INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer:	LGE
Customer P/N:	EAJ62647601
Model:	PJ035IA-02P
Model No.:	GP0350IA00720
Date:	2014/1/8
Revision	1.0

For Customer's Acceptance

Approved by	Comment

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1 Record of revisions

Date	Section	Change
2014.01.8	1.0	Draft version

2 GENERAL DESCRIPTION

2.1 Technical Overview

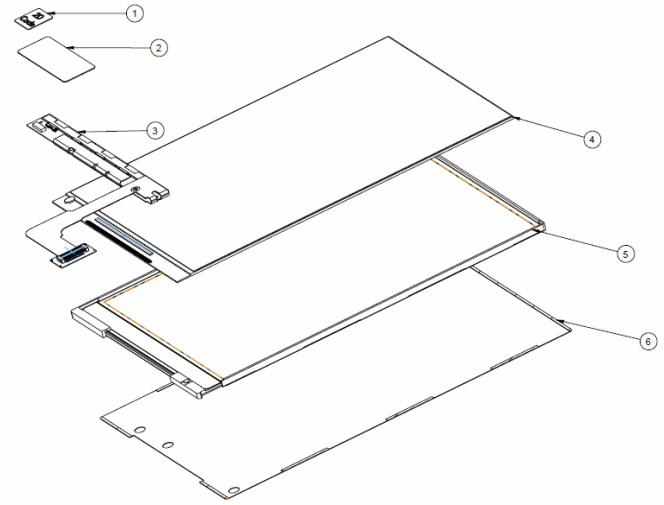
No	Item	Specification	Unit	Remark
1	LCD Size	3.5”	inch	-
2	Panel Type	a-Si TFT active matrix	-	-
3	Resolution	320 x RGB x 480	pixel	-
4	Display Mode	Normally Black, Transmissive	-	-
5	Display Number of Colors	262k/18 bit	-	-
6	Viewing Direction	Free	-	Fig.1
7	Viewing Angle	80/80/80/80	-	-
8	Contrast Ratio	700:1 (typ.)	-	-
9	Luminance	300 typ.	cd/m2	-
10	Module Size	53.1(W) x82.9(L) x 1.73 (T)	mm	Note 1
11	Panel Active Area	48.96(W) x 73.44(L)	mm	Note 1
12	Pixel Pitch	51 (W) x 153(L)	um	-
13	Driver IC	ILI9488	-	-
14	Light Source	5 white LED	-	-
15	Interface	MIPI	-	-
16	Operating Temperature	-20~70	℃	-
17	Storage Temperature	-30~80	℃	-

Note 1: Refer to mechanical drawing.

2.2 Abbreviation

Abbreviation	Explanation
TFT	Thin Film Transistor
α-TFT	Amorphous silicon TFT
WVF	Wide View angle Film
LCM	Liquid Crystal Module
ESD	Electrostatic Discharge
GND	Ground
RGB	Red Green Blue
CPU	Central Processor Unit
CR	Contrast Ratio
COF	Chip On Foil
COG	Chip On Glass
FPC	Flexible Printed Circuit, also known as flex
I/F	Interface
IC	Integrated Circuit
ITO	Indium-Tin-Oxide
LCD	Liquid Crystal Display
LED	Light Emitting Diode
ZIF	Zero Insert Force

2.3 Structure breakdown



No.	Name
1	2D code label
2	Pull tape
3	Main FPC
4	Panel Module
5	Back Light Unit
6	PET film

Figure 2.1 Exploded view of the display parts

No.	Name	Part name	Maker	Amount
1	LCD Module	GP0350IA00720	Innolux	1
2	Panel	9430M0350061N	Innolux	1
3	BLU	4506M0002C00N	Innolux	1
4	FPCa	6A01B000KW000	Three Gold Precise	1
5	IC	6101B000LC000	Ilitek	1

2.4 TFT cell

Parameter	Value
Graphic Format	320 x RGB x 480
LCD glass outer dimensions	51.96 x 80.22 x 0.5mm
Active Area	48.96(W) x 73.44(L) mm
Pixel pitch	51(W) x 153(L) um
Illumination mode	Transmissive
Image mode	Normally black
Optimal viewing direction	80/80/80/80

2.4.1 Polarizer

Parameter	Value
Polarizer upper	132 um (Hard Coating)
Polarizer lower	132 um (add Ag)
Polarizer Supplier	Nitto
Polarizer type	NPFTEGQ1465DUHC (upper polar) NPFTEGQ1465DUAGS1 (lower polar)

2.4.2 Glass

Parameter	Value
Glass Thickness	0.25mm
Colour filter alignment	RGB Vertical stripe, see Figure 2.2

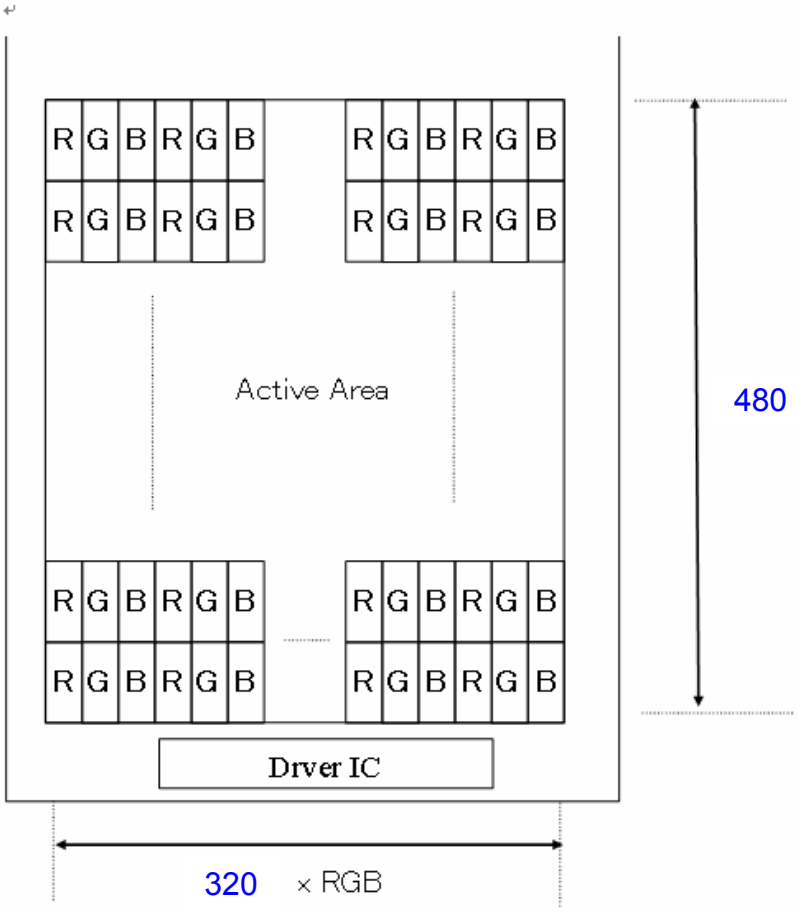


Figure 2.2 Colour filter alignment (front view)

2.4.3 Liquid Crystal

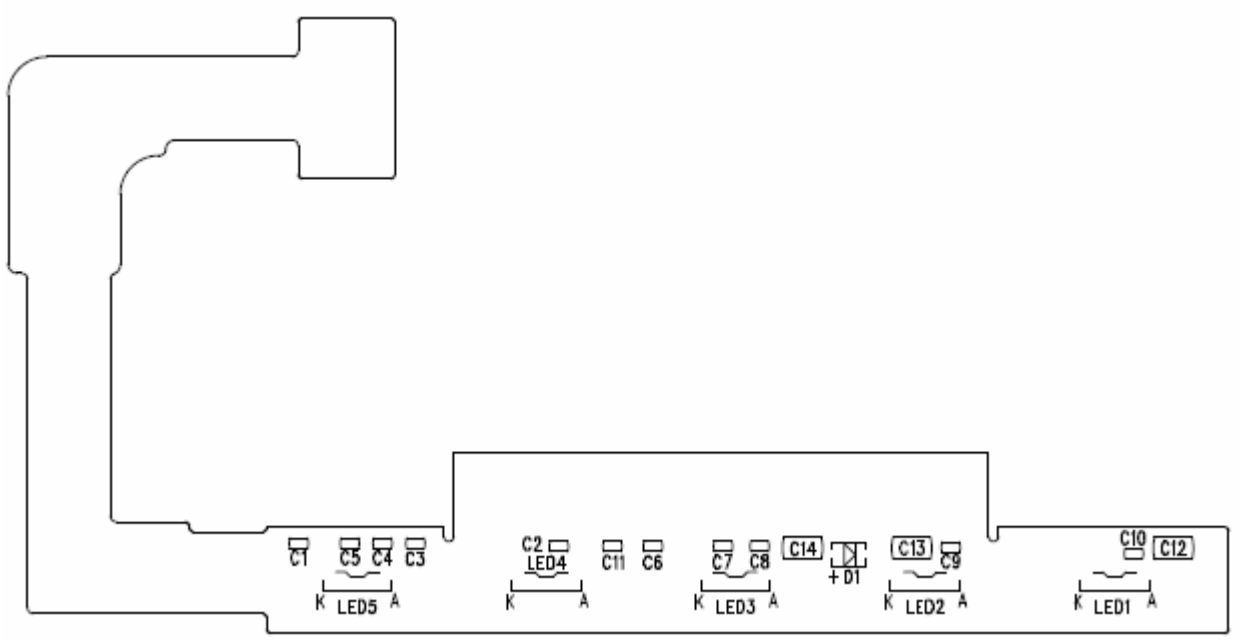
Parameter	Value
Toxicity	Pass SGS & RoHS test

The Liquid Crystal is classified as moderately toxic. It must have no negative biological long-term effects. The Liquid Crystal shall be biodegradable.

2.5 Display Driver Chip

The display driver chip is mounted directly onto the glass substrate by COG technology.

2.6 FPCB Part list



NO	Part Name & Description	Maker P/N	Reference	Qty
1	C-0105KACA , 1uF		C12	1
2	C-0105KADAZZD , 1uF	CL05A105KA5NQNC	C13-14	2
3	C-0105MMBAO , 1uF	CL03A105MP3NSNC	C1-11	11
4	CON-B0H0024C167 , 24 Pin	GB042-24P-H10-E3000	J6	1
5	DIO-AH0000 , If=1mA,Vf=0.33V	HSC226	D1	1
6	FOG-ILI9488-PJ035IA-02P-R-199 , 199 pin / R	ILI9488	GF2	1
7	LED-0D0000064	3806C-W3M1	LED1-5	5

2.7 Backlight Part List

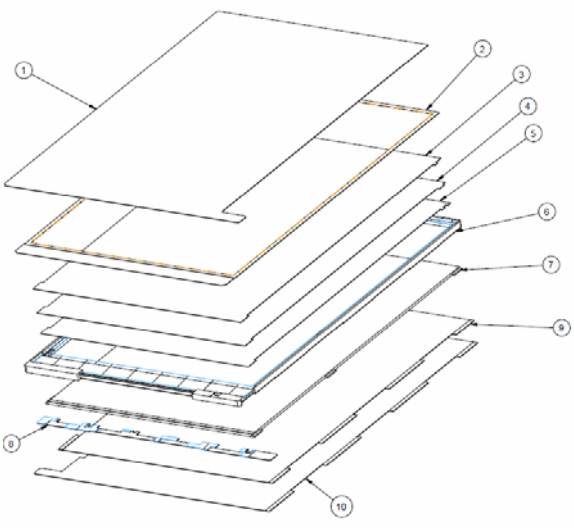
The backlight consists of 5 white LEDs shining into a light guide. The even illuminated area covers at least the LCD active area.

2.7.1 White LEDs

The Backlight system uses 5 LEDs serial connected. The LEDs are bonded to the BL FPC, which is soldering on the LCD FPC.

Parameter	Value
LED luminous rank	W650~W700
LED colour rank	Sa52-Sa62
LED Brightness	Min 6.50 lm, Max 7.25 lm
Number of LED	5 LEDs
LED Part Number	AOT 3806C-W3M1
Innolux P/N	4301B000J6000
LED Vendor	AOT
Light-guide thickness	0.55-0.53 mm
BEF	2 BEFs

2.7.2 Exploded view of the Backlight



No	Part Name	Supplier	Type	Q'ty
1	Protective film			
2	Rim tape	Nitto	Nitto 56805BK	1
3	Lens sheet	3M	TBEF2-GM v2	1
4	Lens sheet	3M	TBEF2-GT	1
5	Diffusion sheet	TSUJIDEN	D163P2SIV	1
6	Mold frame		URC2500	1
7	Light-guide		HL-4000	1
8	FPC tape	SEKISUI	3805BWH	1
9	Reflector	3M	3M ESR-80+ 3M 4597	1
10	Protective film			

2.8 Optical Characteristic

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR≧10	80	-	-	degree	Note 1,2
	Right	θ_R		80	-	-		
	Top	θ_T		80	-	-		
	Bottom	θ_B		80	-	-		
Response Time		$T_{on}+T_{off}$	Normal θ=Φ=0°	-	30	45	ms	Note 2,3
Contrast Ratio		CR	Normal θ=Φ=0° angle	500	700	-	-	Note 2,4
Luminance		L	Normal θ=Φ=0°	240	300	-	cd/m^2	Note 2,5
Color Chromaticity (CIE1976)	White	W_x	Normal θ=Φ=0°	0.266	0.301	0.336		Note 2,6
		W_y		0.275	0.310	0.345		
	Red	R_x		0.605	0.64	0.675		
		R_y		0.295	0.33	0.365		
	Green	G_x		0.265	0.30	0.335		
		G_y		0.565	0.60	0.635		
	Blue	B_x		0.115	0.15	0.185		
		B_y		0.025	0.06	0.095		
Color Gamut		NTSC	CIE1931	65	70	-	%	-
Luminance Uniformity		U_L	Normal θ=Φ=0°	TBD	TBD	-	%	Note 2,7
Flicker						Invisible	dB	Note 2,8
Crosstalk						Invisible	%	Note 2,9

(T_a=+25℃)

2.9 Optical Specification (Note)

Note 1: Definition of viewing angle range

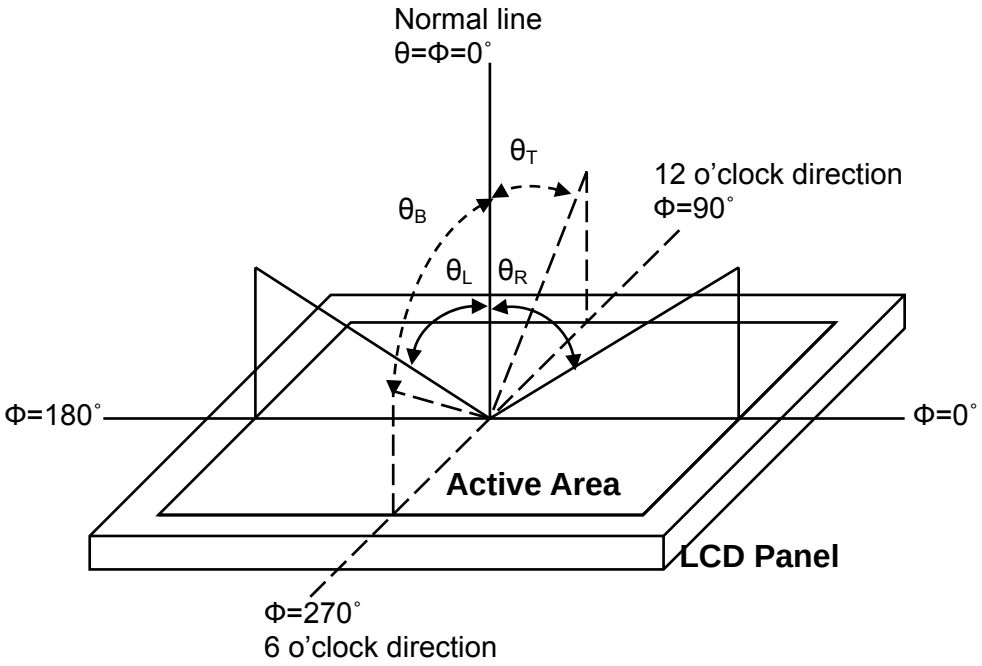


Fig. 1 Definition of viewing angle

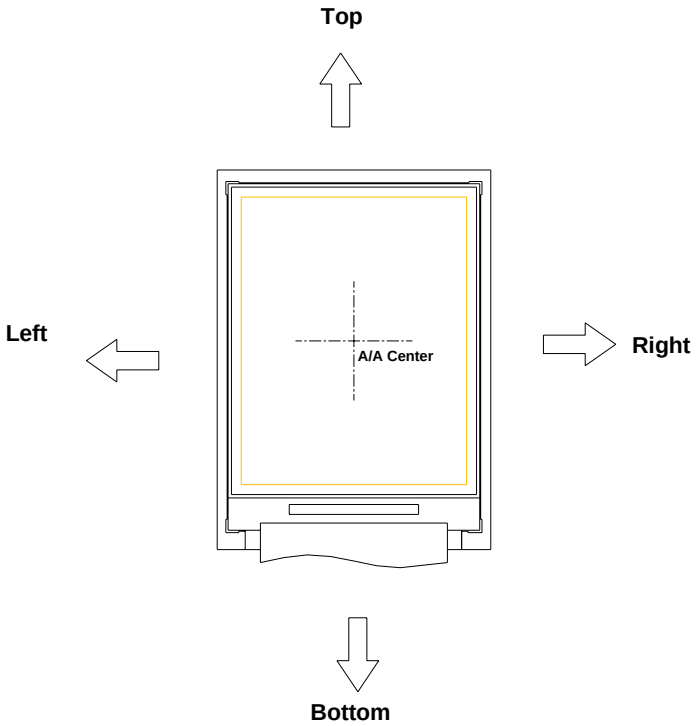


Fig. 2 Definition of viewing angle for display

Note 2: Definition of optical measurement system

The optical characteristics should be measured in a dark room and with ambient temperature T_a=+25℃.After 5 minutes operation, the optical properties are measured at the center point of the LCD screen.**(Equipment: DMS machine)**

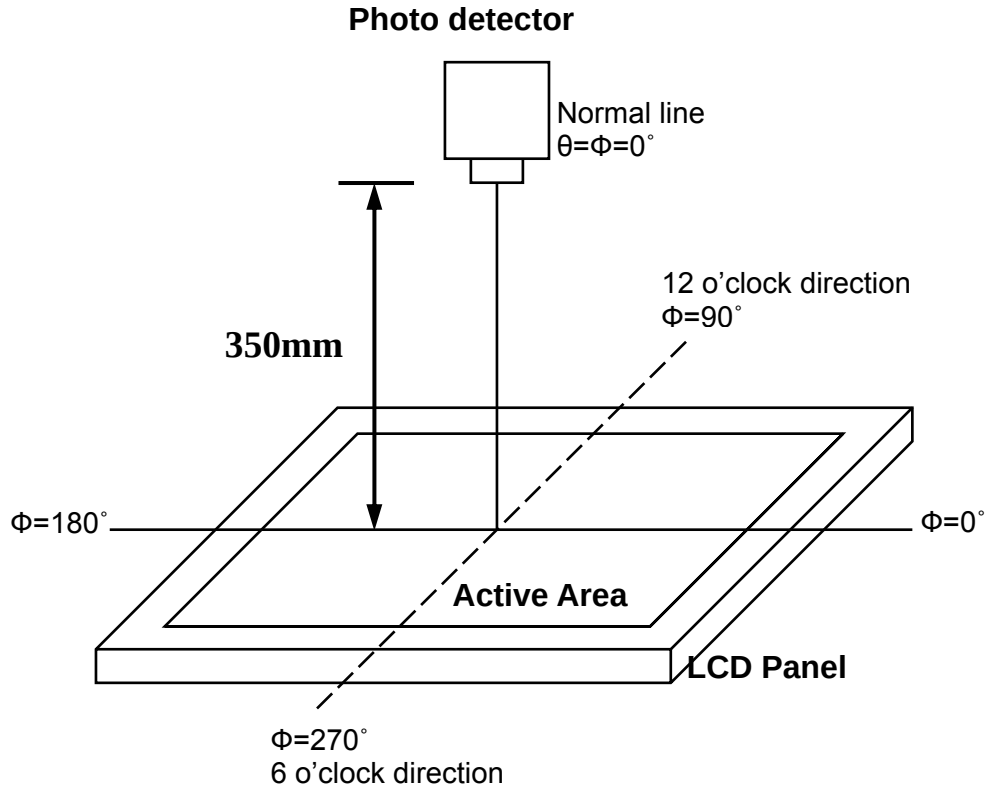


Fig. 3 Optical measurement system setup

Note 3: Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{on}) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_{off}) is the time between photo detector output intensity changed from 90% to 10%.

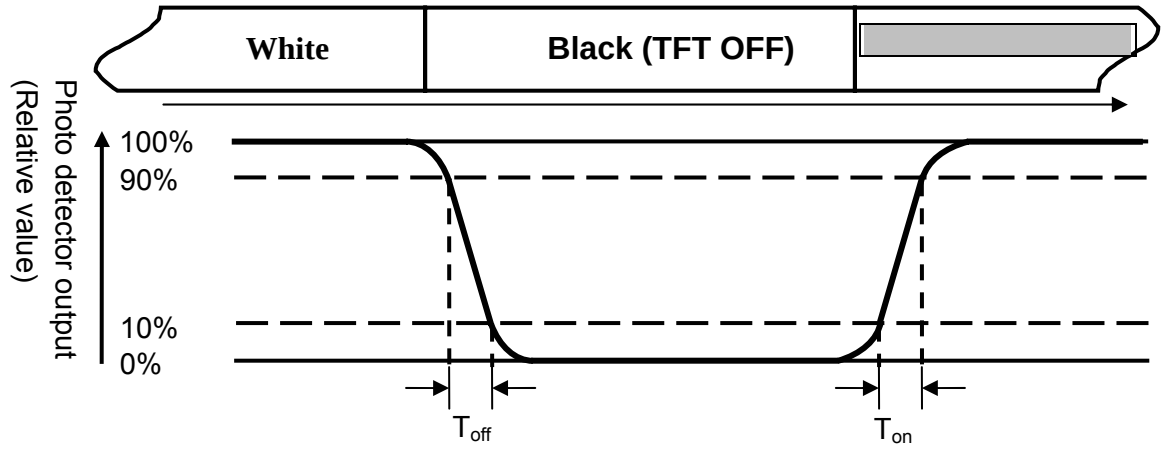


Fig. 4 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of luminance

Measured at the center area of the panel when LCD panel is driven at “white” state.

Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD when panel is driven at “White” state respectively.

Note 7: Definition of luminance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each box.

$$\text{Luminance Uniformity } (U_L) = \frac{L_{min}}{L_{max}}$$

L-------Active area length W----- Active area width

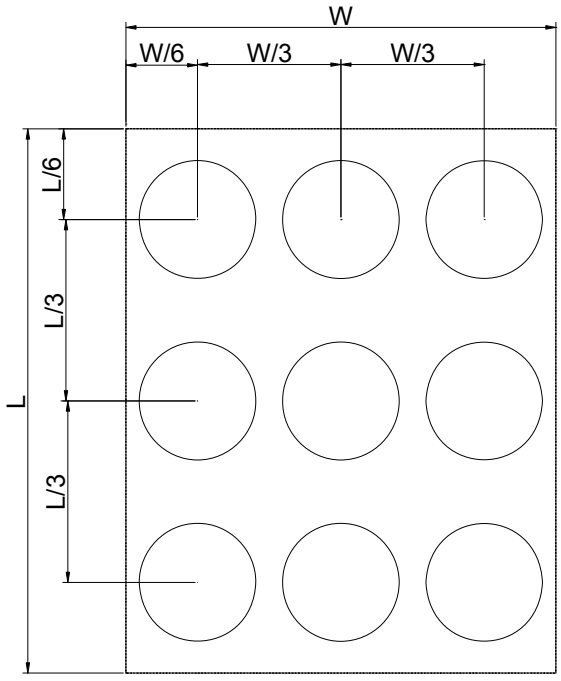


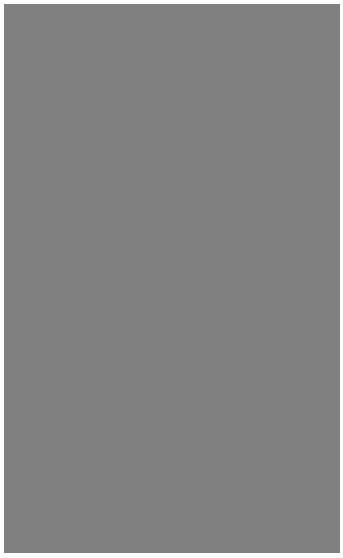
Fig. 5 Definition of luminance uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

Note 8: Definition of Flicker

Flicker is the pattern usually used to describe the visual sensation produced by a rapidly varying light intensity. (Equipment: DMS machine)

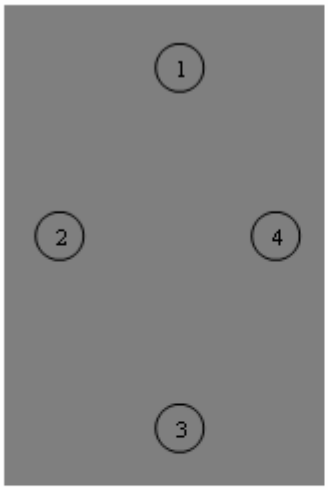


Middle gray pattern (L127)

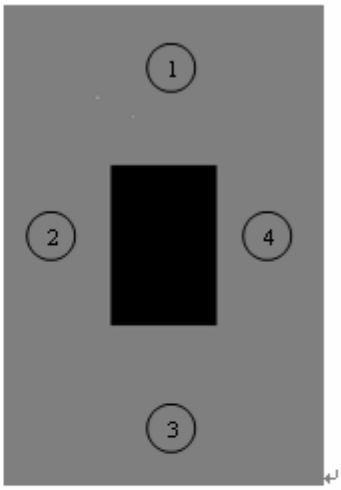
Fig.6 Flicker checker pattern

Note9: Definition of crosstalk

There should be ≦ 4 % of measured value in normal direction of the display when the following figures are loaded. (Equipment: DMS machine)



Left_L127 gray pattern



Right _L0/L127 gray pattern

Fig.7 Crosstalk checker pattern

Crosstalk(%)= (Luminance at Left pattern- Luminance at Right pattern) / Luminance at Left pattern

3 Electrical characteristics

3.1 Maximum Rating

Ta = 25℃

Item		Symbol	Value		Unit	Remarks
			Min.	Max.		
TFT	I/O Circuit Supply Voltage	VDDIO	-0.3	4.5	V	
	Analog Supply Voltage	VDD	0.3	6	V	
	Differential input voltage	CLKP/CLKN D0P/D0N, D1P/D1N	-0.3	1.8	V	
Backlight	Current	I_B	20		mA	
	Power consumption	P_{BL}	290	350	mW	

Note1: The maximum applicable voltage on any pin with respect to 0V.

Note2: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

Note3: 5 LEDs are connected in series; each LED forward current is 20mA

Note4: Where IB=20mA, PBL=IB x VBL, VBL is backlight forward voltage

The backlight module is based on 5 LEDs connected in series. The diagram below shows the maximum allowed current as function of temperature:

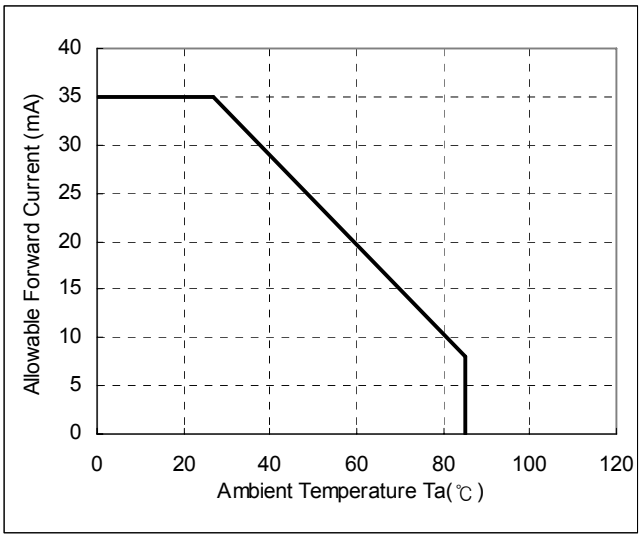


Figure 3.1 Maximum allowable Backlight LED current vs. Ta

Condition higher than the curve will shorten LED lifetime.

3.2 Electrical Characteristi

Ta = 25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
I/O Circuit Supply Voltage	IOVCC	1.5	1.8	3.3	V	
Analog Supply Voltage	VCI	2.5	2.8	3.3	V	
High-level Input Voltage	VIH	0.7*IOVCC	-	IOVCC	V	Notes1
Low-level Input Voltage	VIL	-0.3	-	0.3*IOVCC	V	Notes1
High-level Output Voltage	VOH	0.8*IOVCC	-	IOVCC	V	-
Low-level Output Voltage	VOL	0	-	0.2*IOVCC	V	-
Supply Current for LED	IF	-	20	25	mA	
Sleep Current	VCI	-	0.1	-	mA	
Frame Frequency	VCI	-	60	80	Hz	-

Note: To prevent IC latch up or DC operation in LCD panel, the power on/off sequence should follow the driver IC specification.

3.3 FPCa in Assignment

No.	Symbol	Description
1	GND	Ground(0V)
2	STB_CLKP	MIPI Clock Lane
3	STB_CLKN	MIPI Clock Lane
4	GND	Ground(0V)
5	DATA0P	MIPI DATA Lane
6	DATA0N	MIPI DATA Lane
7	GND	Ground(0V)
8	VCC	Analog Voltage
9	GND	Ground(0V)
10	IOVCC	IO Voltage
11	LED-	LED Cathode Connection
12	LED+	LED Anode Connection
13	GND	Ground(0V)
14	RESET	RESET_SIGNAL
15	GND	Ground(0V)
16	LED_PWM	LED_PWM
17	GND	Ground(0V)
18	VSYNC_OUT	Tearing Effect output signal
19	N/A	N/A customer not use, open
20	GND	Ground(0V)
21	GND	Ground(0V)
22	GND	Ground(0V)
23	Maker ID	INNOLUX is logic High potential (IO Voltage)
24	GND	Ground(0V)

3.4 Block Diagram

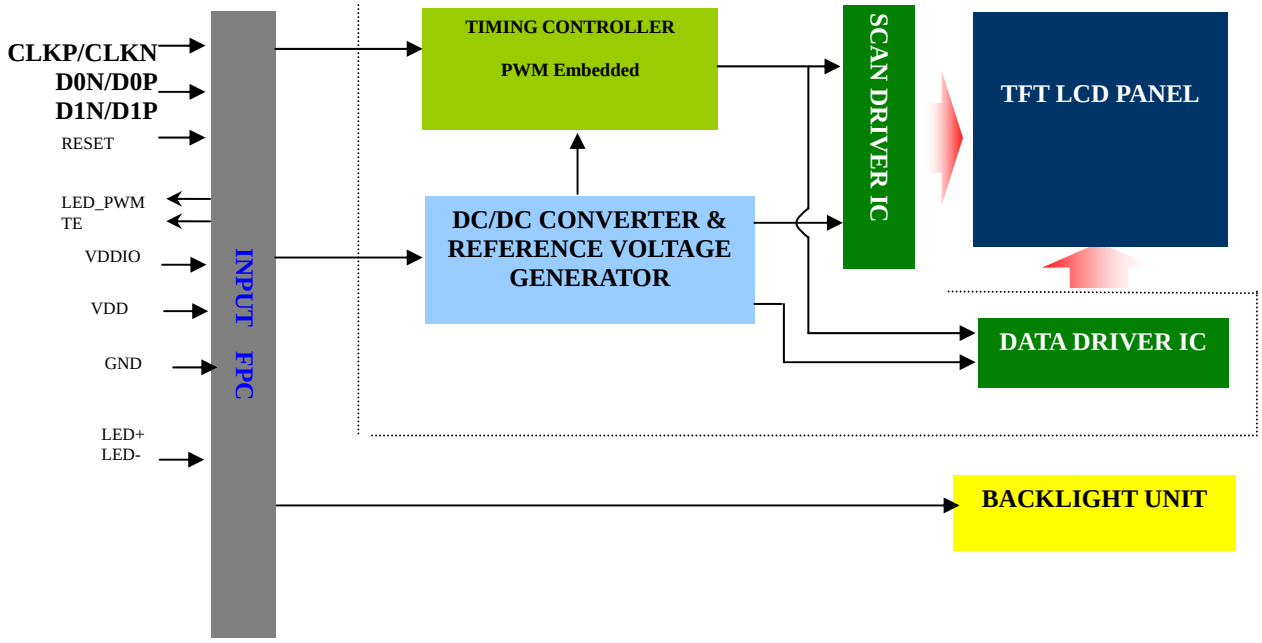
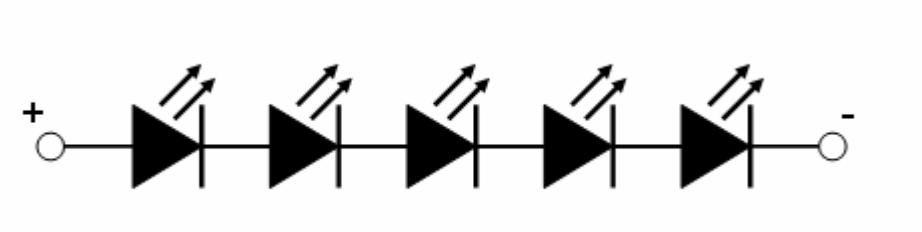


Figure 3.1 Block Diagram

3.5 Backlight Unit

The backlight system is an edge lighting type with 5 white LEDs



Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current	IB	-	20	-	mA	Note 1
Power Consumption	PBL	-	320	-	mW	Note 2

Note1: 5 LEDs are connected in parallel; each LED forward current is 20mA.
Note2: Where IB=20mA, PBL = IB x VBL, VBL is backlight forward voltage.

3.6 LED Specification

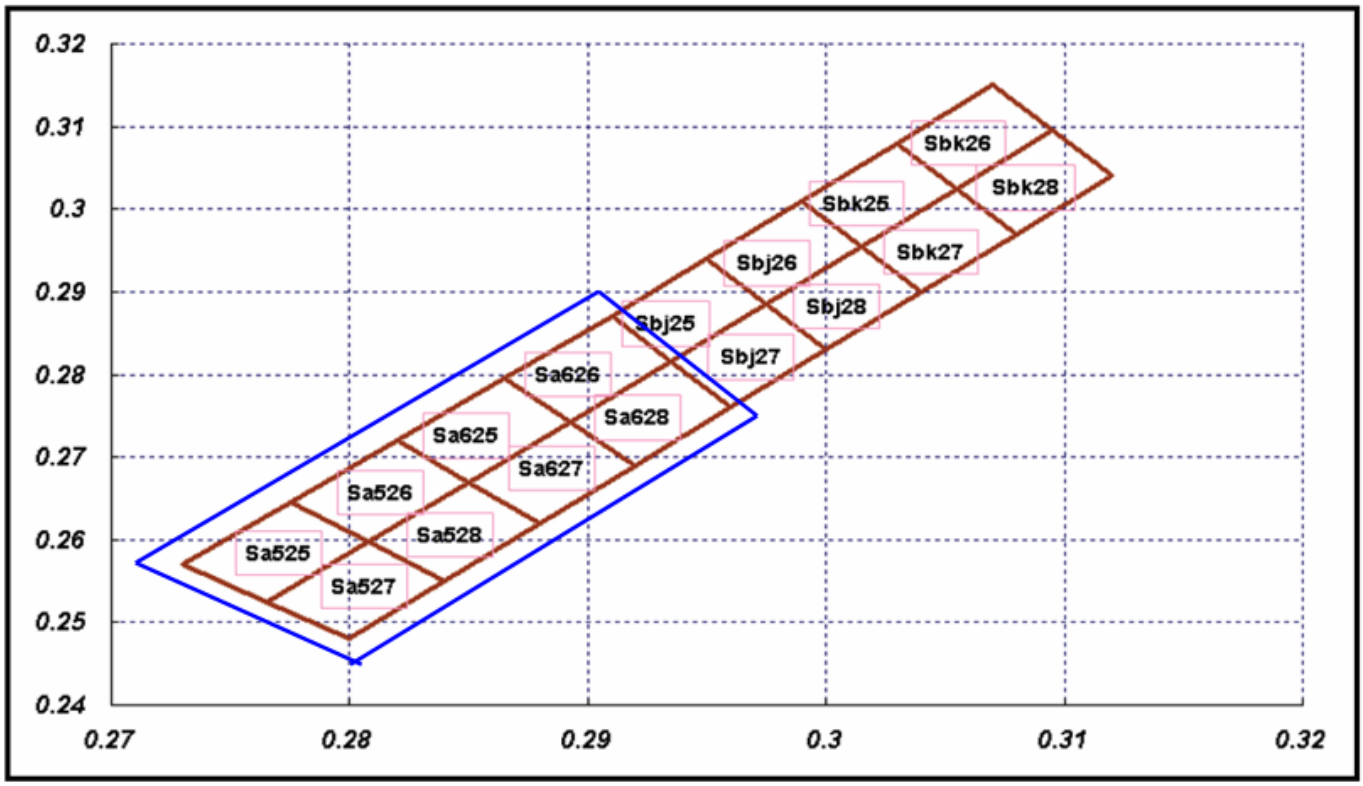
3.6.1 Absolute maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	IF	30	mA
Pulse Forward Current	IFP	100	mA
Reverse Voltage	VR	5	V
Power Dissipation	PD	105	mW
Operating Temp.	TOPR	-30 to 85	°C
Junction Temp.	TJ	90	°C
Storage Temp.	TSTG	-40 to 100	°C

3.6.2 Initial Electrical/Optical Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF = 20mA	2.9	-	3.4	V
Reverse Current	IR	VR = 5V	-	-	50	uA
Luminous Intensity	IV	IF = 20mA	2280	-	2580	mcd
Chromaticity Coordinate	CX	C2S/E2S	0.273	-	0.296	-
	CY		0.248	-	0.287	-
Viewing Angle	$2\theta 1/2$	-	120			Deg.

3.6.3 Rank



Sa525	0.2775	0.2645	Sa526	0.2820	0.2720	Sa527	0.2765	0.2525
	0.2730	0.2570		0.2775	0.2645		0.2808	0.2598
	0.2765	0.2525		0.2808	0.2598		0.2840	0.2550
	0.2808	0.2598		0.2850	0.2670		0.2800	0.2480
Sa528	0.2808	0.2598	Sa625	0.2865	0.2795	Sa626	0.2910	0.2870
	0.2850	0.2670		0.2820	0.2720		0.2935	0.2815
	0.2880	0.2620		0.2850	0.2670		0.2893	0.2743
	0.2840	0.2550		0.2893	0.2743		0.2865	0.2795
Sa627	0.2850	0.2670	Sa628	0.2935	0.2815			
	0.2893	0.2743		0.2960	0.2760			
	0.2920	0.2690		0.2920	0.2690			
	0.2880	0.2620		0.2893	0.2743			

3.7 Timing Characteristics

3.7.1 High Speed Mode – Clock Channel Timing

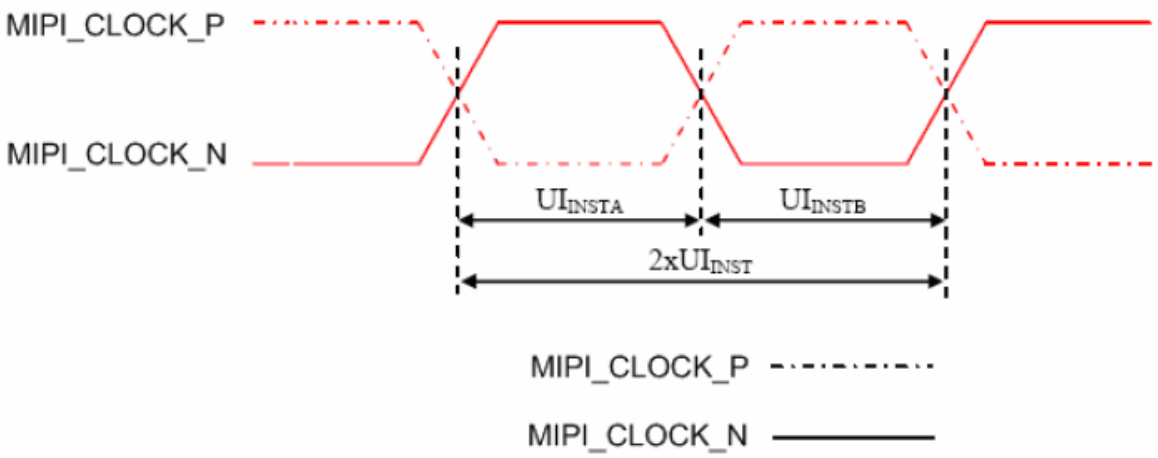


Figure 147: DSI Clock Channel Timing

Table 44: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
MIPI_CLOCK_P/N	$2xUI_{INST}$	Double UI instantaneous	4	25	ns
MIPI_CLOCK_P/N	UI_{INSTA}, UI_{INSTB} (Note 1)	UI instantaneous Half	2 (Note 2)	12.5	ns

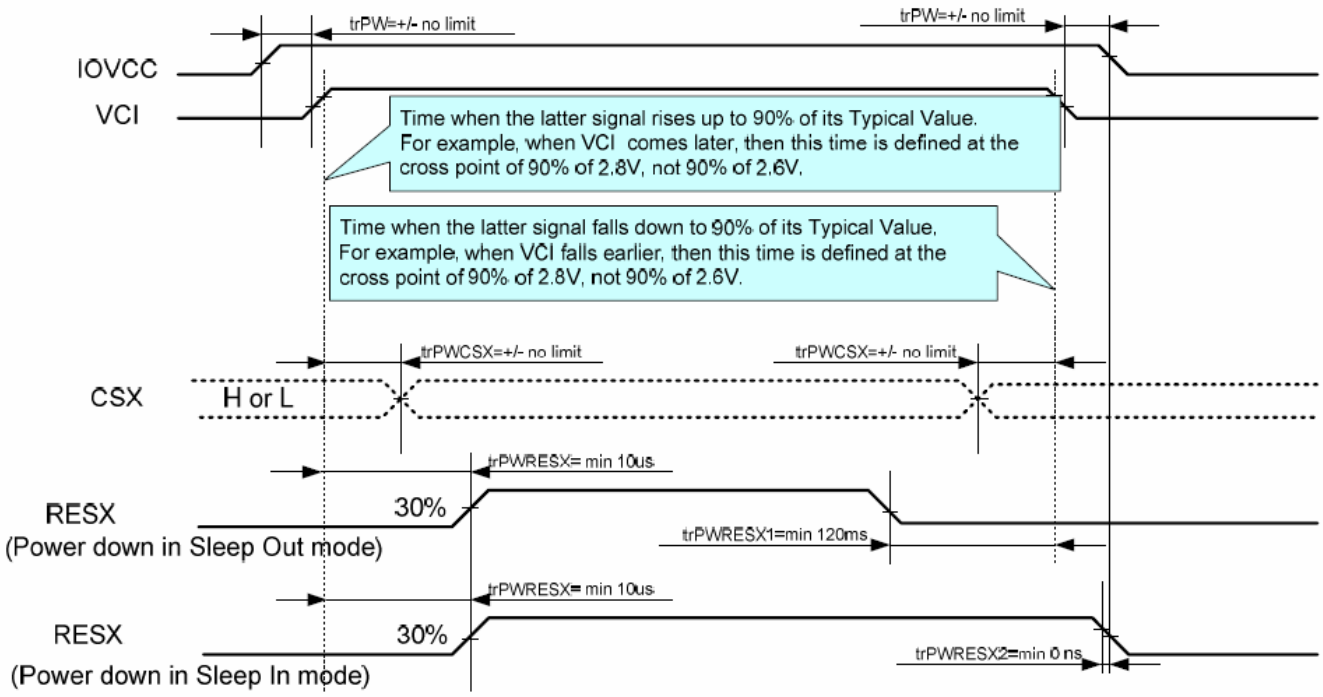
Notes:

1. UI = UIINSTA = UIINSTB
2. See Table 45 for the minimum value of 24 UI per Pixel.

Table 45: Clock Channel Speed Limited

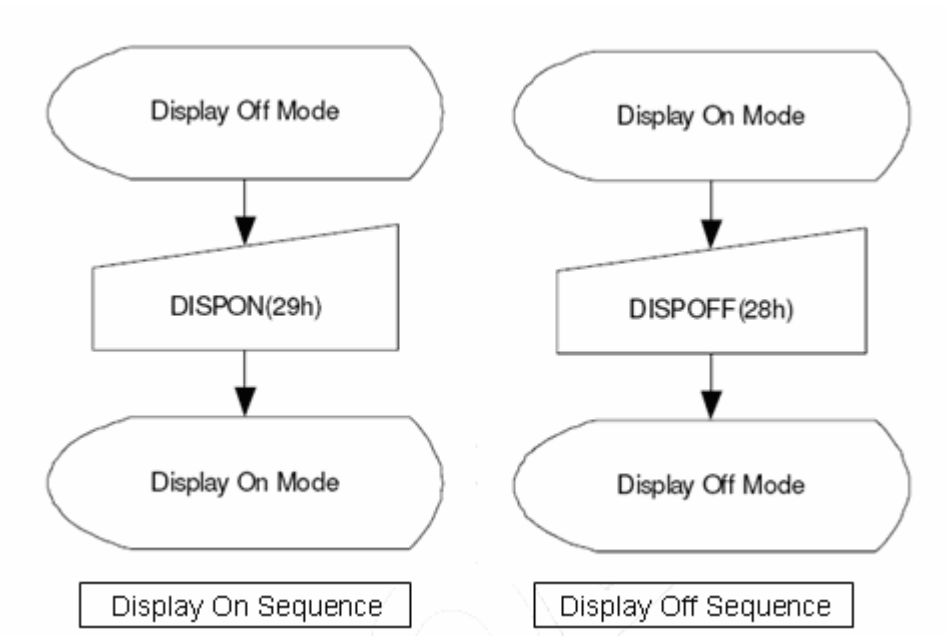
Data type	One Lanes speed	Unit
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	500M	bps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	500M	bps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	500M	bps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	500M	bps

3.8 Power on Sequence



trPWRESX1 is applied to RESX falling in the Sleep Out Mode
trPWRESX2 is applied to RESX falling in the Sleep In Mode

3.9 Display On /Off Sequence



3.10 Initial Sequence

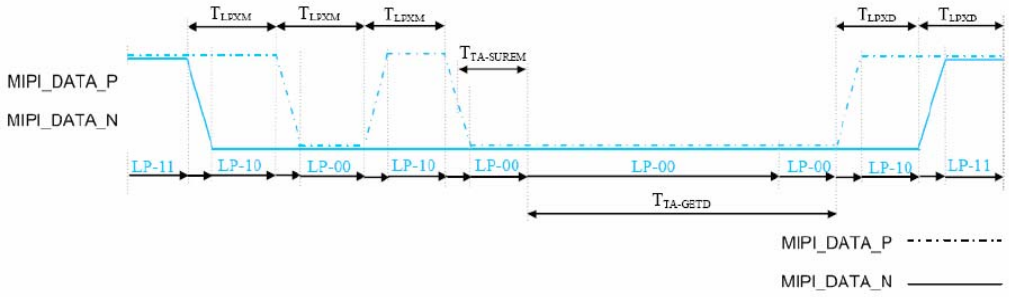
```
void ILI9488_MIPI_Initial_Code()                    // Command mode
{
        Display_Message("Initial Driver...\n");
        Wait(15);


        // Gamma 1227

        MIPI_Command_Gen15(0xE0,0x00,
                                        0x05,
                                        0x08,
                                        0x00,
                                        0x06,
                                        0x04,
                                        0x31,
                                        0x49,
                                        0x4B,
                                        0x0C,
                                        0x16,
                                        0x0E,
                                        0x23,
                                        0x24,
                                        0x0F);
        Wait(20);
        MIPI_Command_Gen15(0xE1,0x00,
                                        0x13,
                                        0x1C,
                                        0x02,
                                        0x10,
                                        0x06,
                                        0x3A,
                                        0x41,
                                        0x56,
                                        0x0B,
                                        0x15,
                                        0x0F,
                                        0x3E,
                                        0x3B,
                                        0x0F);
        Wait(20);

        MIPI_Command_Gen16(0xE2,                                    //Three gamaa control 1
                                0xA0,0xA0,0xA0,0xA0,
                                0xA0,0xA0,0xA0,0xA0,
                                0xA0,0xA0,0xA0,0xA0,
                                0xA0,0xA0,0xA0,0xA0);
```

```
MIPI_Command_Gen64(0xE3,                                    //Three gamaa control 2
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00,
                                    0x00,0x00,0x00,0x00);

MIPI_Command_Gen1(0x53,0x00);                   // CABC off
Wait(15);

MIPI_Command_Gen2(0xC0,0x13,0x13);              // power setting 1

Wait(15);

MIPI_Command_Gen1(0xC1,0x41);                 // power setting 2
Wait(15);



MIPI_Command_Gen1(0x21,0x00);
Wait(15);
MIPI_Command_Gen1(0x36,0x08);                   // Memory Access control
Wait(15);
MIPI_Command_Gen1(0x3A,0x66);                   // Memory Access control
Wait(15);
MIPI_Command_Gen1(0xB0,0x00);                   // power setting 3
Wait(15);

MIPI_Command_Gen1(0xB1,0xA0,10);                // Frame rate in normal mode
Wait(15);
MIPI_Command_Gen1(0xB4,0x00);                   // Column inversion

Wait(15);

MIPI_Command_Gen3(0xB6,0x02,0x42,0x3B);             //Tovis panel initial code
Wait(15);
```

```
   MIPI_Command_Gen4(0xF7,0xA9,0x51,0x2C,0x82);
Wait(20);
MIPI_Command_Gen2(0xF8,0x21,0x06);
Wait(20);

MIPI_Command_DCS(0x11);                          //Sleep Out must wait by 5ms.
Wait_Halt(130);
Into_HS();
WriteFpgaReg(cRgbCtrlReg,0x03);          //   Open RGB memory write.....
Display_Bitmap(PJ035IA_02P,FullBlack);
Wait_Halt(50);

MIPI_Command_DCS(0x29);                          //Display ON
Wait_Halt(15);

SetBridge_com(0xB7,0x020B);
Wait(15);
Display_Message("HS command!!\n");
Display_Message("Initial_CMD finish\n");
Wait_Halt(10);          }
```

3.11 Write Sequence

Low Power Mode and its State Periods on the Bus Turnaround (BTA) from the MCU to the display module (ILI9488) sequence are illustrated below for reference purpose.



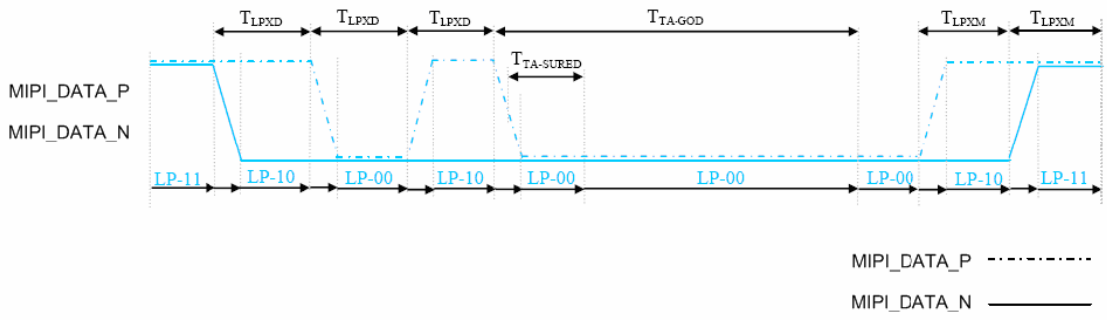
BTA from the MCU to the Display Module

Table 47: Low Power State Period Timings – A

Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MCU ➔ Display Module (ILI9488)	50	75	ns
Output (MIPI_DATA_P/N)	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module (ILI9488_ ➔ MCU)	50	75	ns
Input (MIPI_DATA_P/N)	$T_{TA\text{-}SUREM}$	Time-out before the ILI9488 starts driving	T_{LPXM}	$2xT_{LPXM}$	ns
Output (MIPI_DATA_P/N)	$T_{TA\text{-}SURED}$	Time-out before the MCU starts driving	T_{LPXD}	$2xT_{LPXD}$	ns

3.12 Read Sequence

Low Power Mode and its State Periods on the Bus Turnaround (BTA) from the display module (ILI9488) to the MCU sequence are illustrated below for reference purpose.



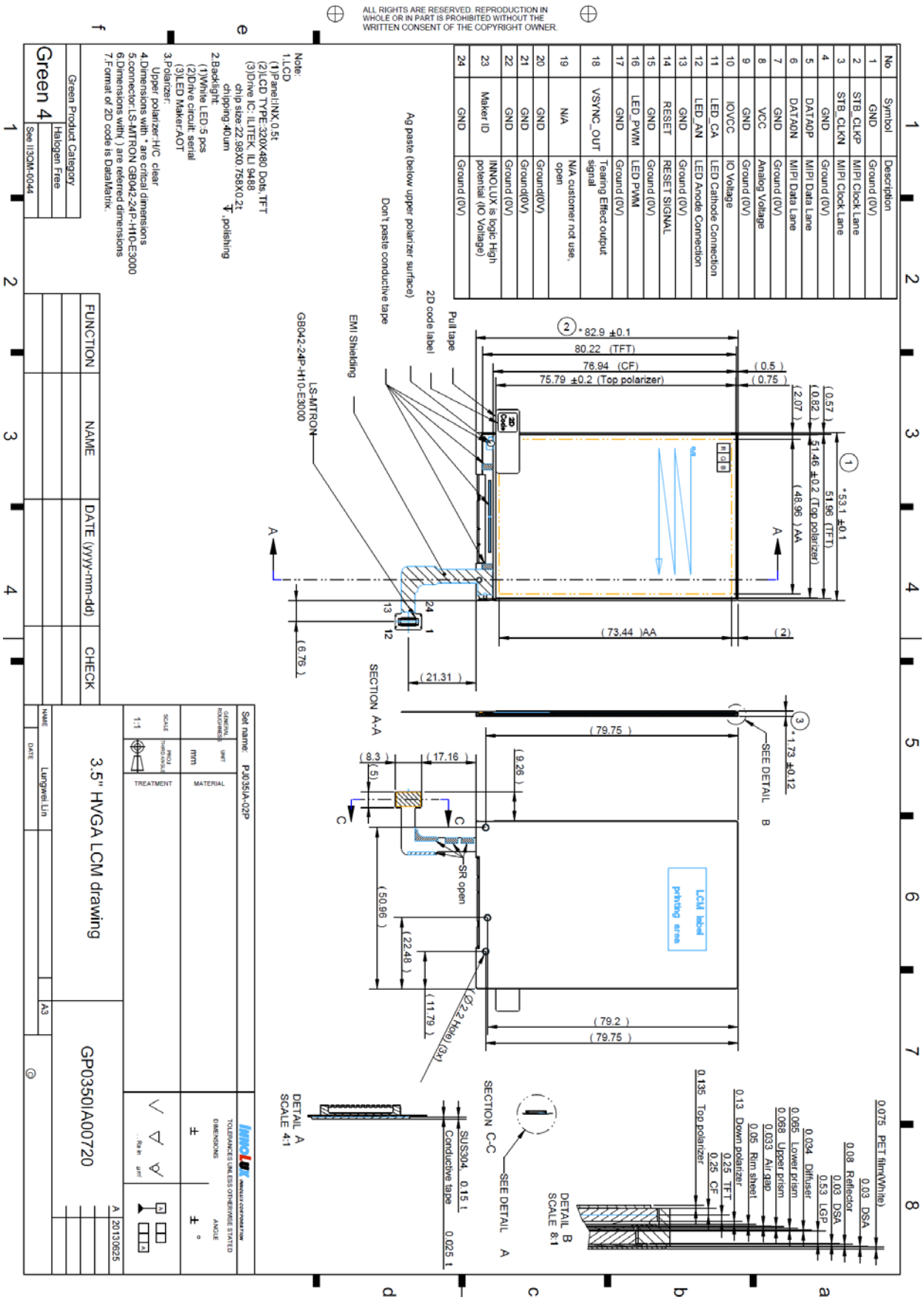
BTA from the Display Module to the MCU

Table 48: Low Power State Period Timings – B

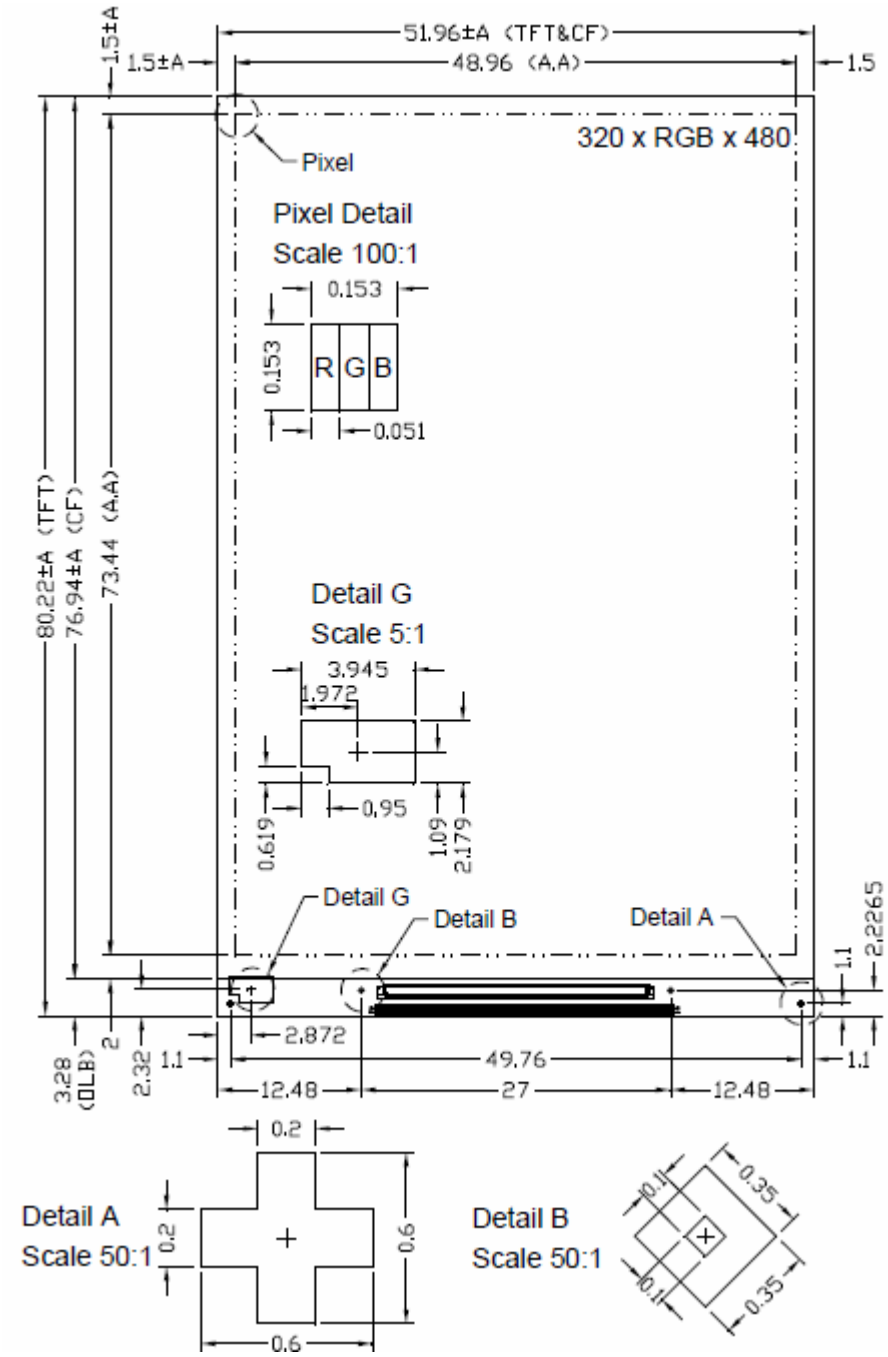
Signal	Symbol	Description	Time	Unit
Input (MIPI_DATA_P/N)	$T_{TA\text{-}GETD}$	Time to drive LP-00 by the ILI9488	$5xT_{LPXD}$	ns
Output (MIPI_DATA_P/N)	$T_{TA\text{-}GOD}$	Time to drive LP-00 after turnaround request – MCU	$4xT_{LPXD}$	ns

4 Mechanical Drawing

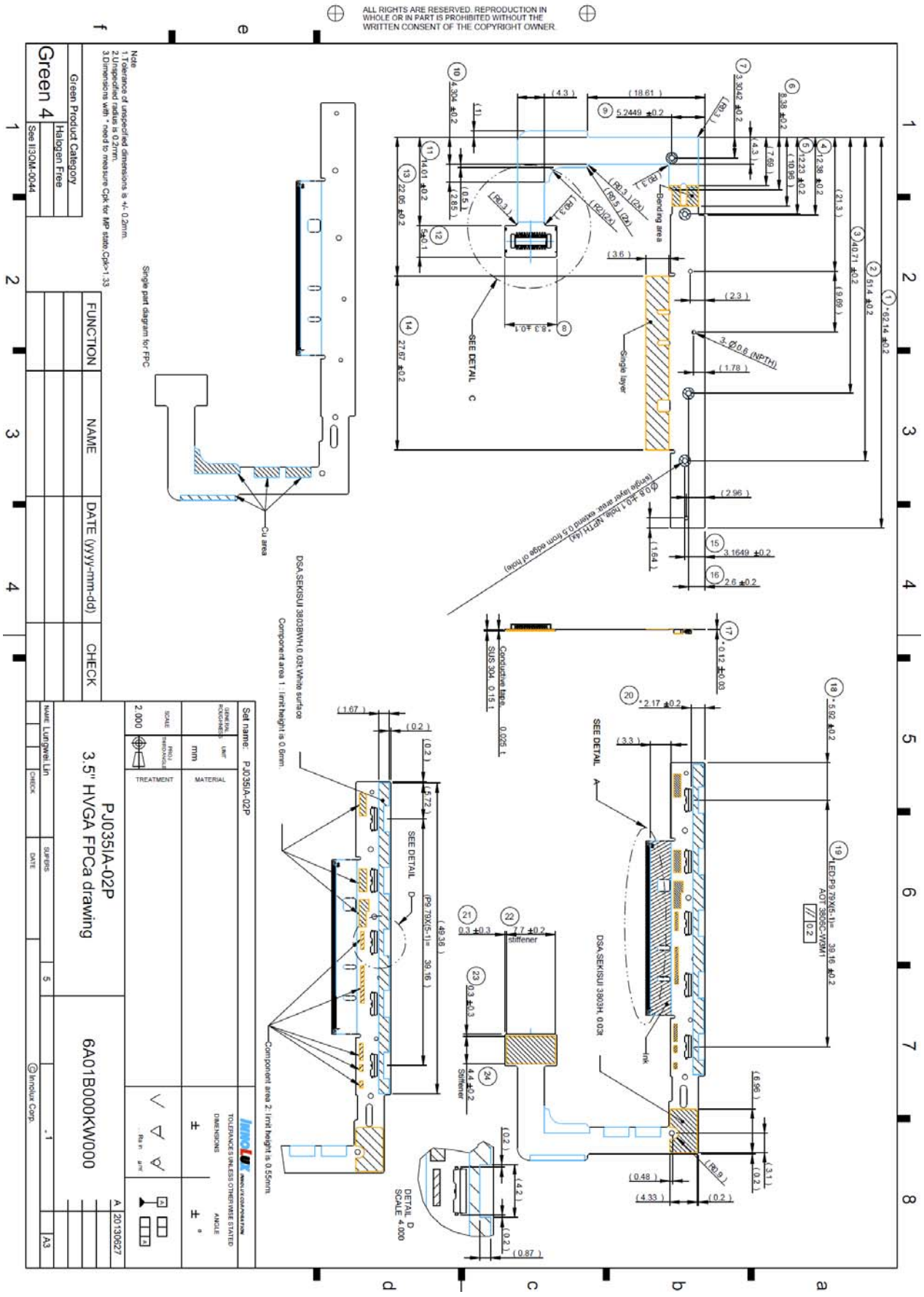
4.1 Module

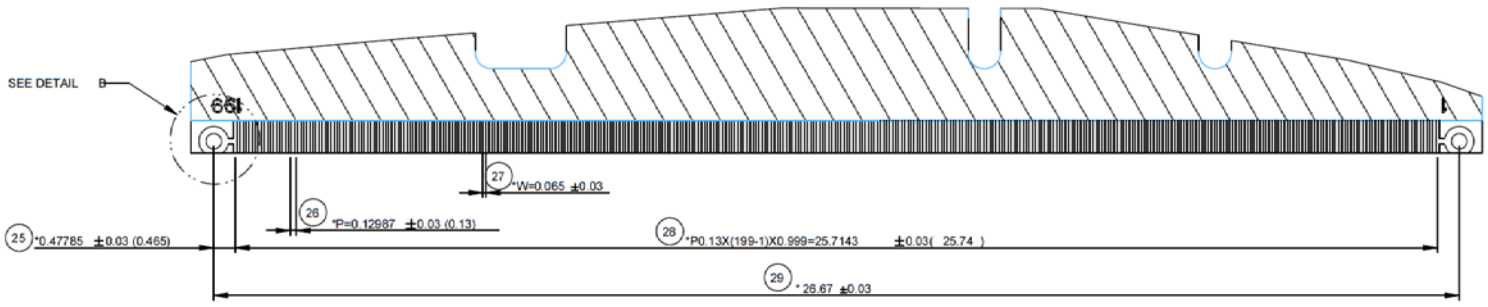


4.2 Panel outline

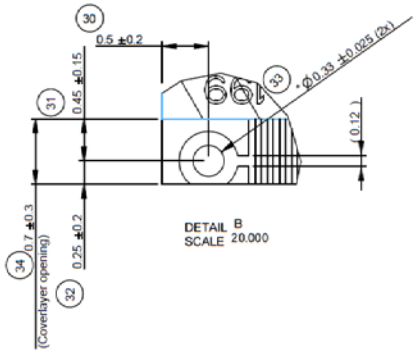


4.3 FPCa Drawing



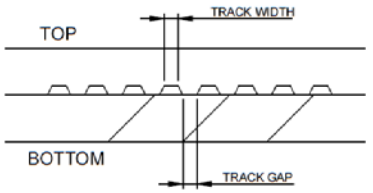


DETAIL A
SCALE 10.000



DETAIL B
SCALE 20.000

REFERENCE VIEW
TRACK / GAP MEASUREMENT



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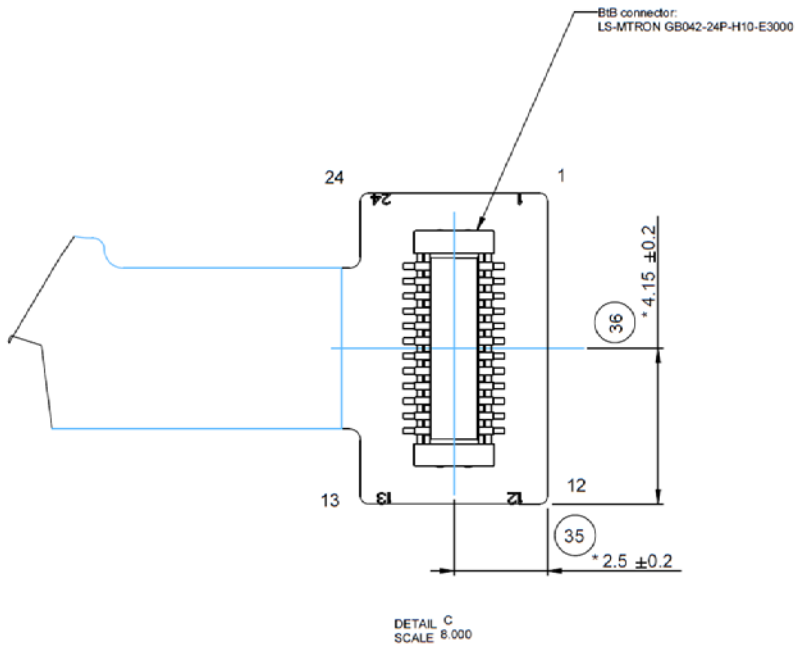
Set name: PJ035IA-02P			INNOLUX CORPORATION
GENERAL ROUGHNESS	UNIT: mm	MATERIAL	TOLERANCES UNLESS OTHERWISE STATED: DIMENSIONS ± / ANGLE ± °
SCALE 1.000	PROJ THIRD-ANGLE	TREATMENT	..Ra in μm

PJ035IA-02P 3.5" HVGA FPCa drawing		6A01B000KW000	A 20130627
NAME Lungwei.Lin	SUPERS 5	- 2	A3
CHECK	DATE	© Innolux Corp.	

Green Product Category	
Green 4	Halogen Free
	See II3QM-0044

FUNCTION	NAME	DATE (yyyy-mm-dd)	CHECK



No	Symbol	Description
1	GND	Ground (0V)
2	STB_CLKP	MIPI Clock Lane
3	STB_CLKN	MIPI Clock Lane
4	GND	Ground (0V)
5	DATA0P	MIPI Data Lane
6	DATA0N	MIPI Data Lane
7	GND	Ground (0V)
8	VCC	Analog Voltage
9	GND	Ground (0V)
10	IOVCC	IO Voltage
11	LED_CA	LED Cathode Connection
12	LED_AN	LED Anode Connection
13	GND	Ground (0V)
14	RESET	RESET SIGNAL
15	GND	Ground (0V)
16	LED_PWM	LED PWM
17	GND	Ground (0V)
18	VSYNC_OUT	Tearing Effect output signal
19	N/A	N/A customer not use, open
20	GND	Ground(0V)
21	GND	Ground(0V)
22	GND	Ground (0V)
23	Maker ID	INNOLUX is logic High potential (IO Voltage)
24	GND	Ground (0V)

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Set name: PJ035IA-02P

INNOLUX CORPORATION

GENERAL ROUGHNESS | UNIT: mm | MATERIAL | TOLERANCES UNLESS OTHERWISE STATED | DIMENSIONS ± | ANGLE ± °

SCALE 1.000 | PROJ THIRD ANGLE | TREATMENT | Ra in μm

PJ035IA-02P
3.5" HVGA FPCa drawing

6A01B000KW000

A 20130627

Green Product Category	
Green 4	Halogen Free
	See II3QM-0044

FUNCTION	NAME	DATE (yyyy-mm-dd)	CHECK

NAME Lungwei.Lin | SUPERS | 5 | _3 | A3

CHECK | DATE

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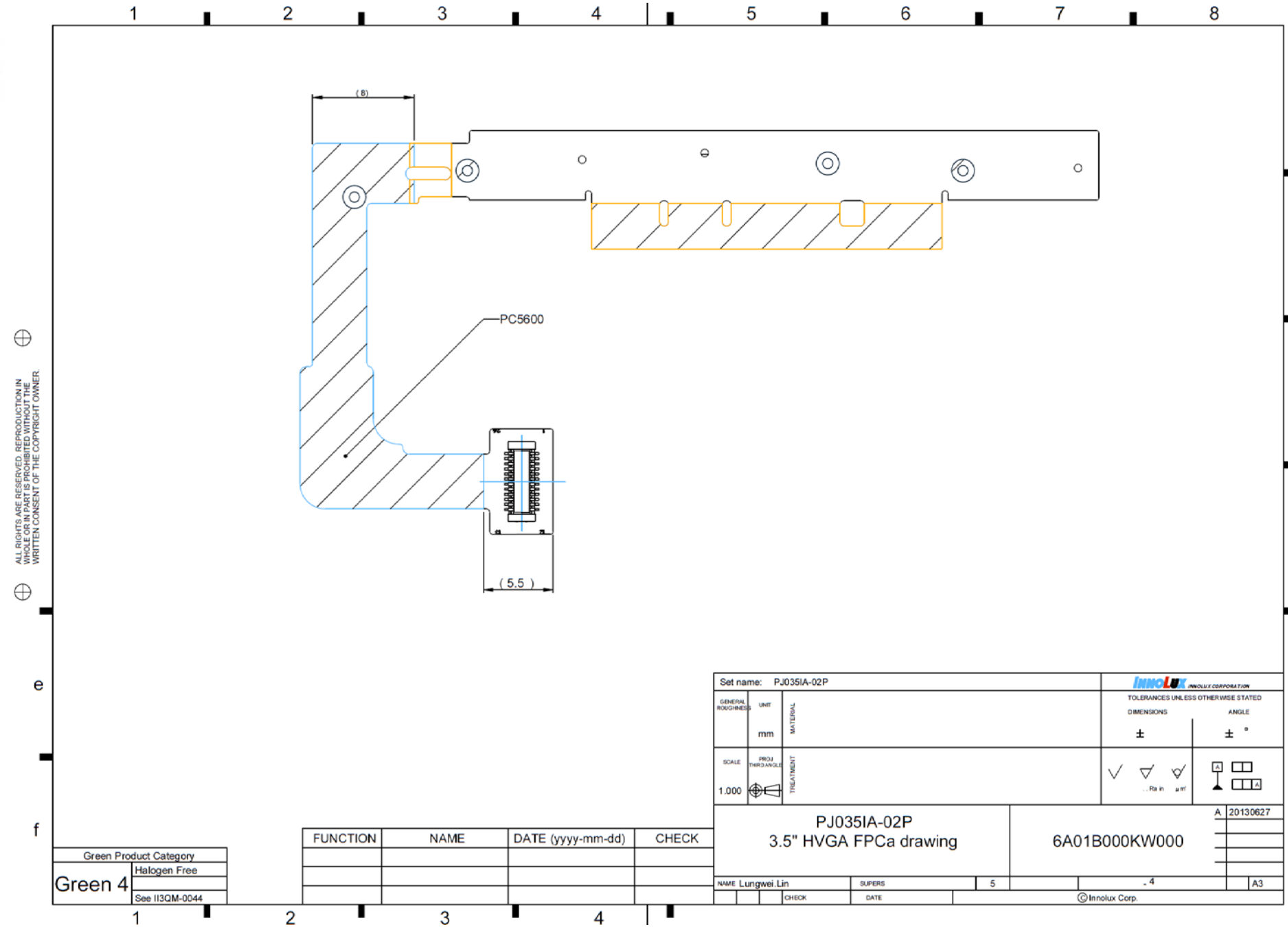

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Set name:	PJ035IA-02P
GENERAL ROUGHNESS	
UNIT	mm
MATERIAL	
SCALE	1.000
PROJ THIRD ANGLE	
TREATMENT	
TOLERANCES UNLESS OTHERWISE STATED	
DIMENSIONS	±
ANGLE	± °

PJ035IA-02P
3.5" HVGA FPCa drawing

6A01B000KW000

A 20130627

NAME	Lungwei.Lin	SUPERS	
CHECK		DATE	

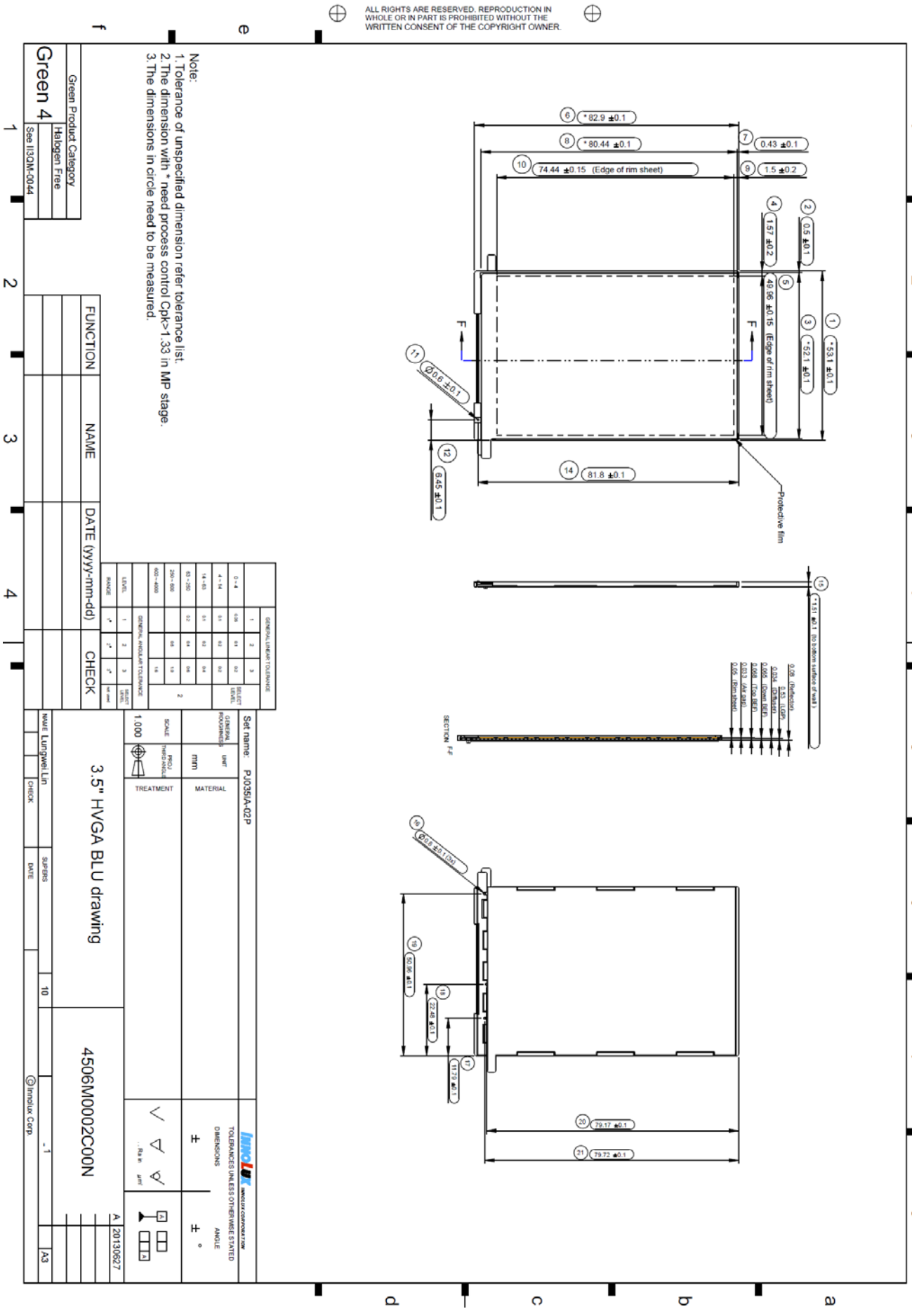
5 - 4 A3

©Innolux Corp.

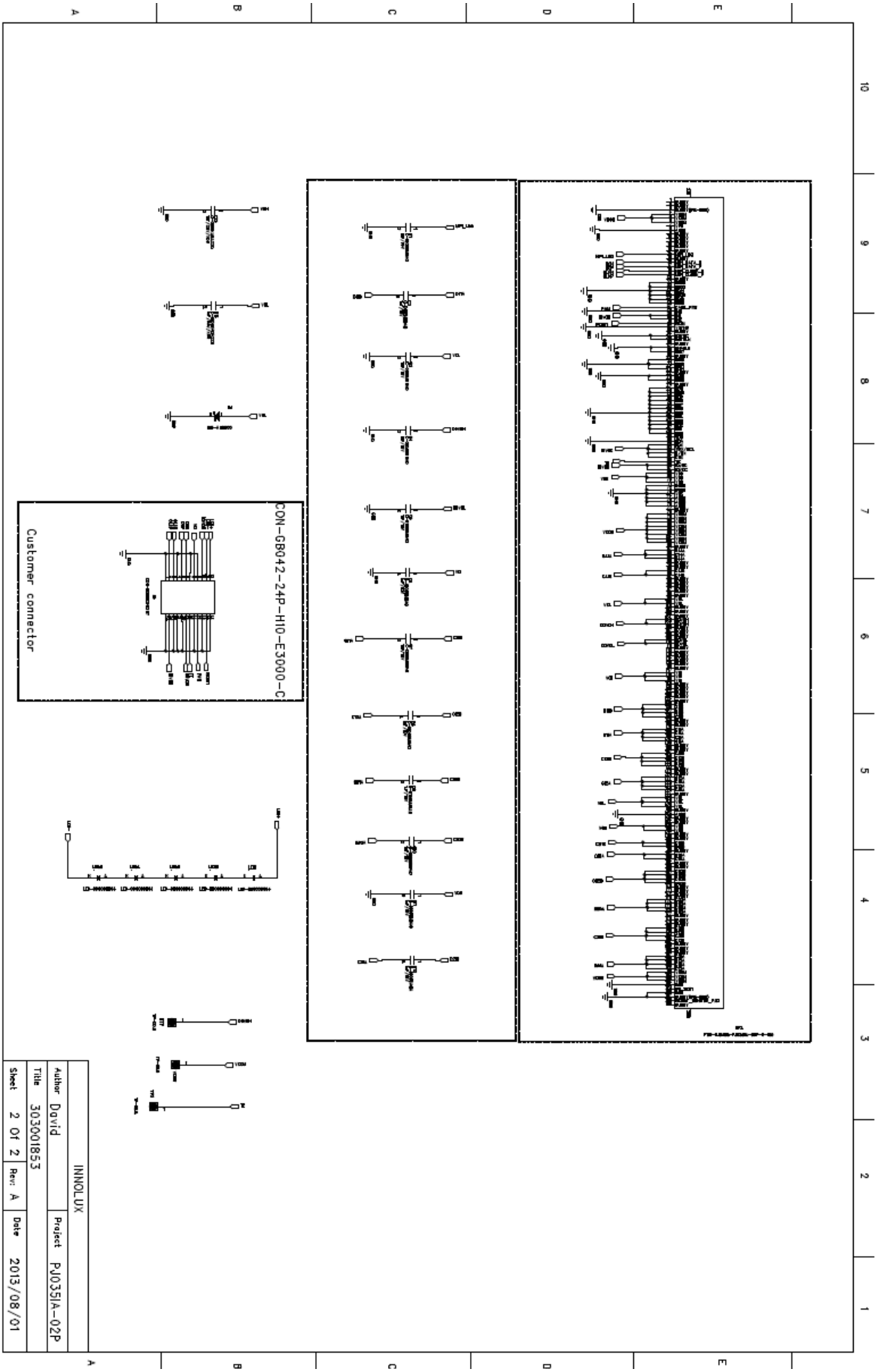
Green Product Category	
Green 4	Halogen Free
	See II3QM-0044

FUNCTION	NAME	DATE (yyyy-mm-dd)	CHECK

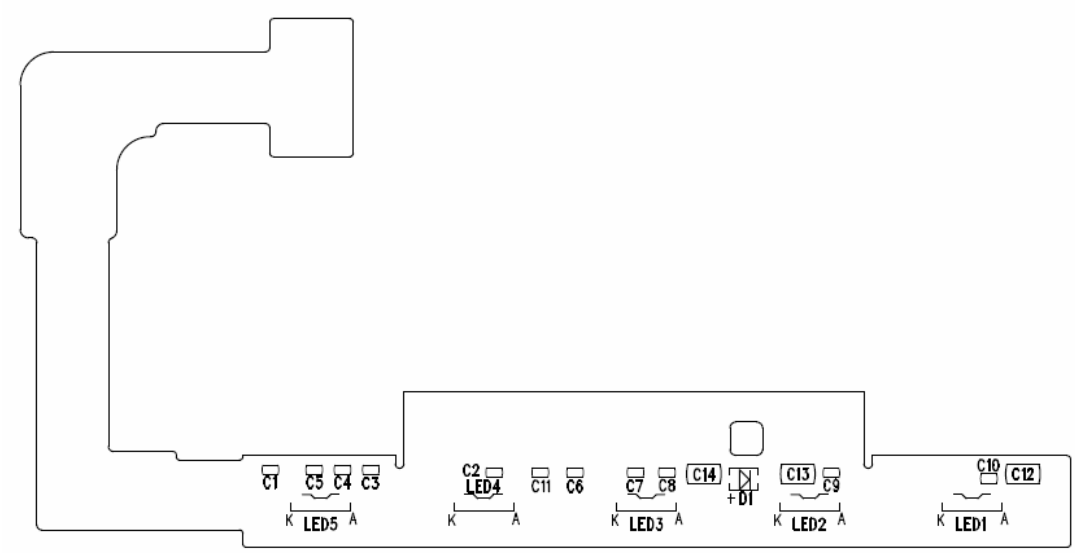
4.4 BLU Drawing



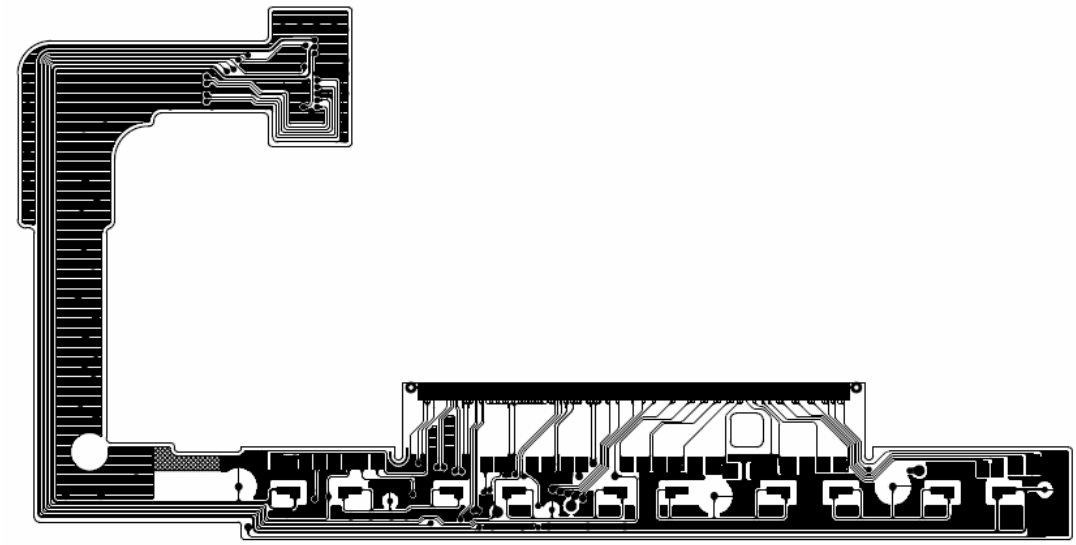
4.5 FPCa Schematic



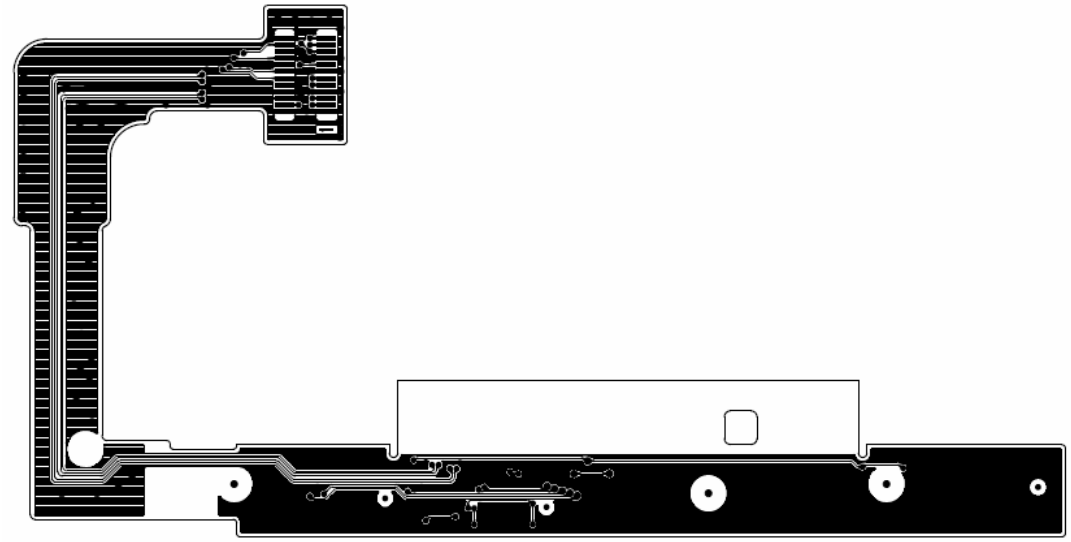
4.6 Gerber Data



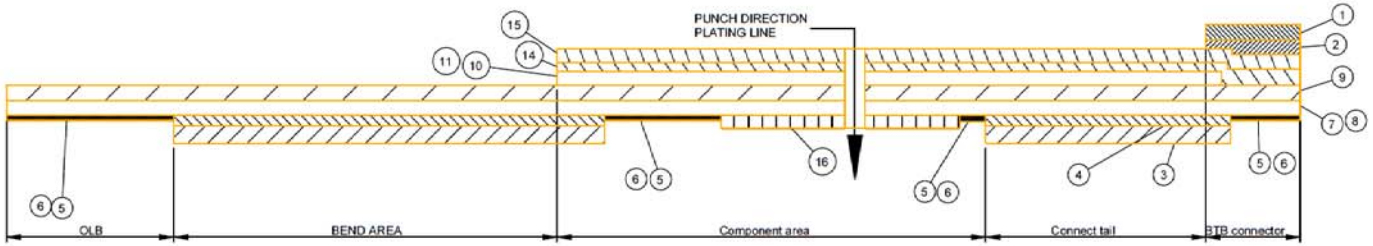
Component Layer



Top Layer



Bottom Layer



Layer		Material	OLB area	Bend area	component area	Connector tail	BTB connector
Stiffener	1	SUS 304					150
	2	Adhesive					25
Cover layer	3	PI		12.5		12.5	
	4	Adhesive		15		15	
Surface finish	5	Au	0.03-0.12		0.03-0.12		0.03-0.12
	6	Ni	1-5		1-5		1-5
Copper plating	7	Copper	18	18	18	18	18
FCCL(ED)	8	Copper					
	9	PI	12.5	12.5	12.5	12.5	12.5
	10	Copper			18	18	
Copper plating	11	Copper					
Surface finish	12	Ni					
	13	Au					
Cover layer	14	Adhesive			15	15	15
	15	PI			12.5	12.5	12.5
Ag shielding film	16	PC5600				22	
Total thickness(mm)			31.53-35.62	58	76	125.5	233

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Set name: PJ035IA-02P

INNOLUX INNOLUX CORPORATION

GENERAL ROUGHNESS | UNIT: mm | MATERIAL | SCALE: 1.000 | PROJECTION ANGLE | TREATMENT

TOLERANCES UNLESS OTHERWISE STATED
DIMENSIONS ± | ANGLE ± °

PJ035IA-02P
3.5" HVGA FPCa drawing

6A01B000KW000

A 20130627

FUNCTION	NAME	DATE (yyyy-mm-dd)	CHECK

NAME Lungwei.Lin | SUPERS | 5 | CHECK | DATE

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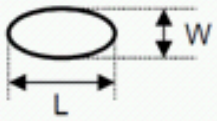
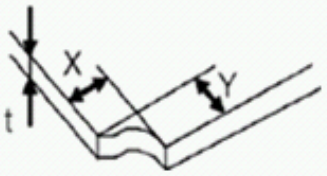
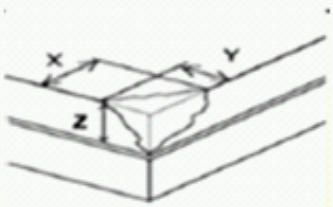
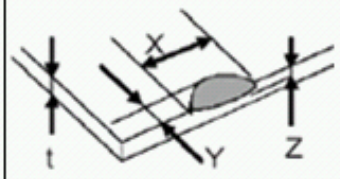
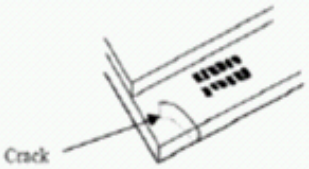
Green Product Category	
Green 4	Halogen Free
	See II3QM-0044

5 Incoming Inspection Specification

5.1 Display quality specification

No.	Defect	Criteria			Remark
1	No Display	Not allowed			
2	Missing Line	Not allowed			
3	Darker or Lighter Line	Not allowed			
4	Dot Defect	Spec		Permissive Qty.	
		Bright Dot		0	
		Dark Dot		0	
5	Round type (Particle, Bubble)	Spec		Permissive Qty.	1. Φ=(L+W)/2, L=Length W=Width 2. Ignore if it's out of A/A 
		Φ ≤ 0.10mm		Ignored	
		0.10mm < Φ ≤ 0.15mm		1	
		0.15mm < Φ		0	
6	Line type (Particle)	Spec		Permissive Qty.	1. L=Length, W=Width 2. Ignore if it's out of A/A 
		W ≤ 0.03mm		Ignore	
		0.03 mm < W ≤ 0.05 mm	L < 5.0mm	1	
		0.05mm < W	5.0mm <L	0	

5.2 Glass chipping and broken

Inspection Item	Inspection standard	Note
Chip of Glass	Corner: X (or Y)≦5.0mm，Y (or X)≦0.5mm，Z≦T	
	Corner: X (or Y)≦5.0mm，Y (or X)≦0.5mm，Z≦T	
	Side: X≦5.0mm，Y≦0.5mm，Z≦T	
	Not allow Pad Crack.	

6 Reliability

6.1 Environmental Reliability Tests

Test Items	Test Conditions	Remark
High Temperature Storage	+80℃±3℃ for 96 hours	-
Low Temperature Storage	-30℃±3℃ for 96 hours	-
High Temperature Operation	+70℃±3℃ for 96 hours	-
Low Temperature Operation	-20℃±3℃ for 96 hours	-
Operate at High Temperature and Humidity	+60℃±3℃, 90%±3%RH. for 96 hours	-
Thermal Shock	-30℃/0.5h ~ +80℃/0.5h for a 24 cycles	-
Vibration Test	Frequency range:10~55Hz Stoke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	-
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 1 times for each direction	-
Package Vibration Test	Random Vibration : $0.015G^2$/Hz from 5-200Hz, -6dB/Octave from 200-500Hz 1 hour for each direction of X. Y. Z. (3 hours for total)	-
Package Drop Test	Height :72cm(Weight≦10kg); 60cm(Weight>10kg) 1 corner, 3 edges, 6 surfaces	-

Note1: During the display practical test under normal operation condition, there shall be no change, which may affect display function.

Note2: Before function check, the test sample requires 2 hours stored at room temperature.

6.2 Mechanical Reliability Tests

6.2.1 Panel 4PB Test

- Test Condition

  Test Method : 4 Point Bending Test
  1. Supporting Jig : 3mm, Loading Jig : 3mm
  2. Jig Speed : 1mm/min
  3. Test Point : X axis, Y axis
  4. Jig length (L) : L1 – 10mm, L2 – 20mm
  5. Jig Material : Steel (or Al)

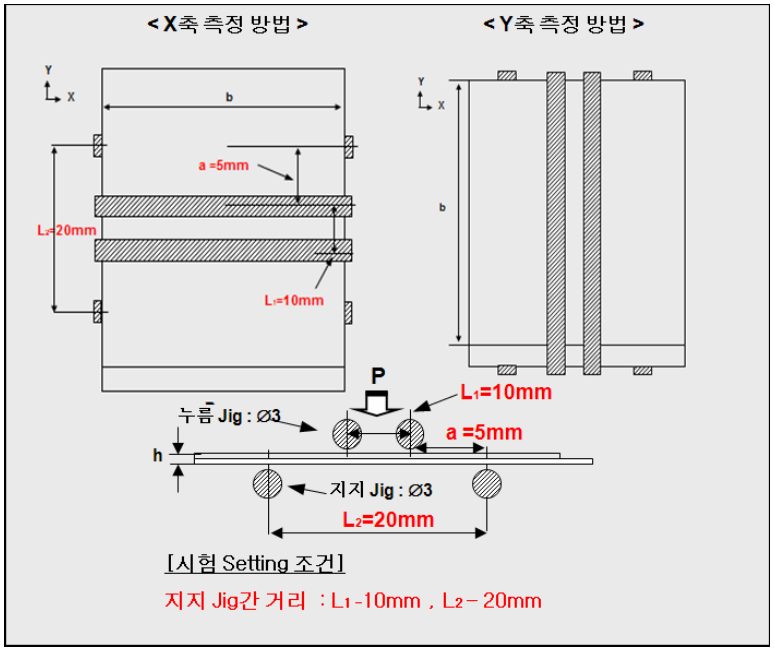
- Criteria (SPEC)

Item	4-Point Bending Test
Criteria	B10 (Weibull 10%)
Spec	B10(Weibull 10%) Stress Higher than 90Mpa
No. of Panel	24ea for each condition (48ea)

Formula for Stress : $\sigma = \frac{3 \cdot 9.8 \cdot P \cdot (L2-L1)}{2 \cdot b \cdot h^2}$ (Mpa)

(σ : Flexural Stress)

b : item width (mm)
h : item thickness (mm)
L : Length between supports (mm)
P : Load (kgf)



6.2.2 Driver IC 4PB Test

- Test Condition

  Test Method : 4 Point Bending Test
  1. Supporting Jig : 3mm, Loading Jig : 3mm
  2. Jig Speed : 1mm/min
  3. Test Point : X axis, Y axis
  4. Jig length (L) : 10mm
  5. Jig Material : Steel (or Al)

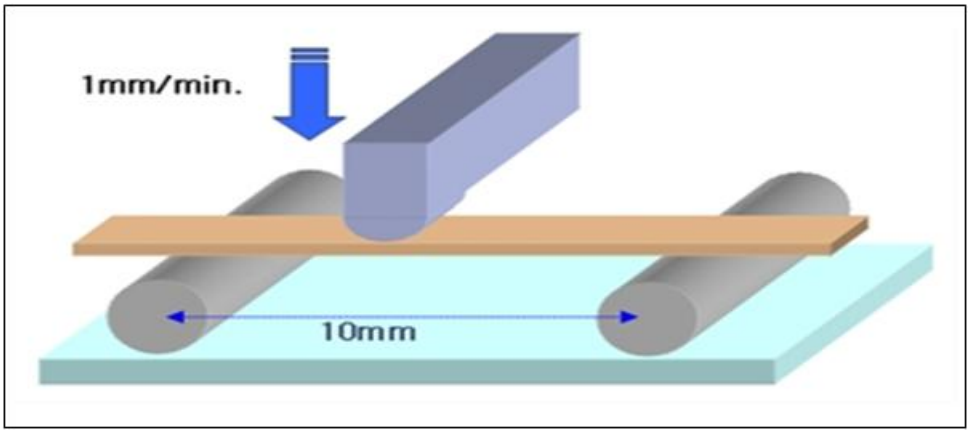
- Criteria (SPEC)

Item	3-Point Bending Test
Criteria	B10 (Weibull 10%)
Spec	B10 : Higher than 350Mpa
No. of IC	24ea

Formula for Stress : $\sigma = \frac{3 \cdot 9.8 \cdot P \cdot (L2-L1)}{2 \cdot b \cdot h^2}$ (Mpa)

(σ : Flexural Stress)

b : item width (mm)
h : item thickness (mm)
L : Length between supports (mm)
P : Load (kgf)



7 Production Aspects

7.1 Safety

7.1.1 The liquid crystal in the LCD is poisonous. DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

7.2 Handling

7.2.1 The LCD and touch panel is made of plate glass. DO NOT subject the panel to mechanical shock or to excessive force on its surface.

7.2.2 Do not handle the product by holding the flexible pattern portion in order to assure the reliability

7.2.3 Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

7.2.4 Provide a space so that the panel does not come into contact with other components.

7.2.5 To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

7.2.6 Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

7.2.7 Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

7.2.8 To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

7.3 Static Electricity

7.3.1 Ground soldering iron tips, tools and testers when they are in operation.

7.3.2 Ground your body when handling the products.

7.3.3 Power on the LCD module BEFORE applying the voltage to the input terminals.

7.3.4 DO NOT apply voltage which exceeds the absolute maximum rating.

7.3.5 Store the products in an anti-electrostatic bag or container.

7.4 Storage

7.4.1 Store the products in a dark place at +25℃±10℃ with low humidity (65%RH or less).

7.4.2 DO NOT store the products in an atmosphere containing organic solvents or corrosive gas.

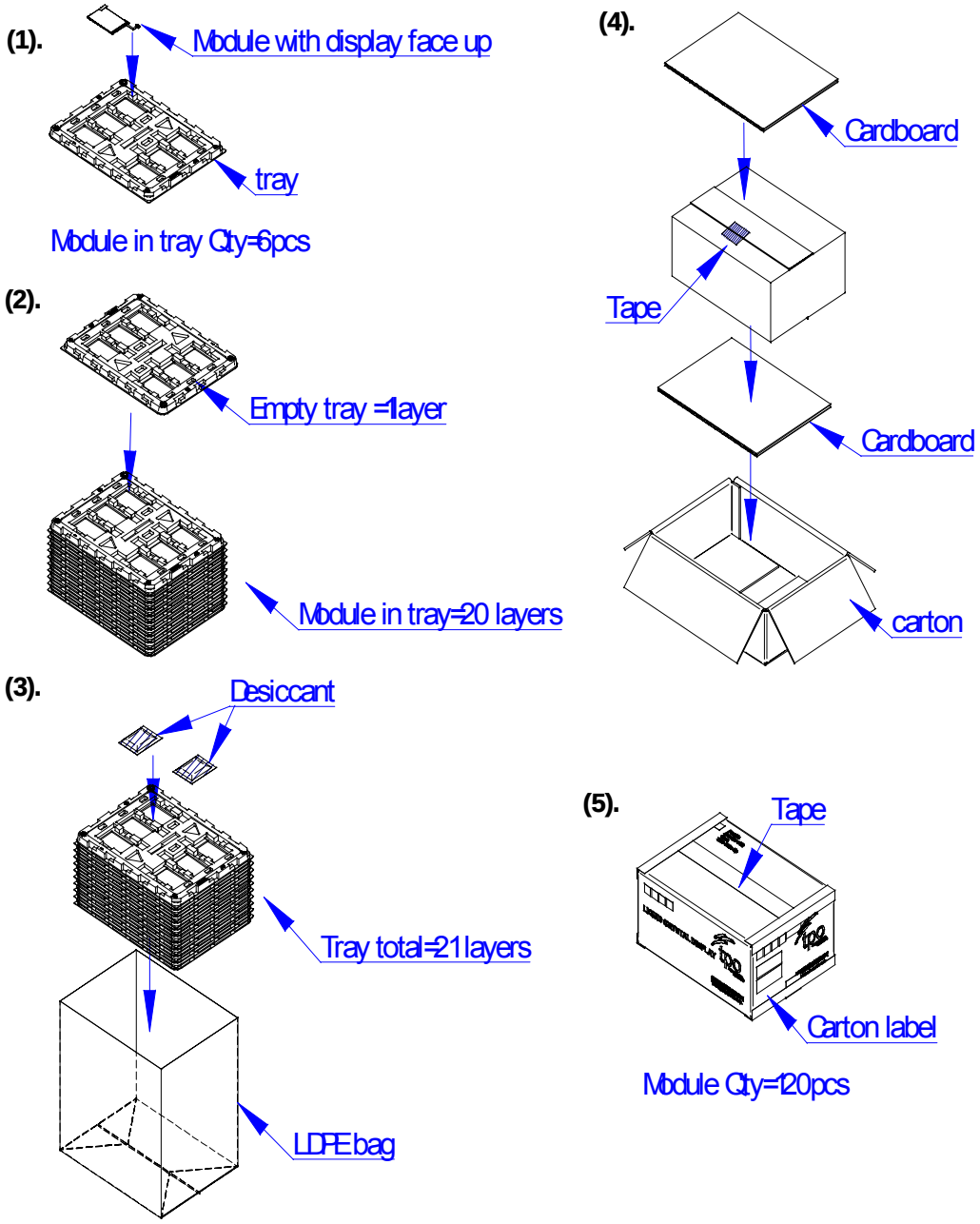
7.5 Cleaning

7.5.1 DO NOT wipe the touch panel with dry cloth, as it may cause scratch.

7.5.2 Wipe off the stain on the product by using soft cloth moistened with ethanol. DO Not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

8 Packaging of displays

8.1 Packing Description



3.5" Module (PJ035IA-02A) delivery packing method

(1). Module packed into tray cavity (with Module display face up).

(2). Tray stacking with 20 layers and with 1 empty tray above the stacking tray unit.
2pcs desiccant put above the empty tray

(3). Stacking tray unit put into the LDPE bag and fix by adhesive tape.

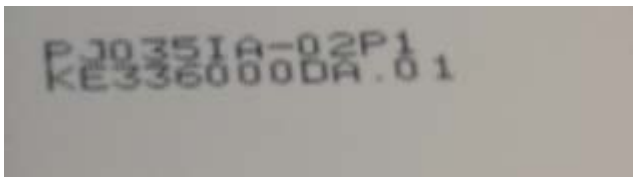
(4). Put 1pc cardboard inside the carton bottom, and then pack the package unit into the carton. Put 1pc cardboard above the package unit.

(5). Carton tapping with adhesive tape.

8.2 Designation of Lot Mark

- LGE P/N: EAJ62647601
- Production date:Y13M12D01 (Year/month/date)
- INX code : PJ035IA-02P
- Vendor Code: TW008187
-Size : in(5*5), out(6*6)

Scan output : EAJ62647601+Y13M12D01+PJ035IA-02P+TW008187



PJ035IA-02P1: Module Name

- KE336000DA.01 : LOT ID

  LOT ID (13) = Fab code(1) + LOT type(1) + Year(1) + Weeks(2) + S/N(4) + Main LOT(4)

  Fab Code (K) = Nanjing Factory1 : K , Nanjing Factory2 : H

  LOT Type (E) = LOT Type

  Year (3) = Last Year(2014)

  Weeks (36) = Weeks 36

  S/N (000D) = Serial No.

  Main LOT (A.01)= Main LOT

9 QC Flow Chart