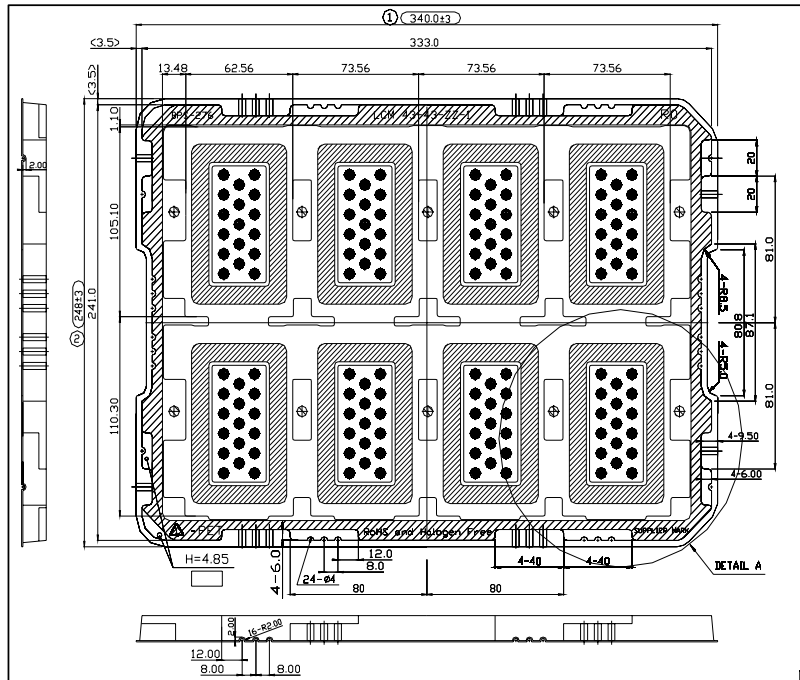
Nil: Without TP P: with TP

Model	BTL434880-W548L	19/30	PRODUCT SPECIFICATION
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14. Package Terms

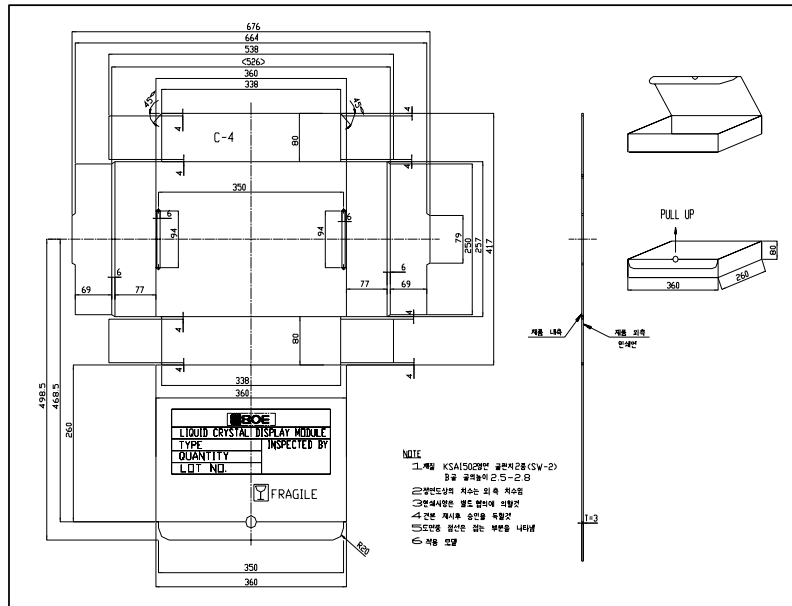
1、Tray Size

L:340mm
W:248mm
(8pcs LCM/Tray)



2、Inner BOX Size

L:360mm
W:260mm
H:80mm
(7pcs Tray) / Inner Box



Inner Box Drawing

Model

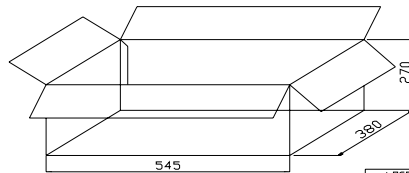
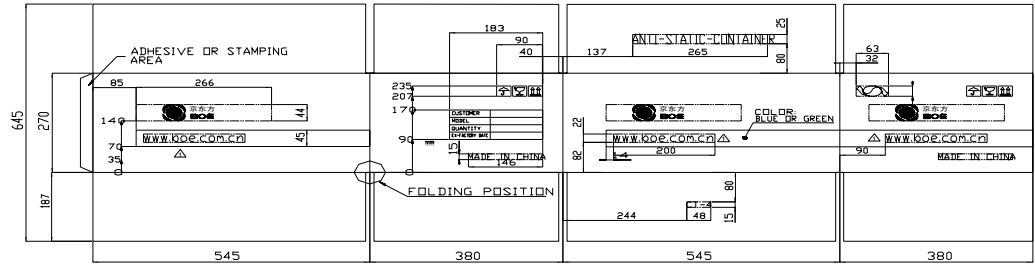
BTL434880-W548L

20/30

PRODUCT SPECIFICATION

3. Out BOX Size

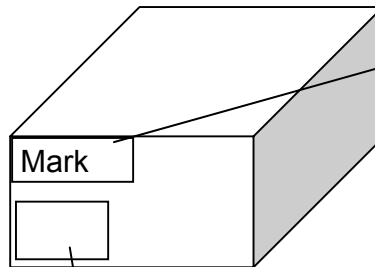
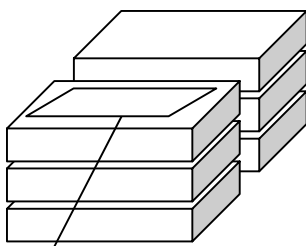
L: 545mm
W: 380mm
H: 270mm
(6pcs Inner / Out)



NOTE
1.MATERIAL: KSA 1531,Dw2(T=8mm)
2.DRAWING DIMENSIONS ARE EQUAL TO OUTSIDE DIMENSION.
3.INNER BOX(C-4) ARRANGEMENT: 3STEPS X 2ROWS
4.MARKS ARE REFER TO SEPERATE CONSULTATION.

LOGO	COLOR
	BLUE OR GREEN
WWW.BOE.COM.CN	CLEARNESS
OTHERS	BLUE OR GREEN

4. Packing label content



Customer Address
Product No.
P/O No.
Lot No.
Box No.

Mark Item

R/R			BOE			CD Inc			
LIQUID CRYSTAL DISPLAY M						CUSTOMER		Q'TY	
TYPE		INS	MODEL		DATE	YYYY-MM-DD			
QUANTITY	EA		RUN NO		LOC CODE				
LOT NO			ORIGIN		(QA)				

5. Packing notice

- [1] Sub LCD should be placed upwardly while in the tray.
- [2] Every seven full trays with a blank one while twining twice on both sides by adhesive tape.
- [3] Every tray should be put crossedly.

6. Product label

- [1] There should be Logo and product modle of BOE on FPC ASS'Y.

7. Packing Q'ty list

	INNER BOX	TRAY	MODULE
OUT BOX	6	42	288
INNER BOX	1	7	48
TRAY	-	1	8

Model	BTL434880-W548L	21/30	PRODUCT SPECIFICATION
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1.LCD Module Out-Going Quality Level

(1.0) Purpose

The LCD specification provides outgoing provision and its expected quality level based on our outgoing inspection of LCD.

(1.1) Applicable Scope

The LCD specification is applicable to the arrangement in regard to outgoing Inspection and quality assurance after it.

(1.2) Quality Specification

(1.2.1) Quality Level

The quality level of BHL&BMDT are based on GB/T2828.1-2003, Apply Level II, normal inspection by single sampling.

Rank	Item	AQL	Note
Major(MA)	Parts Short, Parts Mounting Back Light, Open Solder Bridging Outside Dimension Solder Ball, Cold Solder	0.25	
Minor (MI)	Stains on LCD Panel Surface, Color Variation,dot, Stains, Scratches, Foreign Substance, Spots, Air Bubbles, Parts Alignment	0.4	

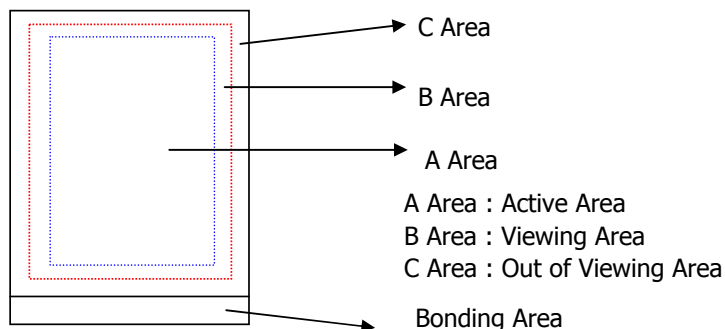
(1.2.2) Appearance Standards

1) Inspection Conditions

The inspection shall be applied under 20W white fluorescent lamp light at a distance between 400-500mm, with the eyes 300mm away from products and and the angle of view within 30° to perpendicular line.

The mobile lens should be fixed on when doing inspection in case the mobile with lens.

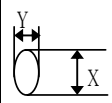
2) Definition of the Area


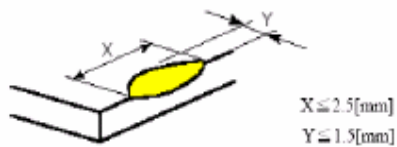
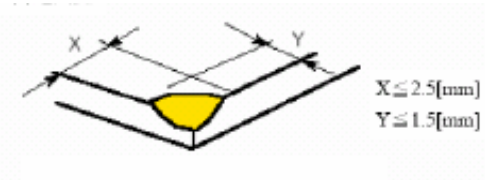
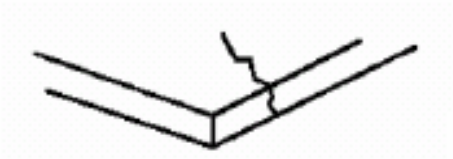


(1.2.3) Appearance Spec

No	Item	Criteria	Rank	Remark																																										
1	Nick, POL and Color Filter Scratches、 other POL line defect	<p>(1) Round shape</p> <table border="1"> <thead> <tr> <th rowspan="2">Area Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td colspan="2">Ignore</td> <td></td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> <td>Ignore</td> <td></td> </tr> <tr> <td>$0.30 < \Phi$</td> <td>0</td> <td>Ignore</td> <td></td> </tr> </tbody> </table> <p>(2) Line shape</p> <table border="1"> <thead> <tr> <th colspan="2">Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>≤ 3</td> <td>≤ 0.04</td> <td colspan="2">Ignore</td> <td></td> </tr> <tr> <td>≤ 2</td> <td>$0.04 < \Phi \leq 0$</td> <td>3</td> <td>Ignore</td> <td></td> </tr> <tr> <td>≥ 3</td> <td>---</td> <td colspan="2">Not allowed</td> <td></td> </tr> </tbody> </table> <p>Note: Within size between points or between line and line, or the distance between points and lines should be greater than</p>	Area Dimension	Acceptable Q'ty		Remark	A Area	B Area	$\Phi \leq 0.20$	Ignore			$0.20 < \Phi \leq 0.30$	2	Ignore		$0.30 < \Phi$	0	Ignore		Dimension		Acceptable Q'ty		Remark	Length	Width	A Area	B Area	≤ 3	≤ 0.04	Ignore			≤ 2	$0.04 < \Phi \leq 0$	3	Ignore		≥ 3	---	Not allowed			MI	
Area Dimension	Acceptable Q'ty			Remark																																										
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Length	Width	A Area	B Area																																											
≤ 3	≤ 0.04	Ignore																																												
≤ 2	$0.04 < \Phi \leq 0$	3	Ignore																																											
≥ 3	---	Not allowed																																												
2	Stains, Foreign Particle, Dirt under polarizer, Black and White Spots	<p>(1) Round shape</p> <table border="1"> <thead> <tr> <th rowspan="2">Area Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td colspan="2">Ignore</td> <td></td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> <td>Ignore</td> <td></td> </tr> <tr> <td>$0.30 < \Phi$</td> <td>0</td> <td>Ignore</td> <td></td> </tr> </tbody> </table> <p>(2) Line shape</p> <table border="1"> <thead> <tr> <th colspan="2">Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>≤ 3</td> <td>≤ 0.04</td> <td colspan="2">Ignore</td> <td></td> </tr> <tr> <td>≤ 2</td> <td>$0.04 < \Phi \leq 0$</td> <td>3</td> <td>Ignore</td> <td></td> </tr> <tr> <td>≥ 3</td> <td>---</td> <td colspan="2">Not allowed</td> <td></td> </tr> </tbody> </table> <p>Note: Within size between points or between line and line, or the distance between points and lines should be greater than</p>	Area Dimension	Acceptable Q'ty		Remark	A Area	B Area	$\Phi \leq 0.20$	Ignore			$0.20 < \Phi \leq 0.30$	2	Ignore		$0.30 < \Phi$	0	Ignore		Dimension		Acceptable Q'ty		Remark	Length	Width	A Area	B Area	≤ 3	≤ 0.04	Ignore			≤ 2	$0.04 < \Phi \leq 0$	3	Ignore		≥ 3	---	Not allowed			MI	
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≤ 3	≤ 0.04	Ignore																																												
≤ 2	$0.04 < \Phi \leq 0$	3	Ignore																																											
≥ 3	---	Not allowed																																												
3	Bad dot, dark dot and bright dot	<p>(1) Bright dot</p> <table border="1"> <thead> <tr> <th rowspan="2">Area Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>$\Phi < 1/2$ dot</td> <td>3</td> <td>Ignore</td> <td>1 dot is sub pixel</td> </tr> <tr> <td>$1/2$ dot $\leq \Phi$</td> <td>1</td> <td>Ignore</td> <td>pixel</td> </tr> </tbody> </table> <p>(2) dark dot</p> <table border="1"> <thead> <tr> <th rowspan="2">Dimension</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>$\Phi < 1/2$ dot</td> <td>4</td> <td>Ignore</td> <td></td> </tr> <tr> <td>$1/2$ dot $\leq \Phi$</td> <td>2</td> <td>Ignore</td> <td></td> </tr> </tbody> </table> <p>Note:(1).Two bright spot appearing in the pixel is defective; (2).The distance between points should be greater than 5mm.</p>	Area Dimension	Acceptable Q'ty		Remark	A Area	B Area	$\Phi < 1/2$ dot	3	Ignore	1 dot is sub pixel	$1/2$ dot $\leq \Phi$	1	Ignore	pixel	Dimension	Acceptable Q'ty		Remark	A Area	B Area	$\Phi < 1/2$ dot	4	Ignore		$1/2$ dot $\leq \Phi$	2	Ignore		MI															
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	A Area	B Area																																												
$\Phi < 1/2$ dot	4	Ignore																																												
$1/2$ dot $\leq \Phi$	2	Ignore																																												

Note : A limitation sample is given top priority

No	Item	Criteria	Rank	Remark																			
4	Air Bubbles Between Glass and Polarizer	<table border="1"> <thead> <tr> <th rowspan="2">Area Dimension**</th> <th colspan="2">Acceptable Q'ty</th> <th rowspan="2">Remark</th> </tr> <tr> <th>A Area</th> <th>B Area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> <td rowspan="4">Φ:Average diameter</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td>2</td> <td>Ignore</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="2">Not allowed</td> </tr> <tr> <td>Total</td> <td>2</td> <td>Ignore</td> </tr> </tbody> </table>	Area Dimension**	Acceptable Q'ty		Remark	A Area	B Area	$\Phi \leq 0.2$	Ignore		Φ :Average diameter	$0.2 < \Phi \leq 0.3$	2	Ignore	$0.3 < \Phi$	Not allowed		Total	2	Ignore	MI	
		Area Dimension**		Acceptable Q'ty			Remark																
			A Area	B Area																			
		$\Phi \leq 0.2$	Ignore		Φ :Average diameter																		
		$0.2 < \Phi \leq 0.3$	2	Ignore																			
$0.3 < \Phi$	Not allowed																						
Total	2	Ignore																					
5	Parts Short	Not allowed	MA																				
6	Solder Bridging	Any bridging between components,except common circuit, is not allowed	MA																				
7	Outside Dimension	Drawing & specification must be within permissible tolerance	MA																				
8	Open	Not allowed	MA																				
9	Cold Solder	Not allowed	MA																				
10	Parts Mounting	Parts mounting failure is not allowed Wrong parts mounted is not allowed	MA	 Diameter= $(X + Y)/2$																			
11	Color Variation	Refer to the limit sample consented by both parties for judgement	MI																				
12	Stains On LCD Panel Surface	Stains which can be wiped off with soft cloth are not counted as defect Stains which can't be removed even with soft cloth are not allowed	MI																				
13	Back Light	No light and short of light and abnormal lighting are not allowed	MA																				

No	Item	Criteria	Rank	Remark
14	Glass Chipping	(1).PAD position : X-Ignore、 $Y \leq 0.45$	MI	
			MI	
		(2).General position: $X+Y \leq 4$	MI	
			MI	
		(3).Corner position: $X+Y \leq 4$	MI	
			MI	
		(4).Dangers of the injury position: Not allowed	MA	

(1.3) Reliability Test

Item	Content
Room Temperature Operation	50,000 hrs

(1.4) Reliability Test - Module Middle Reliability

No.	Item	Condition	Duration	Sample Quantity	Creteria (Acc/Rej)	Note
1	High Temp Operation	70 ± 2°C	120 hrs	3	0/1	
2	High Temp Storage	80 ± 2°C	120 hrs	3	0/1	
3	Low Temp Operation	-20 ± 2°C	120 hrs	3	0/1	
4	Low Temp Storage	-30 ± 2°C	120 hrs	3	0/1	
5	High Temp and High Humidity Storage	60°C,90% RH	120 hrs	3	0/1	
6	High Temp and High Humidity Operation	60°C,90% RH	120 hrs	3	0/1	
7	Thermal Shock	-25°C(0.5h) ↔ 70°C(0.5h)	20cycle	3	0/1	
8	Packaging Vibration Test	To be measured after subjecting to total fixed amplitude of 1.5mm vibrating frequency 10 to 55Hz, one cycle 60 seconds to direction of X,Y,Z for each 15 minutes,(Total 45minutes) and after removing vibration				
9	Packaging Drop Test	To be measured after dropping from 80cm high onto steel board of 15mm thick and from 6 face				
10	ESD	- Condition:150pf, 330Ω, ±8KV, 5 times Air Discharge (ESD which is made by above condition should be shot on LCD glass panel, not other's area(such as on IC and so on) - After testing, cosmetic and electrical defects should not happen. -Total current consumption should be below double of initial value. -In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.				

(1.5) Criteria

- a. No. 1 ~ 9 : No changes for indication and appearance.
- b. No. 1 ~ 3, 5 ~ 9 : Leave the all samples under room temperature 4 hours after reliability test ends.
- c. No. 4 : Leave the all samples under room temperature 12 hours after reliability test ends.

Model	BTL434880-W548L	26/30	PRODUCT SPECIFICATION
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(1.6) On_going Reliability Test

No.	Item	Condition and Judgment	Duration	Sample Quantity	Test Frequency	Note
1	ESD	Test conditions: contact: $\pm 4kV$; air-type: $\pm 8kV$; Decision method: No obvious abnormalities in appearance test, sizes and electrical properties to be within specifications.	5 times	3	once a month	
2	Thermal Shock	Test conditions: $-25^{\circ}C(45min) \leftrightarrow 70^{\circ}C(45min)$; Decision method: Sizes and electrical characteristics after the test to be within specifications.	20 cycles	5	once a month	
3	High Temp and High Humidity Operation	Test conditions: $60^{\circ}C, 90\% RH$; Decision method: Sizes and electrical characteristics after the test to be within specifications.	120 hrs	5	once a month	
4	Low Temp Storage	Test conditions: $-25^{\circ}C \pm 3^{\circ}C$; Decision method: No obvious abnormalities in appearance test, sizes and electrical properties to be within specifications.	72 hrs	5	once a month	
5	High Temp Operation	Test conditions: $70^{\circ}C \pm 3^{\circ}C$; Decision method: No obvious abnormalities in appearance test, sizes and electrical properties to be within specifications.	120 hrs	5	once a month	
6	Low Temp Operation	Test conditions: $-20^{\circ}C \pm 3^{\circ}C$; Decision method: No obvious abnormalities in appearance test, sizes and electrical properties to be within specifications.	48 hrs	5	once a month	
7	Vibration Test	Test conditions:(A) the vibration frequency: 5 ~ 20Hz, 20 ~ 500Hz; (B) acceleration: $0.96m^2 / s^3$, $0.96m^2 / s^3$ -3dB frequency; (C) Vibration duration: 60min / axis, total X, Y, Z axis; Decision method: Sizes and electrical characteristics after test to be within specifications, and can be installed in the normal use of mobile phones.	---	3 (Min)	once three months	
8	Packaging Drop Test	Test conditions:(A)100cm concrete floor; (B) 1 corner, 3 edges and six faces each time; Decision method:No obvious abnormalities in appearance test, sizes and electrical properties to be within specifications.	---	one box (Min)	once a month	

2. Notes on the design and use of touch panel:

(2.1) Designing the housing, it is recommended to cover the edge of the housing bezel to the between the viewing areas and active areas of touch panel, to protect the bank line of vulnerable areas within the 2 mm region, which shown in figure 1 and figure 2;

(2.2) Between panel and housing should be leaved by $0.5 \pm 0.2\text{mm}$ gap with cushion material or other gasket, which shown in figure 2;

(2.3) In order to prevent suppressing the active area of touch panel by gasket, it should be keep away from the edge of active area more than 1.5mm pitch, which shown in figure 2;

(2.4) Due to the operating unbearable areas of the edge of the viewing areas, keep your company from testing the touch-screen with pen sliding in the processes of inspection and using, which shown in figure 3.

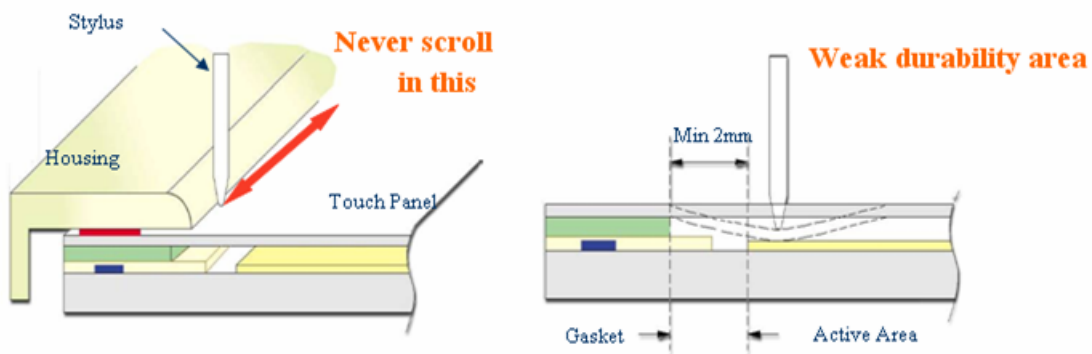


Figure 1

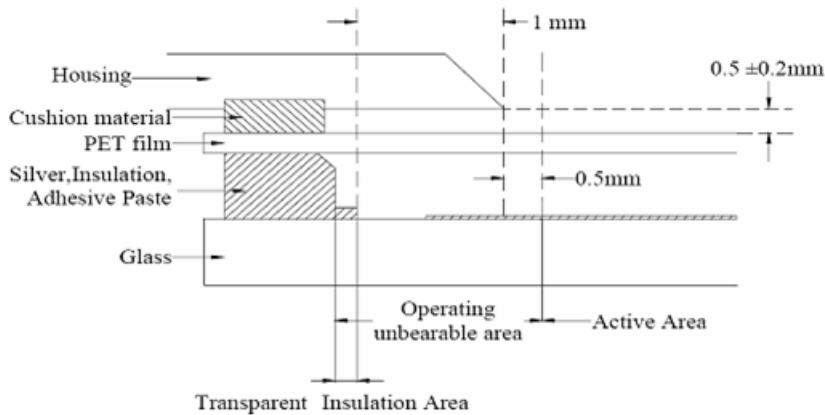


Figure 2

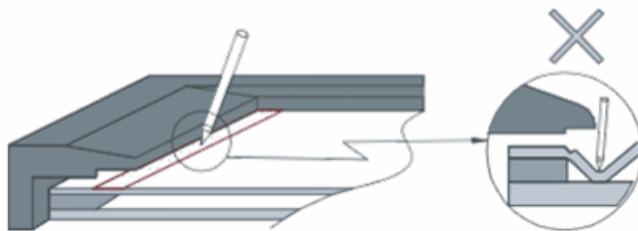


Figure 3

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3. BHL&BMDT Customer Quality Service Process

In order to provide better service for Customer, BHL&BMDT shall apply the after-sales product quality service process as below:

- 1> According to the P/O from Customer, BHL&BMDT should deliver required product to the right place appointed by Customer.
- 2> Customer shall apply inspection to the incoming product.
- 3> Inspection standard should be provided by BHL&BMDT, and it will become effective after confirmed by Customer. Inspection and Defects determination should be carried out according to the standard agreed by both Parties.
- 4> In order to guarantee in-time communication of product quality situation and effective service, QA staff on Customer side should send Weekly Quality Report to the appointed CS staff in BHL&BMDT.
- 5> After BHL&BMDT get related information, both sides should arrange time and place to determine the non-performing products found by Customer.
- 6> BHL&BMDT should cooperate with Customer in case of special quality requirement.
- 7> After confirmed by both side, BHL&BMDT should be responsible for the defect part caused by our quality problem. BHL&BMDT take back the confirmed defect products and return normal goods to customer.
- 8> BHL&BMDT agree to provide related training of LCD product technology and usage.
- 9> Customer should use the LCD product according to the instruction. BHL&BMDT will not be responsible for the defect product caused by violation of Users' Instruction.
- 10> Both parties should deal with the quality problem under the principle of mutual consultation and cooperation. And both parties should negotiate to handle the defect products of which the cause isn't clear.

4.LCD Module Operation Instruction

4.1 Cautions for storage

- 1> Avoid hitting the LCD Panel in any way because the LCD is made of glass.
- 2> Physical status of liquid crystal will change under extrem temperature, and it can not be resumed when the temperature returns to normal. So LCD module should be stored in required temperature. Same reason, LCD module should be stored in required humidity. Low humidity may add static, while high humidity may corrode the ITO circuit of LCD product. The suitable storage environment is: temperature: 22±5°C, humidity: 55%±10%.
- 3> Avoid exposing LCD module under sunshine, strong fluorescence or ultraviolet radiation for a long time. It should be stored in dark area.
- 4> Chemical liquid is forbidden to clean the LCD, such as alcohol, acetone and IPA. Because all of these can do damage to the LCD. Water on the LCD surface must be cleaned as soon as possible, or it will cause POL color change or other defect.
- 5> LCD products should be stored in static-protective polythene bag under certain requirement.

4.2 Cautions for installing and assembling

- 1> Please make sure that operators wear static-protective bands correctly and working tables are effectively grounded during operation.
- 2> Please place LCD module on the tray provided by BHL&BMDT while moving it, in order to avoid mechanical damage. Hold the module's side frames to avoid damage during moving. Please move and assemble LCD very carefully during assembly, and avoid pushing or twisting it.
- 3> Avoid disassembling LCD module or damage the FPC or permanent defect may happen.
- 4> Avoid cleaning the LCD surface with hard materials. Please clean LCD with Air-gun or very soft cloth when necessary. The protective film on the POL is prohibited to be removed until assembly, otherwise, dust, spit or other foreign matter may fall on the LCD surface. After the protective film is removed, only air-gun can be applied to remove any dust or foreign matter. Fingure or cloth MUST NOT be used in such cases.
- 5> Avoid twisting, disassembling, squeezing or hitting the PCB. It will damage the circuit or component on PCB and cause functional defect.
- 6> Please use the connector according to the instruction provided by BHL&BMDT.
- 7> Please place dual module with the sub-panel upward. Trays should be placed in contrary direction. An empty tray should be placed on the top.
- 8> Sealing operation on PCB must be very careful to avoid short or cutting the original circuit on PCB. Otherwise, permanent damage to the LCD may happen.
- 9> Please take great care to use connector. Defect caused by wrong or careless operation on Customer side are not within the compensation range.

4.3 Cautions for operation

- 1> Avoid adding direct DC or high voltage to LCD panel. It will cause functional damage to the LCD or shorten the life of LCD product.
- 2> LCD may respond slowly or display abnormally in extrem temperature (lower than -20°C or higher than 50°C). But this doesn't mean LCD functional defect. LCD will display normally in regular temperature. Therefore, avoid using LCD product in extrem temperature.
- 3> Avoid pushing the display area of LCD panel which may cause abnormal display. This doesn't mean LCD functional defect, neither. LCD will display normally in regular temperature.
- 4> Electrical inspection for LCD product is carried out by using mobile phone provided by Customer. Special test equipment could be applied under mutual consent.

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