Doc. Number:

■ Tentative Specification
□ Preliminary Specification
□ Approval Specification

MODEL NO.: P080LDE
SUFFIX: DF1

Customer:

APPROVED BY **SIGNATURE**

Name / Title
Note :

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
	Willy Yeh 2014/09/02	SingYi Li 2014/09/02

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

CONTENTS

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

版權屬於群創所有 禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

REVISION HISTORY

Version	Date	Page	Description
V 1	04, 16, 2014	All	First Release
V 1.1	07, 25, 2014	34, 35	RA Spec
V1.2	09, 01, 2014	5~44	Update Chapter 1~8

版權屬於群創所有 禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

1. General Description of TDM

1.1 Overview

P080LDE-DF1 is a 8" (8" diagonal) TDM (Touch Display Module) with **10 pins I2C** interface for Touch Module and TFT Liquid Crystal Display module with LED Backlight unit and **45 pins MIPI** interface. This module supports 1200 x 1920 WUXGA mode.

1.2 General Specifications of TDM

Item	Specification	Unit	Note
Screen Size	8" diagonal		
Driver Element	a-si TFT active matrix	-	
Pixel Number	1200 x R.G.B. x 1920	pixel	
Pixel Pitch	0.0897 (H) x 0.0897 (V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16,777,216 (8bit color depth)	color	
Transmissive Mode	Normally black	-	
Luminance, White	LCM: 400	Cd/m2	
	TDM: 380		
Power Consumption	LCM: Total 2.3 W (Max.) (panel 0.55 W (Max.), BL 1.75W (Max.))		10 fingers touches
	TDM：2.4 W (Max.)		
Touch Technology	Projected Capacitive Multi-Touch Panel		
Number of Channels	25(X)-39(Y)		
TPM/LCM Bonding Type	Direct-bond		UV-OCA: 0.2mm
Numbers of Touch	10 Points		
TP Reporting rate	<60 Hz (16.7 ms)		
Minimum stylus diameter	5 mm		
Sensor Glass	Soda lime 0.7mm		
TP unit cell pattern pitch size	4.3456x 4.4415	mm	
TP Type	WIS		
Touch Module Outline	119.44 x 211.8 (mm)	mm	
Touch Active Area	108.64 x 173.224 (mm)	mm	
Touch Windows Visible Area	108.64 x 173.224 (mm)	mm	
TP Module Thickness (Max)	TPM:0.7 (w/o FPCA) 1.8 (W/i FPCa)	mm	UV-OCA: 0.2mm
	TPM:0.7		
Module Weight (Max)	LCM:82.2	g	
	TPM:46		
	TDM:128.2		
AR/AG/ASF	No		

Note (1) The specified power consumption (with converter efficiency) is under the conditions at **VDD= 3.3V, fv = 60 Hz, Brightness (5 point average) = 400nits, I_{F_LED} = 22mA** and Ta = 25 ± 2 ºC, whereas **white** pattern is displayed.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

1.3 General TP Sensor Specifications

Item	Specification	Unit	Note
Bridge-Type	Metal		
Process Flow	BM/ITO/DE/ME/PAS		
BM Thickness	1.4	um	
BM OD	>4		
ITO Resistance	<50	ohm/sq.	
DE Thickness	1.6	um	
ME Resistance	≤ 0.35	ohm/sq	
PAS Thickness	2.3	um	
Index Match Film	Yes		
Transmittance, T%	Among visible light spectrum > 87%		
Transmittance, a*	-1.5 < a* < 1.5		
Transmittance, b*	-2 < b* < 4.5		
Reflection, R%	NA		
Reflection, a*	NA		
Reflection, b*	NA		
Haze	< 1%	%	
Number of Channels	25(X)-39(Y)		
Trace line/space	20/25		

版權屬於群創所有 禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

1.4 WIS Specifications

Item	Specification	Unit	Note
Cover Lens Thickness	0.7±0.05	mm	
Cover Type	Glass (WIS)		
Cover Lens Substrate	Soda-lime		
ASF	Without		
Light Sensor ink	IR Ink Transmittance : 10%-20% at 540nm & > 70% at 850nm (Black color)		
Logo	No		
Logo method	NA		
Logo Color	NA		
Drill Hole	No		
Function Hole	Camera/IR Hole		
Hole Optical Spec.	NA		
4PB(B10) (Mpa)	160		
Surface Treatment	No		
Pencil hardness	>7H		
Light Sensor Hole Transmittance	10%-20% at 540nm & > 70% at 850nm		
Corner spec	四角雲形線		
2nd strength	No		
Outline Dimension (mm)	119.44 x 211.8	mm	
Visible Area (mm)	108.64 x 173.224	mm	
Weight(g)	Glass :44.3g FPC:0.6g OCA:7.4g		

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

2. Optical Characteristics

2.1 Test Conditions of LCM

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VDDI	1.8	V
	VCI	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	66	mA

The measurement methods of optical characteristics are shown in Section 5.2. The following items should be measured under the test conditions described in Section 5.1 and stable environment shown in Note (5)

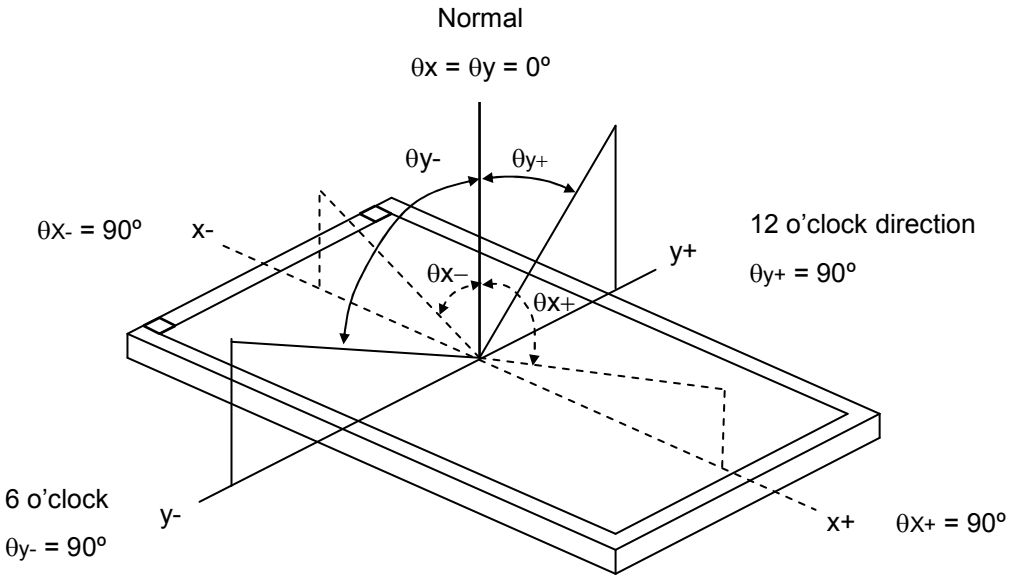
2.2 Optical Specifications of TDM

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0°	600	800	-	-	(2),(5) , (7)
Response Time		$T_{R+}T_F$		-	25	30	ms	(3) ,(7)
CP Luminance of White	LCM	L_{CP}		340	400	-	Cd/ m^2	(4), (6), (7)
	TDM			320	380			
Color Chromaticity	White	Wx	R=G=B=255 Gray scale	Typ – 0.03	(0.313)	Typ + 0.03	- -	(4), (6), (7)
		Wy			(0.329)			
	Red	Rx			0.613			
		Ry			0.350			
	Green	Gx			0.325			
		Gy			0.605			
	Blue	Bx			0.152			
		By			0.071			
NTSC			θ_x=0°, θ_Y =0°	55	60	-	%	(5), (6), (7)
Viewing Angle	Horizontal	x- + x+	CR > 10	170	178	-	deg.	(1), (5), (7)
	Vertical	y- + y+		170	178	-		
White Variation of 9 Points		δW_{9p}	θ_x=0°, θ_Y =0°	80		-	%	(5), (6), (7)
White Variation of 13 Points		δW_{13p}	θ_x=0°, θ_Y =0°	67		-	%	(5), (6), (7)

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

Note (1) Definition of Viewing Angle (θx, θy):



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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

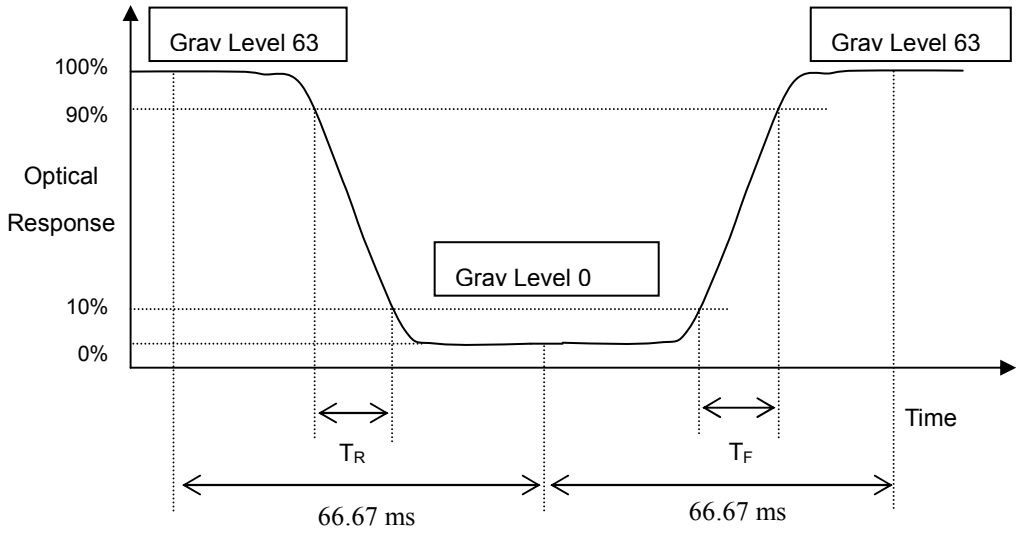
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

Note (4) Definition of Center Point Luminance of White (L_{CP}):

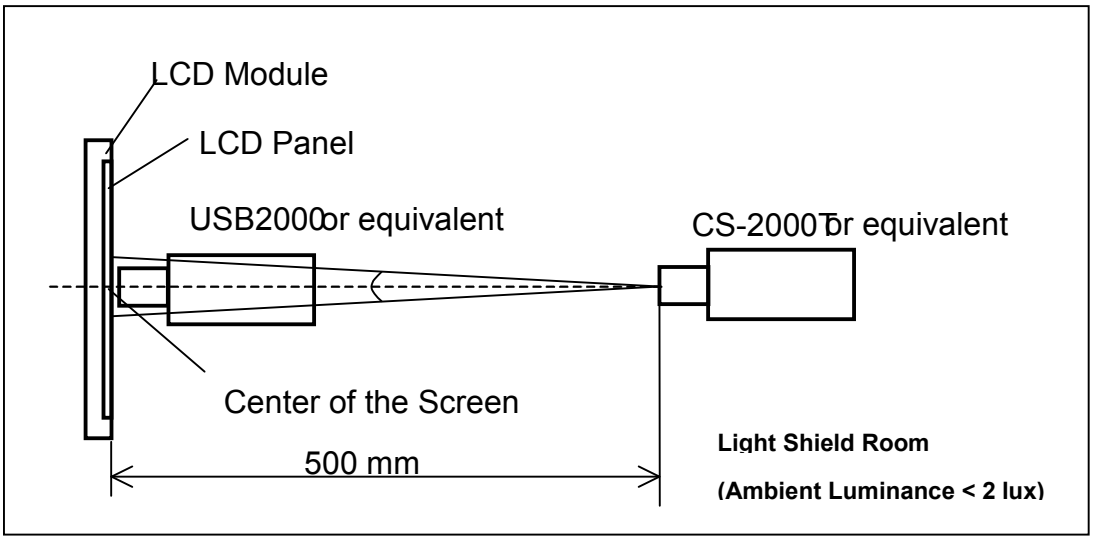
Measure the luminance of gray level 63 at center point

L_{CP} = L(5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

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

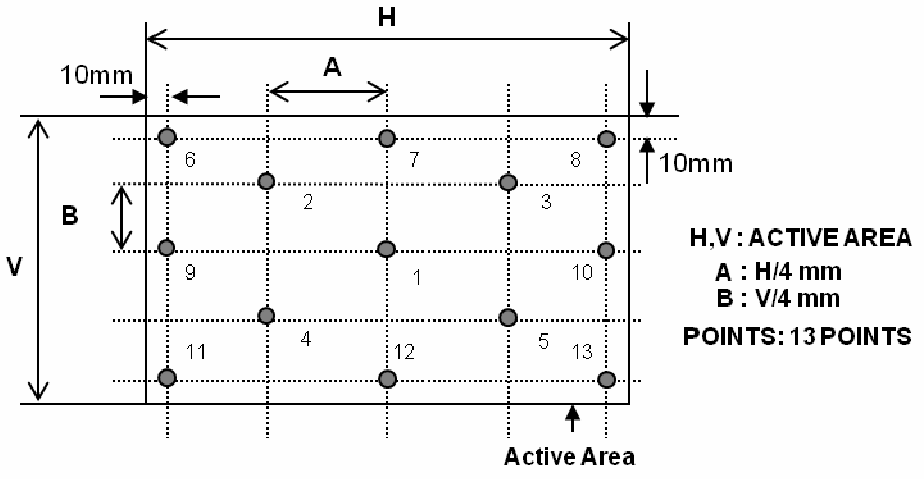


Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 13 points

δW_{9p} = {Minimum [L (1) ~ L (13)] / Maximum [L (1) ~ L (13)]}*100%

Active area



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

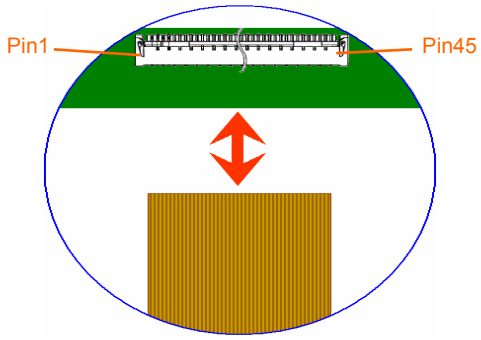
Note (7) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3. Electrical Specifications of LCM

3.1 CONNECTOR TYPE



Please refer Appendix Outline Drawing for detail design.

Connector Part No.: **I-PEX 20584-045E-01**

3.2 ABSOLUTE MAXIMUM RATINGS

3.2.1 ABSOLUTE RATINGS OF ENVIRONMENT

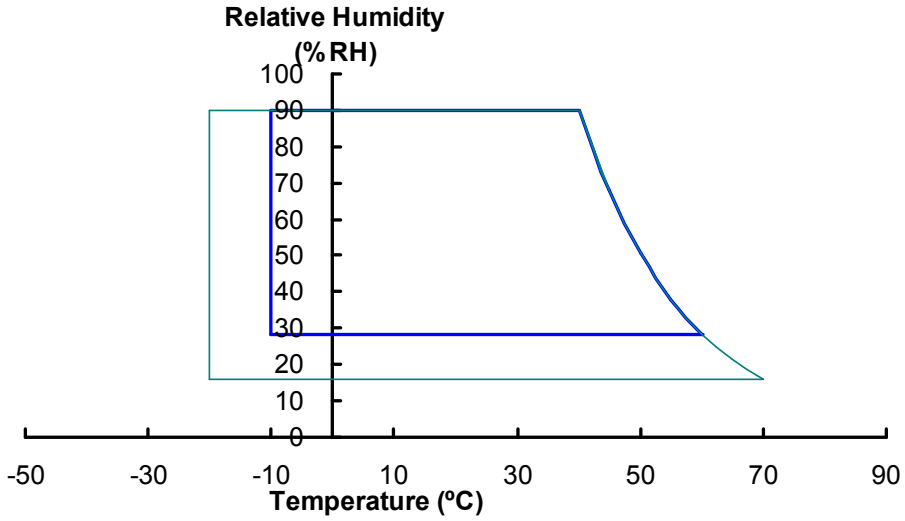
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+70	ºC	(1)
Operating Ambient Temperature	T_{OP}	-10	+60	ºC	(1), (2)

Note (1) (a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be -10 ºC min. and 70 ºC max.



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.3 ELECTRICAL ABSOLUTE RATINGS

3.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	**VDD**	**+2.7**	**+3.6**	**V**	(1)

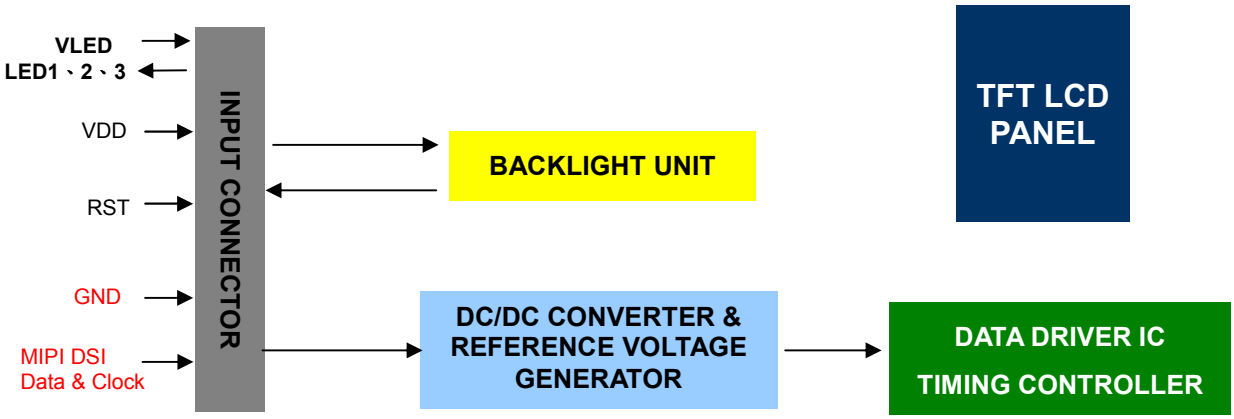
Note (1) Stresses beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.4. ELECTRICAL SPECIFICATIONS

3.4.1 FUNCTION BLOCK DIAGRAM



3.4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

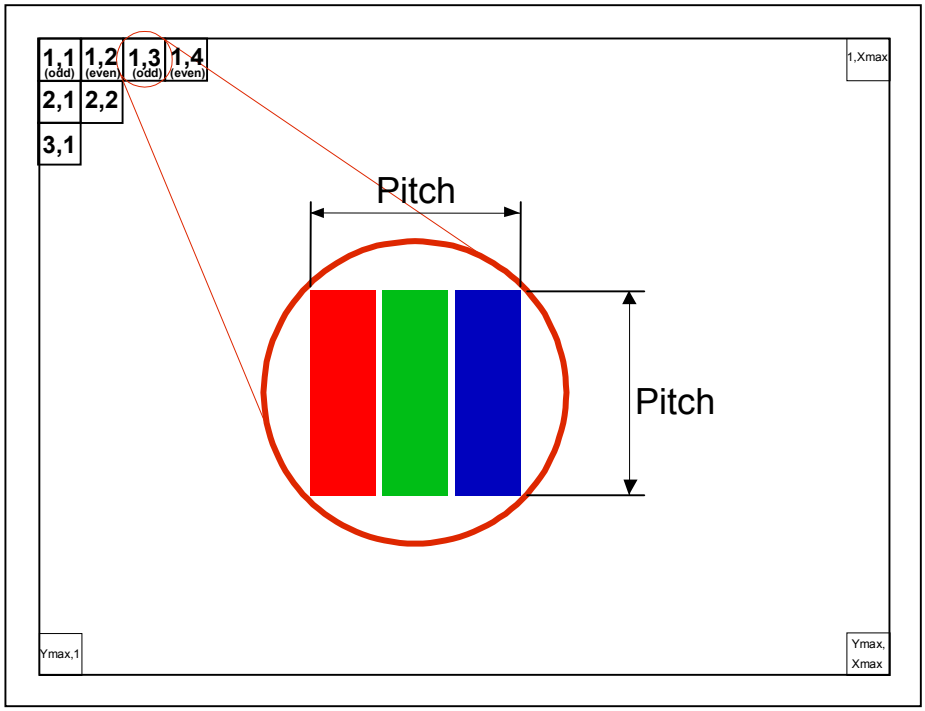
Pin	Symbol	I/O	Description	Remark
1	NC(WPN)		No connection, please keep it floating	
2	GND	P	Ground	
3	ID1		Ground	
4	ID2		No connection	
5	NC(SDA)		No connection, please keep it floating	
6	NC(SCL)		No connection, please keep it floating	
7	NC(MTP)		No connection, please keep it floating	7.4V~7.6V
8	GND	P	Ground	
9	ID3		Ground	
10	NC(BIST)		No connection, please keep it floating	1.4V~1.6V
11	GND	P	Ground	
12	NC		No connection	
13	NC		No connection	
14	VDD	P	3.3V input	3.0V~3.6V
15	VDD	P	3.3V input	3.0V~3.6V
16	VDD	P	3.3V input	3.0V~3.6V
17	VDD	P	3.3V input	3.0V~3.6V
18	GND	P	Ground	
19	NC		No connection	
20	RESET	I	Device reset signal	3.0V~3.6V
21	GND	P	Ground	
22	D0_P	I	MIPI data 0 positive signal	
23	D0_N	I	MIPI data 0 negative signal	
24	GND	P	Ground	

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

25	D1_P	I	MIPI data 1 positive signal	
26	D1_N	I	MIPI data 1 negative signal	
27	GND	P	Ground	
28	CLK_P	I	MIPI CLK positive signal	
29	CLK_N	I	MIPI CLK negative signal	
30	GND	P	Ground	
31	D2_P	I	MIPI data 2 positive signal	
32	D2_N	I	MIPI data 2 negative signal	
33	GND	P	Ground	
34	D3_P	I	MIPI data 3 positive signal	
35	D3_N	I	MIPI data 3 negative signal	
36	GND	P	Ground	
37	LED3	P	LED Cathode	
38	LED2	P	LED Cathode	
39	LED1	P	LED Cathode	
40	GND	P	Ground	
41	VLED	P	LED Anode	22.4V
42	VLED	P	LED Anode	22.4V
43	VLED	P	LED Anode	22.4V
44	GND	P	Ground	
45	NC		No connection	

Note (1) The first pixel is odd as shown in the following figure.

Note (2) Normal operation/BIST pattern selection. (Control by MIPI LP Command)



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.5 Electrical Characteristics

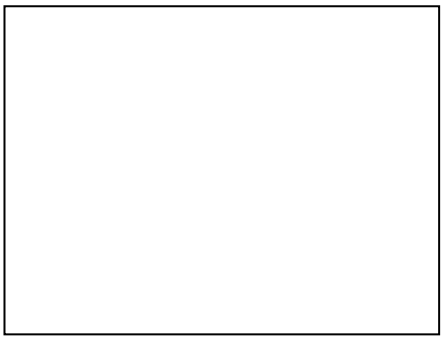
3.5.1 LCD ElectronicsSpecifications

Item		Symbol	Values			Unit	Remark
			Min.	Typ.	Max.		
Power supply voltage		VDD	3.0	3.3	3.6	V	
VDD High level input voltage		V_{IH1}	0.7 VDD	-	VDDI	V	For I/O circuit
VDD Low level input voltage		V_{IL1}	0	-	0.3 VDD	V	
Power Supply Current	White	I_{VDD}		116	120	mA	Note (2)

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) The specified power supply current is under the conditions at VDD = 3.3 V,Ta = 25 ± 2 ºC, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

b. White Pattern



Active Area

3.6 LED Converter Specifications

N/A

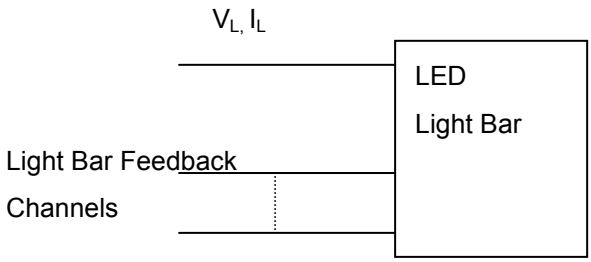
3.7 Backlight Unit

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	V_L			23	V	(1)(2)(Duty100%)
LED Light Bar Power Supply Current	I_L	-	66	-	mA	
Power Consumption	P_L	-		1.5	W	(3)
LED Life Time	L_{BL}	15,000	-	-	Hrs	(4)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below :

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.



Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$ (Without LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I_L = 22 mA(Per EA) until the brightness becomes ≦ 50% of its original value.

3.8 Signal Timing Specifications

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
DCLK	Frequency	1/Tc	-	159.4	-	MHz
DE	Vertical Total Time	TV	1981	1981	1982	TH
	Vertical Active Display Period	TVD	-	1920	-	TH
	Vertical Front Porch Period	TVFP	35	35	36	TH
	Vsync pulse width	TVPW	1	1	1	TH
	Vertical Back Porch Period	TVBP		25		TH
	Horizontal Total Time	TH	1275	1341	1342	Tc
	Horizontal Active Display Period	THD	-	1200	-	Tc
	Horizontal Front Porch Period	THFP	42	80	81	Tc
	Horizontal pulse width	THPW	1	1	1	Tc
	Horizontal Back Porch Period	THBP	32	60	60	Tc
	MIPI Data frequency	FDATA	955	999	1000	MHz

Note1: DCLK = TV x TH x frame rate, and frame rate = 60Hz.

Note 2: The CABC and CE function were disabled.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.9 MIPI Interface DC/AC Characteristic

3.9.1 MIPI Interface DC characteristic

Parameter	Symbol	Conditions	Specification			UNIT
			MIN	TYP	MAX	
MIPI digital operation current	I_{VCCIF}	VCC=VCC_IF=1.5V, Data Rate=500Mbps,	-	-	24	mA
MIPI digital stand-by current	$I_{VCCIFST}$	VCC_IF input current. All input signal are stopped.	-	200	-	uA
MIPI Characteristics for High Speed Receiver						
Single-endedl input low voltage	V_{ILHS}		-40	-	-	mV
Single-endedl input high voltage	V_{IHHS}		-	-	460	mV
Common-mode voltage	V_{CMRXDC}		155	-	330	mV
Differential input impedance	Z_{ID}		80	100	125	ohm
Differential input high threshold	V_{IDTH}			-	70	mV
Differential input low threshold	V_{IDTL}		70	-	-	mV
MIPI Characteristics for Low Power Mode						
Pad signal voltage range	V_I		-50	-	1350	mV
Ground shift	V_{GNDSH}		-50	-	50	mV
Output low level	V_{OL}		-150		150	mV
Output high level	V_{OH}		1.1	1.2	1.3	V

Note 1) VDD= 2.7V to 3.6V, AVDD= 7V to 10V, GND=AGND= 0V, TA= -20 to +85°C

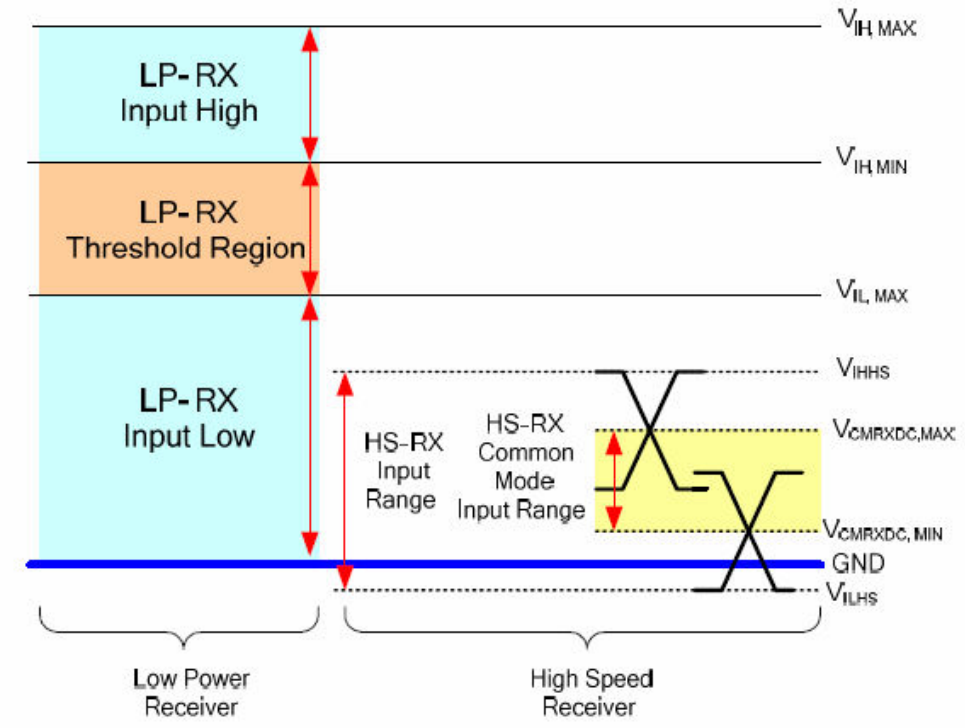


Figure :MIPI DC Diagram

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.9.2 MIPI AC Characteristic

3.9.2.1 LP Transmission

(VDD= 2.7V to 3.6V, AVDD= 7V to 10V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
15%-85% rise time and fall time	T_{RLP} / T_{FLP}	-	-	25	ns
Pulse width of the LP exclusive-OR clock	$T_{LP\text{-}PULSE\text{-}TX}$	-50	-	-	ns
Period of the LP exclusive-OR clock	$T_{LP\text{-}PER\text{-}TX}$	100			ns

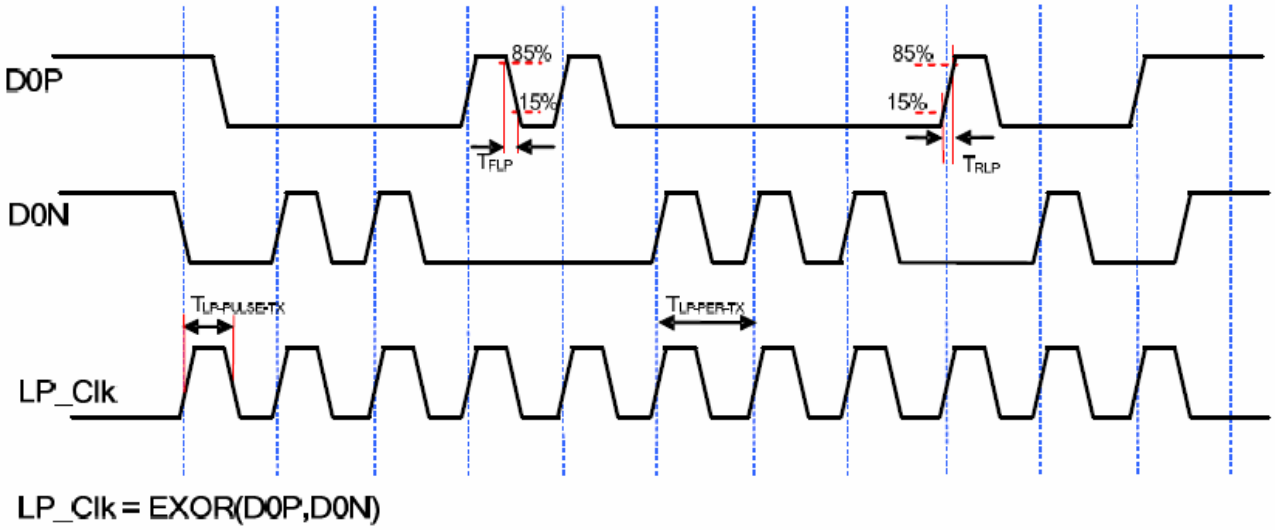


Figure :LP Transmitter Timing Definitions

3.9.3 High Speed Transmission

3.9.3.1 Data-Clock Timing Specifications

(VDD= 2.7V to 3.6V, AVDD= 7V to 10V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
UI instantaneous	UI_{INST}	1.0	-	12.5	ns
Data to Clock Setup Time	T_{SETUP}	0.25	-	-	UI_{INST}
Data to Clock Hold Time	T_{HOLD}	0.25	-	-	UI_{INST}

Note:

Data to clock setup time/ hold time cannot reach those listed in above “Data-Clock Timing Specifications” may cause abnormal display.

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

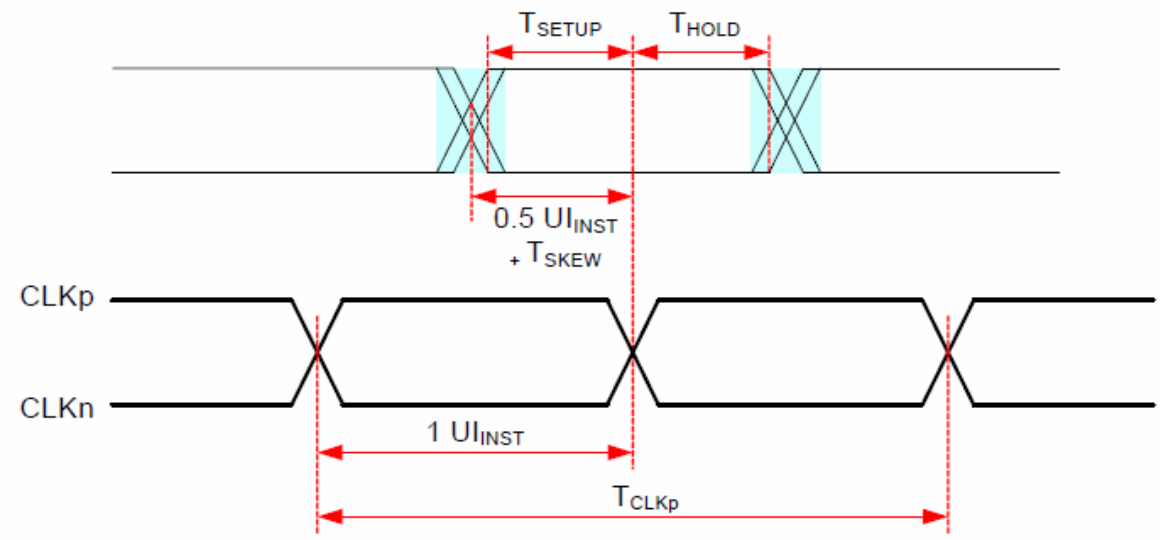


Figure : Data to Clock Timing Definitions

3.9.3.2 High-Speed Data Transmission in Bursts

3.9.3.2.1 High-Speed Data Transmission Operation Timing Parameters

(VDD= 2.7V to 3.6V, AVDD= 7V to 10V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
Time to drive LP-00 to prepare for HS transmission	$T_{HS-PREPARE}$	40+4UI	-	85+6UI	ns
Time from start of tHS-TRAIL or tCLK-TRAIL period to start of LP-11 state	T_{EOT}	-	-	105+12UI	ns
Time to enable Data Lane receiver line termination measured from when Dn cross VIL,MAX	$T_{HS-TERM-EN}$	-	-	35+4UI	ns
Time to drive flipped differential state after last payload data bit of a HS transmission burst	$T_{HS-TRAIL}$	60+4UI	-	-	ns
Time-out at RX to ignore transition period of EoT	$T_{HS-SKIP}$	40		55+4UI	ns
Time to drive LP-11 after HS burst	$T_{HS-EXIT}$	100	-	-	ns
Length of any Low-Power state period	T_{LPX}	50	-	-	ns
Sync sequence period	$T_{HS-SYNC}$	-	8UI	-	ns
Minimum lead HS-0 drive period before the Sync sequence	$T_{HS-ZERO}$	105+6UI	-	-	ns

Note:

1. The minimum value depends on the bit rate. Implementations should ensure proper operation for all the supported bit rates.
2. UI means Unit Interval, equal to one half HS clock period on the Clock Lane.
3. T_{LPX} is an internal state machine timing reference. Externally measured values may differ slightly from the specified values due to asymmetrical rise and fall times.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

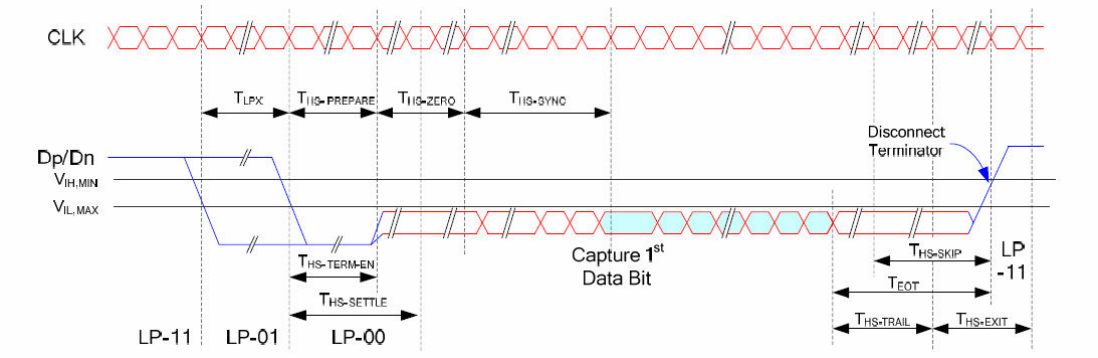


Figure : High-Speed Data Transmission in Bursts

3.9.3.3 High-Speed Clock Transmission

3.9.3.3.1 Switching the Clock Lane Operation Timing Parameters

(VDD= 2.7V to 3.6V, AVDD= 7V to 10V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	$T_{CLK-POST}$	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	$T_{CLK-MISS}$	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	$T_{CLK-PREPARE}$	38	-	95	ns
Minimum lead HS-0 drive period before starting Clock	$T_{CLK-PREPARE}$ +$T_{CLK-ZERO}$	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross VIL,MAX	$T_{HS-TERM-EN}$			38	ns
Minimum time that the HS clock must be set prior to any associated date lane beginning the transmission from LP to HS mode	$T_{CLK-PRE}$	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	$T_{CLK-TRAIL}$	60	-	-	ns

Note:

The DSI host processor shall support continuous clock on the Clock Lane for NT chip that require it, so the host processor needs to keep the HS serial clock running.

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

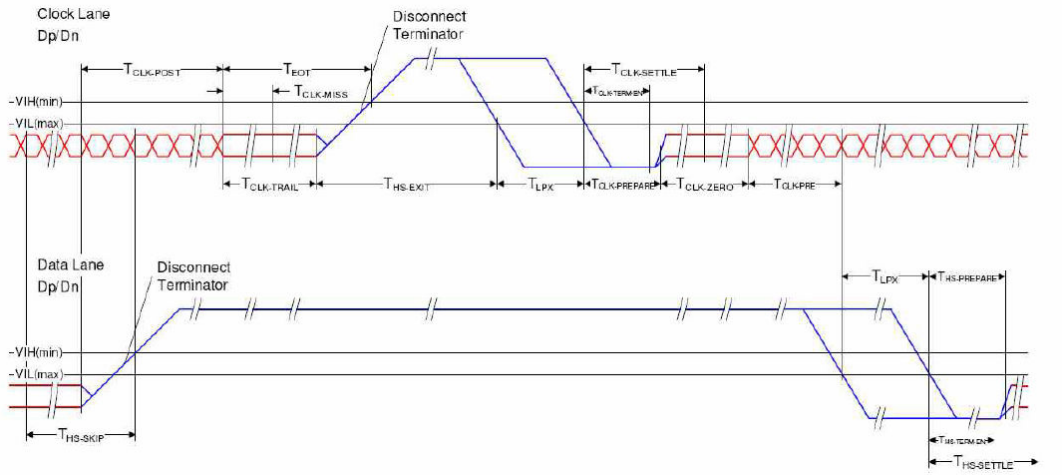
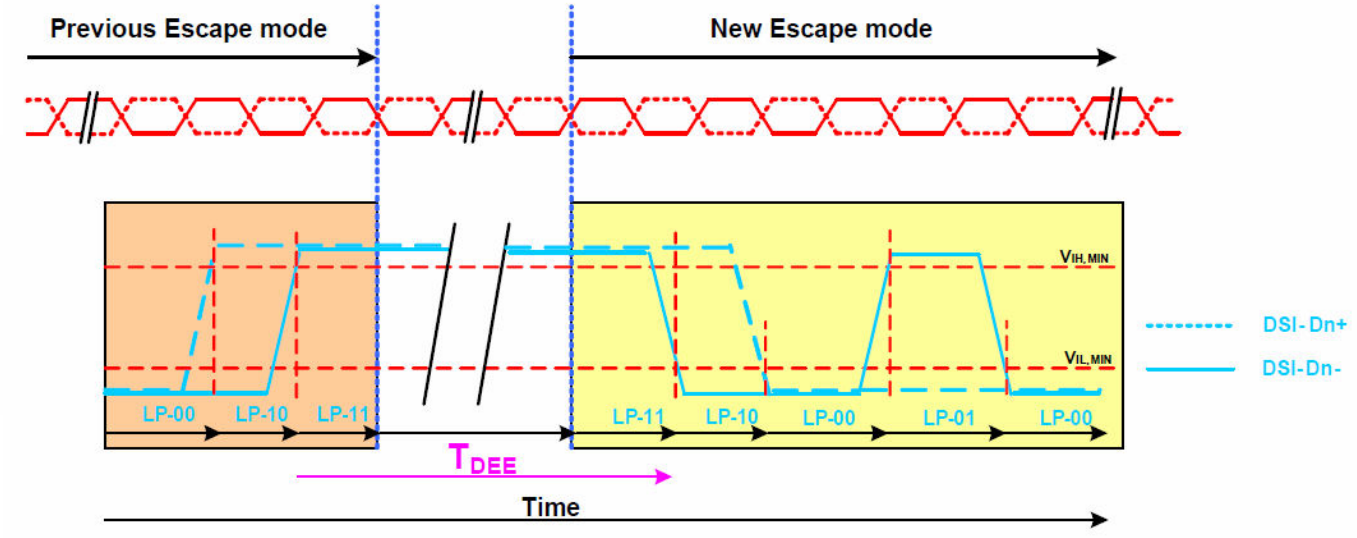


Figure :Switching the Clock Lane between Clock Transmission and Low-Power Mode

3.9.3.4 LP11 timing request between data transformation

When Clock lane of DSI TX chip always keeps High speed mode, then Clock lane never go back to Low power mode. If Date lane of TX chip needs to transmit the next new data transmission or sequence, after the end of Low power mode or High speed mode. Then TX chip needs to keep LP-11 stop state before the next new data transmission, no matter in Low power mode or High speed mode. The LP-11 minimum timing is required for RX chip in the following 9 conditions, include of LP - LP, LP - HS, HS - LP, and HS – HS. This rule is suitable for short or long packet between TX and RX data transmission.

(1) Timing between LP - LP command

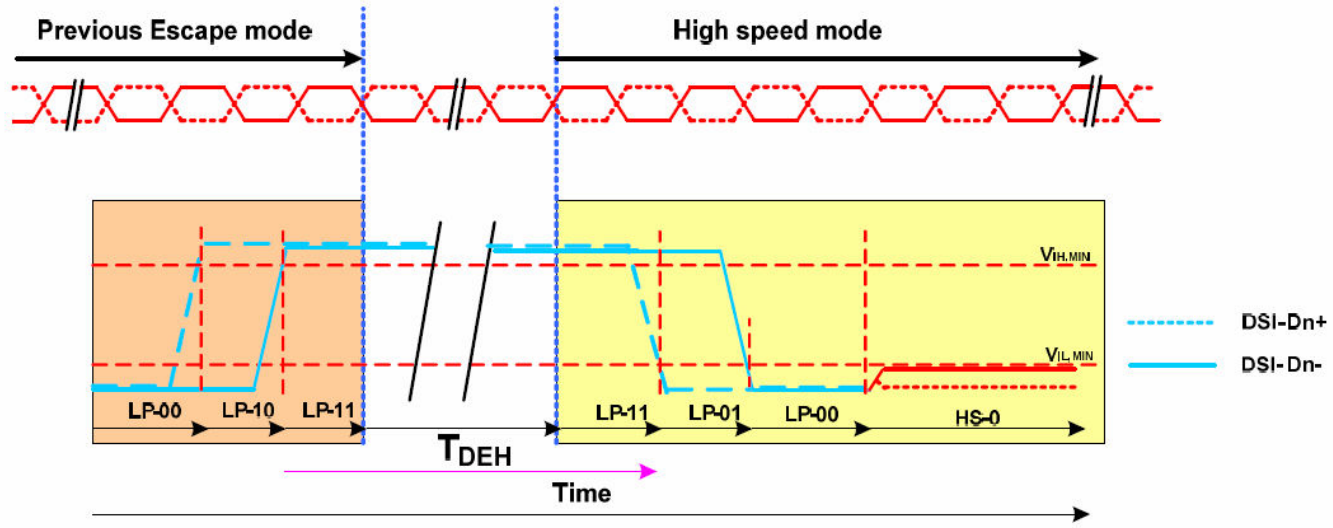


Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
LP-11 delay to a start of the new Escape Mode Entry	T_{DEE}	150	-	-	ns

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

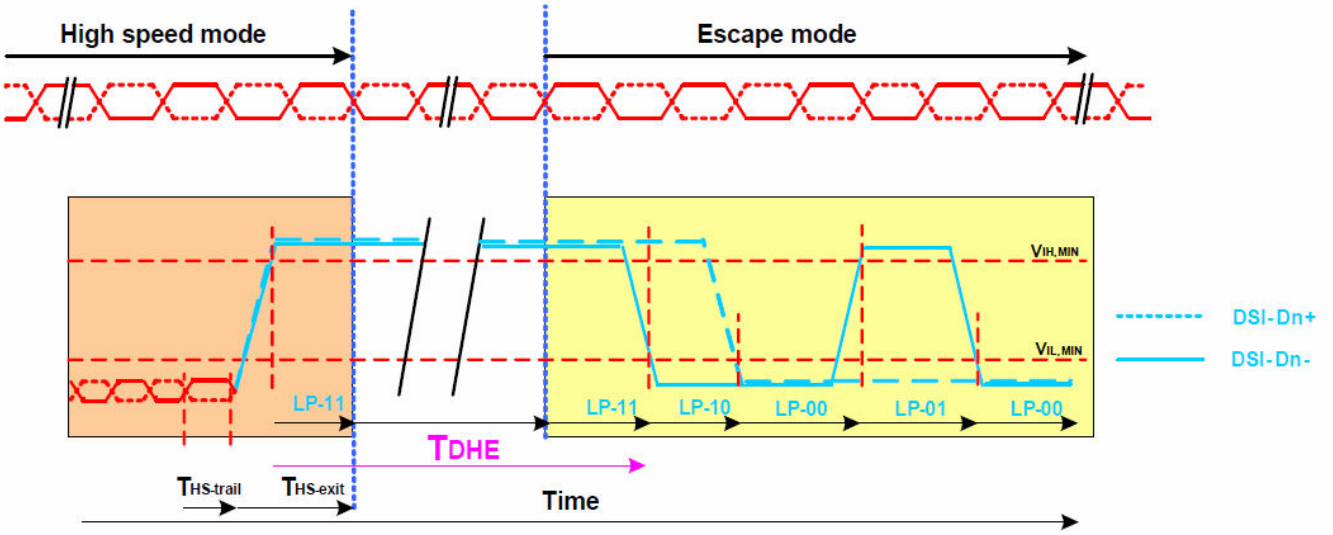
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

(2)Timing between LP - HS command



Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
LP-11 delay to a start of the Entering High Speed Mode	T_{DEH}	Max(150,32UI)	-	-	ns

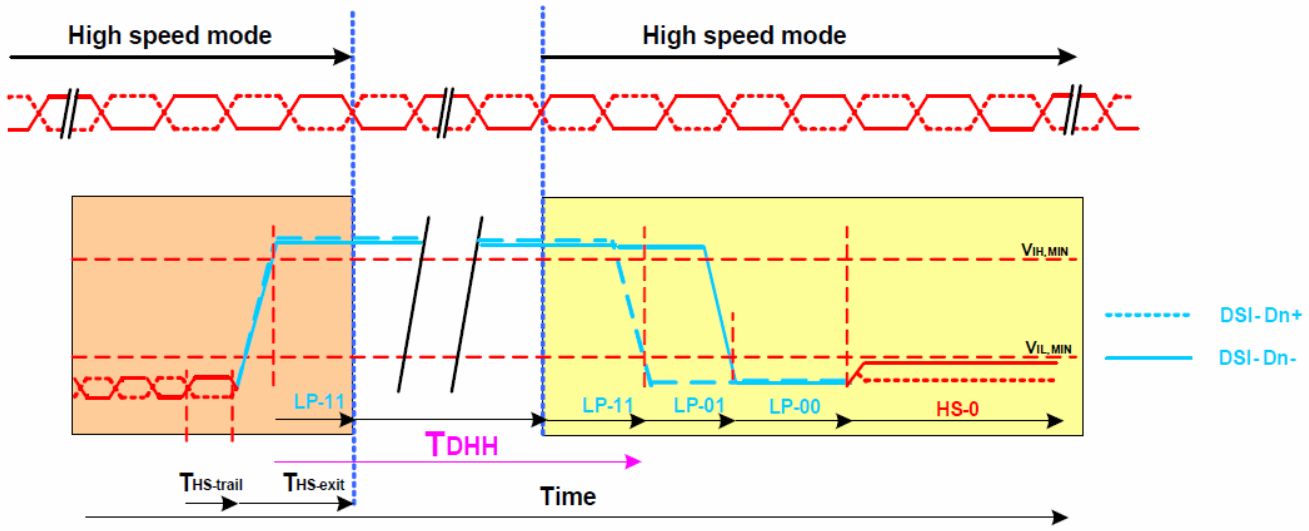
(3)Timing between HS - LP command



Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
LP-11 delay to a start of the Escape Mode Entry	T_{DHE}	Max(150,32UI)	-	-	ns

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

(4)Timing between HS - HS command



Parameter	Symbol	Specification			UNIT
		MIN	TYP	MAX	
LP-11 delay to a start of the Entering High Speed Mode	T_{DHH}	Max(150,32UI)	-	-	ns

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.10 MIPI interface (Mobile Industry Processing Interface)

The Display Serial Interface standard defines protocols between a host processor and peripheral devices that adhere to MIPI Alliance standards for mobile device interfaces. The DSI standard builds on existing standards by adopting pixel formats and command set defined in MIPI Alliance standards. DSI-compliant peripherals support either of two basic modes of operation: Command Mode and Video Mode. Which mode is used depends on the architecture and capabilities of the peripheral. The mode definitions reflect the primary intended use of DSI for display interconnect, but are not intended to restrict DSI from operating in other applications.

Command Mode refers to operation in which transactions primarily take the form of sending commands and data to a peripheral, such as a display module, that incorporates a display controller. The display controller may include local registers. Systems using Command Mode write to, and read from the registers.The host processor indirectly controls activity at the peripheral by sending commands, parameters and data to the display controller. The host processor can also read display module status information. Command Mode operation requires a bidirectional interface.

Video Mode refers to operation in which transfers from the host processor to the peripheral take the form of a real-time pixel stream. In normal operation, the display module relies on the host processor to provide image data at sufficient bandwidth to avoid flicker or other visible artifacts in the displayed image. Video information should only be transmitted using High Speed Mode. To reduce complexity and cost, systems that only operate in Video Mode may use a unidirectional data path.

Note: The NT51021 IC only supports Video Mode operation.

3.10.1 MIPI Lane Configuration

	MCU (Master) Display Module (Slave)
Clock Lane+/-	Unidirectional Lane ■ Clock Only ■ Escape Mode(ULPS Only)
Data Lane0+/-	Unidirectional Lane ■ Forward High-Speed ■ Forward Escape Mode ■ Forward LPDT
Data Lane1+/-	Unidirectional ■ Forward High speed
Data Lane2+/-	Unidirectional ■ Forward High speed
Data Lane3+/-	Unidirectional ■ Forward High speed

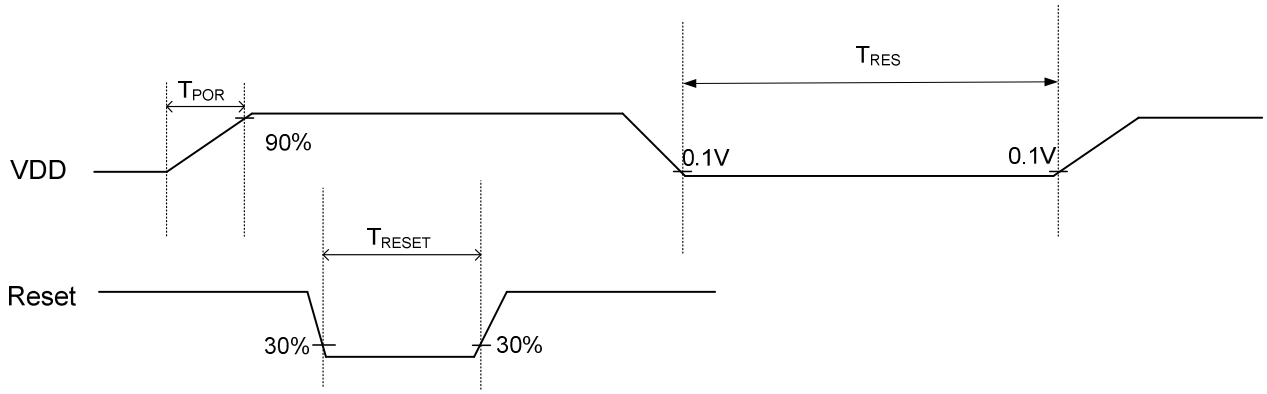
The connection between host device and display module is as reference.

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

3.11 Input AC Characteristic

a. VDD/GRB AC characteristic:

VDD= 3..3V, GND=AGND= 0V, TA= -20 to +85°C)



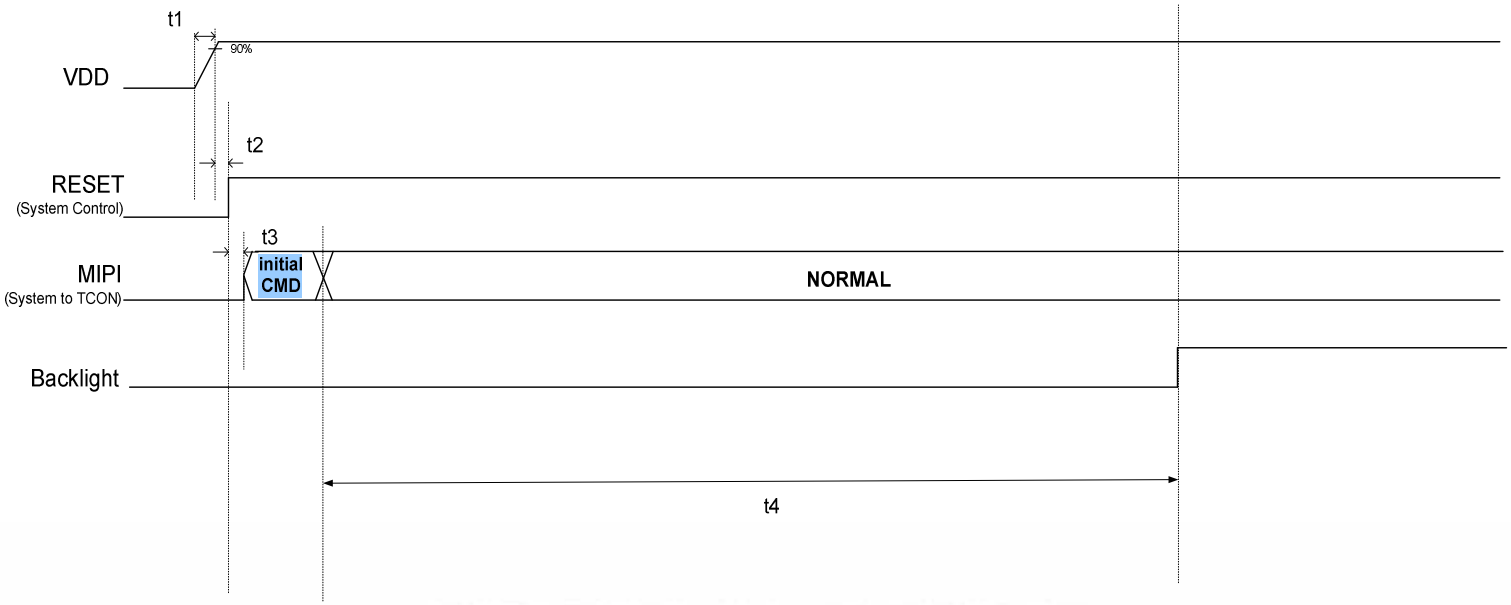
Parameter Symbol	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD power source slew time	T_{POR}	-	-	20	ms	From 0V to 90% VDD
RESET active pulse width	T_{RESET}	1	-	-	ms	VDD=3.3V
VDD resettle time	T_{RES}	1	-	-	s	

3.12 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.

a. Power on Timing Sequence:

VDD=3.0 to 3.6V

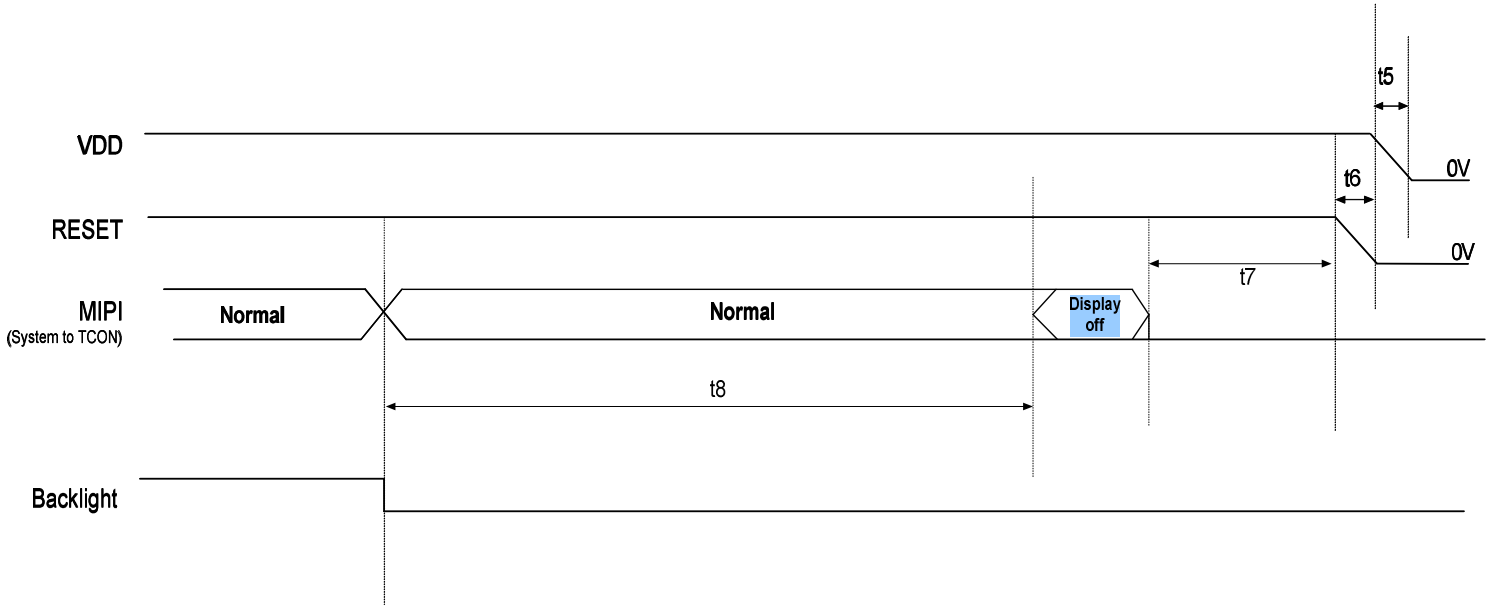


The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
t1	-	-	2	ms	
t2	5	-	-	ms	
t3	20	-	-	ms	
t4	100	-	-	ms	

b. Power off:

VDD=3.0 to 3.6V.



Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
t5	0	-	-	ms	
t6	0	-	-	ms	
t7	100	-	-	ms	
t8	20	-	-	ms	

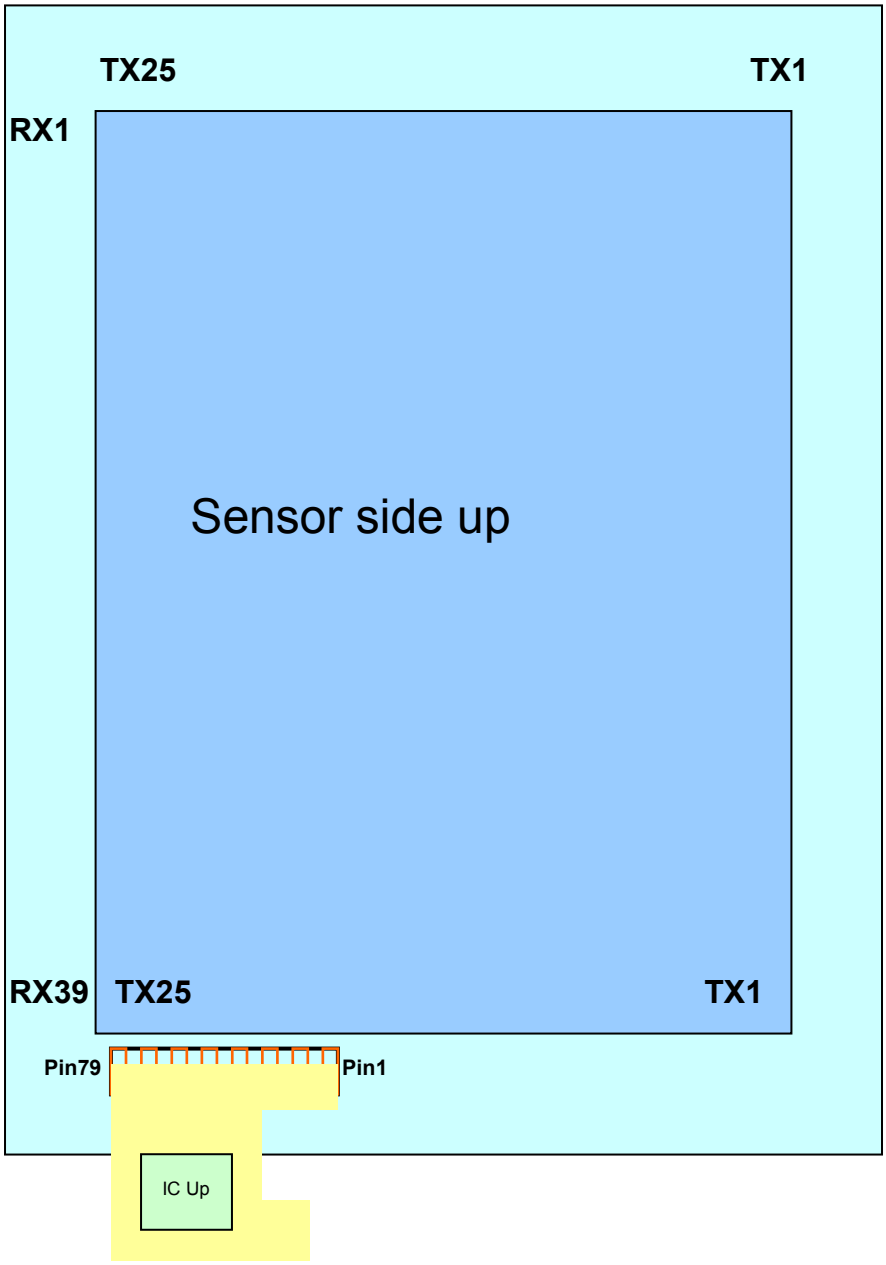
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

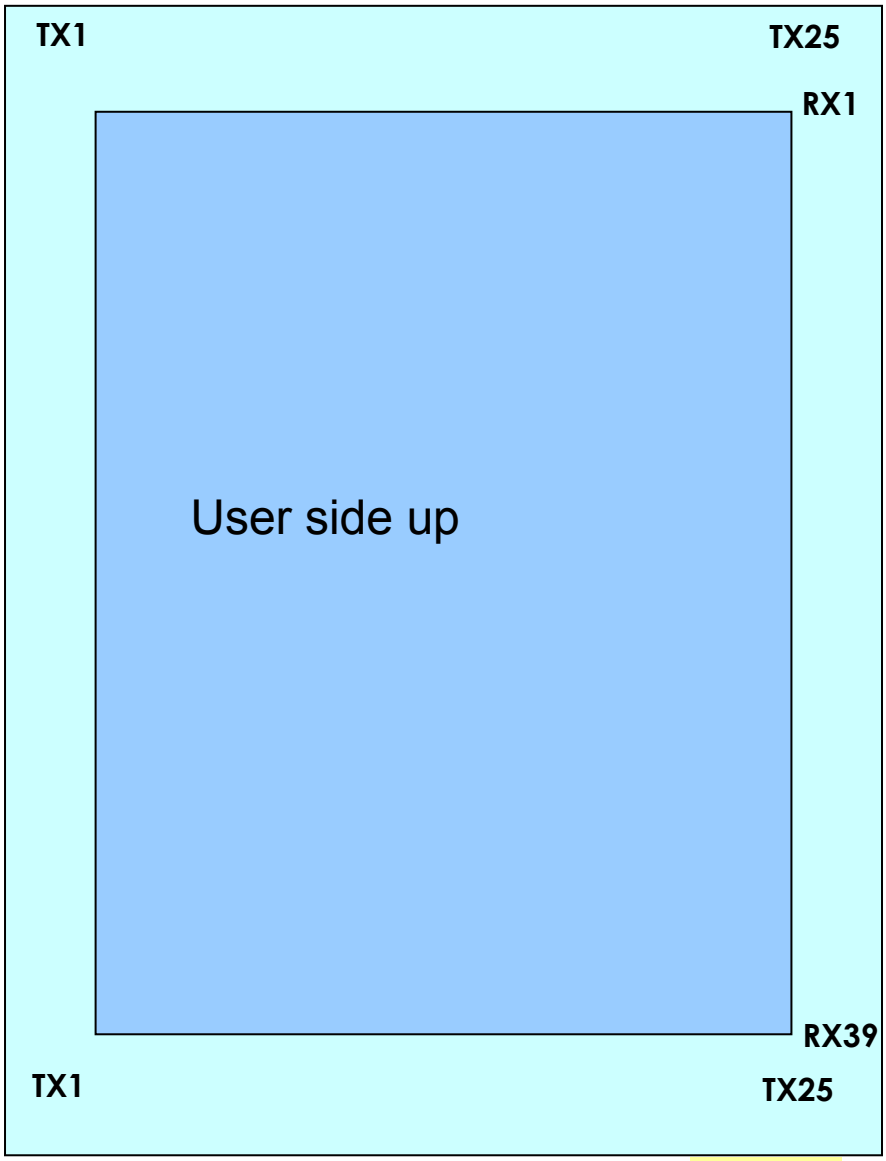
4. Electrical Specifications of TPM

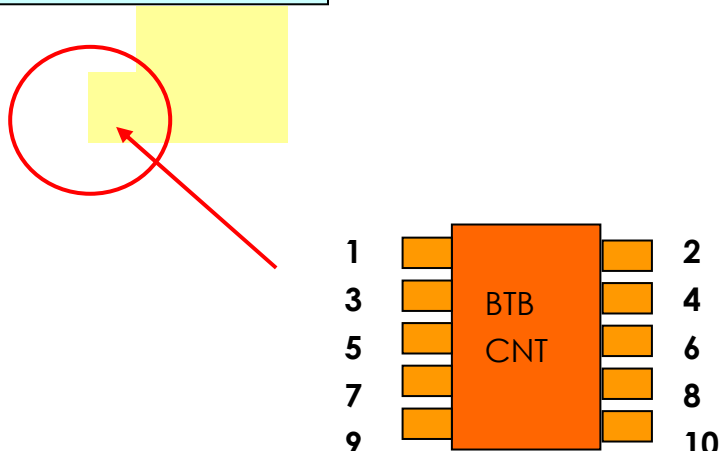
4.1 General Specifications of TPM

TP Technology	Projected Capacitive Multi-Touch Panel
Sensing technology	Projected mutual
Touch Structure	WIS
Touch Channels (X - Y)	25-39
Sensor Pitch (X - Y)	X 4.3456mm/Y 4.4415mm
FPC Golden Finger shape	Follow : DF37B-10DP-0.4V(51)　HRS
Supply Voltage	VDD 3.3V



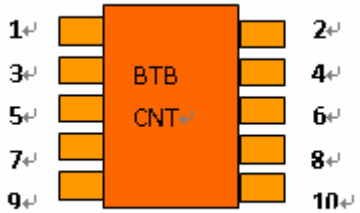
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.





The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

4.2 Electrical Characteristics of TPM

Item	Spec
Supply Voltage	VDD 3.3V
Interface	I2C
Chipset	Nova NT11003_QFN88B
Interface Connector to system	DF37B-10DP-0.4V(51) HRS
Interface Connector Pin Assignment (BTB CNT)	
Support OS	Android
FPC	2 Layers; 1/3 oz

Pin no.	
1	ESD_GND
2	GND
3	VDDIO(1.8V)
4	I2C Clock (SCK)
5	I2C Data (SDA)
6	I2C Interrupt (INT)
7	TP_Sync
8	GND
9	RST
10	VDDIN (3.3V)

4.3 TPM Pin Assignment

4.3.1 Sensor & FPCa Pin Assignment

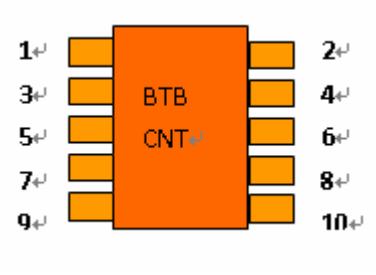
金手指端 Pin Assignment

pin #	pin assignment	pin #	pin assignment	pin #	pin assignment	pin #	pin assignment
1	GND	22	TX20	43	RX37	64	RX16
2	GND	23	TX21	44	RX36	65	RX15
3	TX1	24	TX22	45	RX35	66	RX14
4	TX2	25	TX23	46	RX34	67	RX13
5	TX3	26	TX24	47	RX33	68	RX12
6	TX4	27	TX25	48	RX32	69	RX11
7	TX5	28	NA	49	RX31	70	RX10
8	TX6	29	NA	50	RX30	71	RX9
9	TX7	30	NA	51	RX29	72	RX8
10	TX8	31	NA	52	RX28	73	RX7
11	TX9	32	ESD_GND	53	RX27	74	RX6
12	TX10	33	ESD_GND	54	RX26	75	RX5
13	TX11	34	ESD_GND	55	RX25	76	RX4
14	TX12	35	NA	56	RX24	77	RX3

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

15	TX13	36	NA	57	RX23	78	RX2
16	TX14	37	NA	58	RX22	79	RX1
17	TX15	38	NA	59	RX21		
18	TX16	39	GND	60	RX20		
19	TX17	40	GND	61	RX19		
20	TX18	41	RX39	62	RX18		
21	TX19	42	RX38	63	RX17		

(b)Connector Pin Assignment



pin #	pin assignment
1	ESD_GND
2	GND
3	VDDIO(1.8V)
4	SCK
5	SDA
6	INT
7	TP_Sync
8	GND
9	RST
10	VDDIN(3.3V)

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

4.3.2 TP Performance

Test parameter	Spec
Multi-touch	10 point
Report Rate (continuous)	<16.7ms
Response time (idle to active)	<35ms
Linearity with 5mm finger	< 1mm on X, Y and Diagonal at 5mm/sec and 50mm/sec speed
Accuracy with 5mm finger	< 1mm tested on 13 points by touching each point 10 times
Finger Separation	2 fingers when distance is >12mm
Jitter	< 1mm with stationary contact for 5 secs
Noise suppression capability	40Vpp common mode noise with 50-500KHz noise requency with 5ø and 22ø

5. Mechanical Specifications of TDM

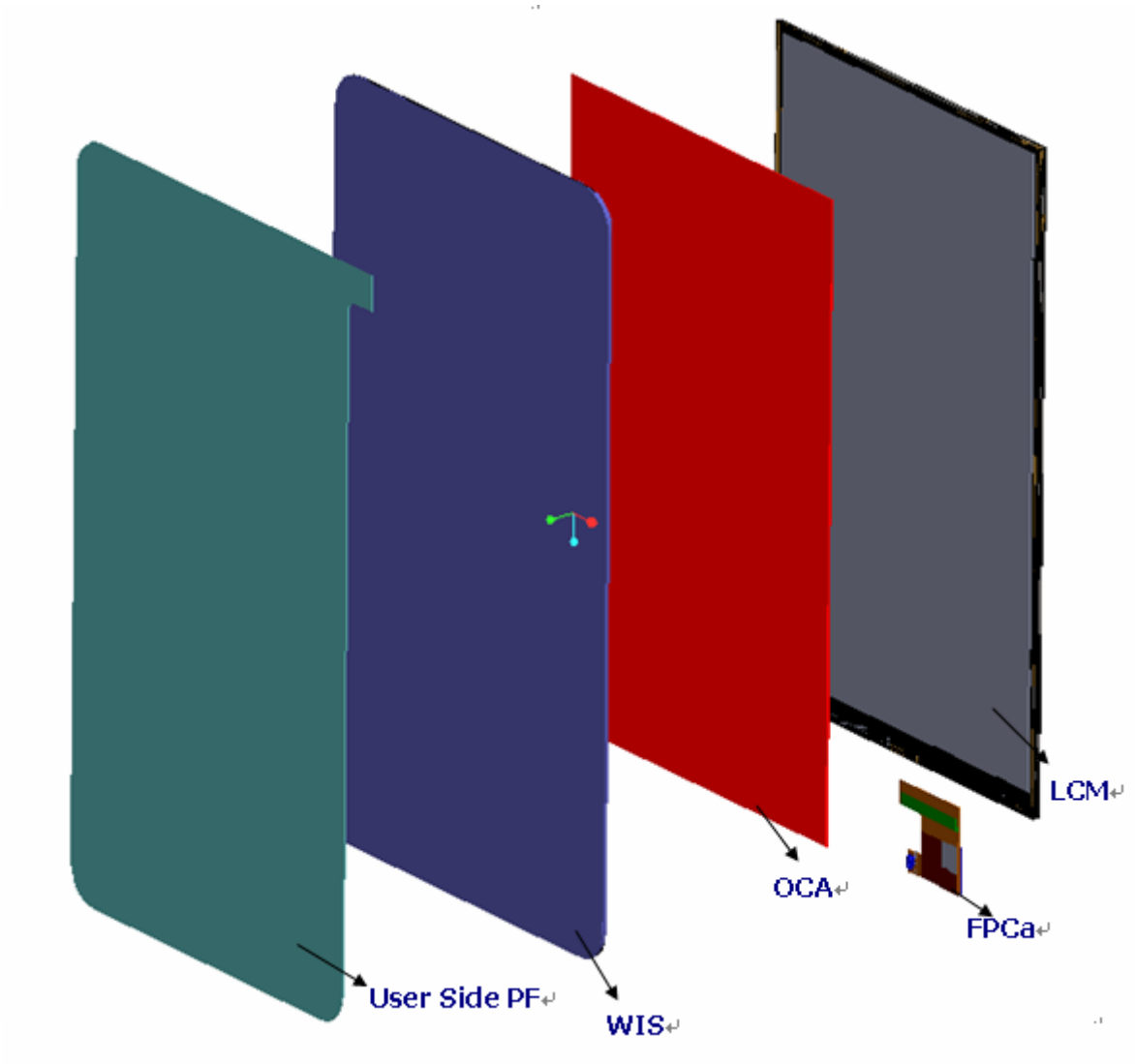
5.1 Mechanical Specifications of LCM

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	114.3	114.6	114.9	mm	Module Size
	Vertical (V)	184.3	184.6	184.9	mm	
	Thickness (T)			2.15(w/o FPCA) 3.65(w/ FPCA)	mm	
CF Polarizer	Horizontal	110.14	110.44	110.74	mm	CF Polarizer
	Vertical	175.32	175.62	175.92	mm	
Active Area	Horizontal	107.59	107.64	107.69	mm	Active Area
	Vertical	172.174	172.224	172.274	mm	
Weight		-	-	90	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

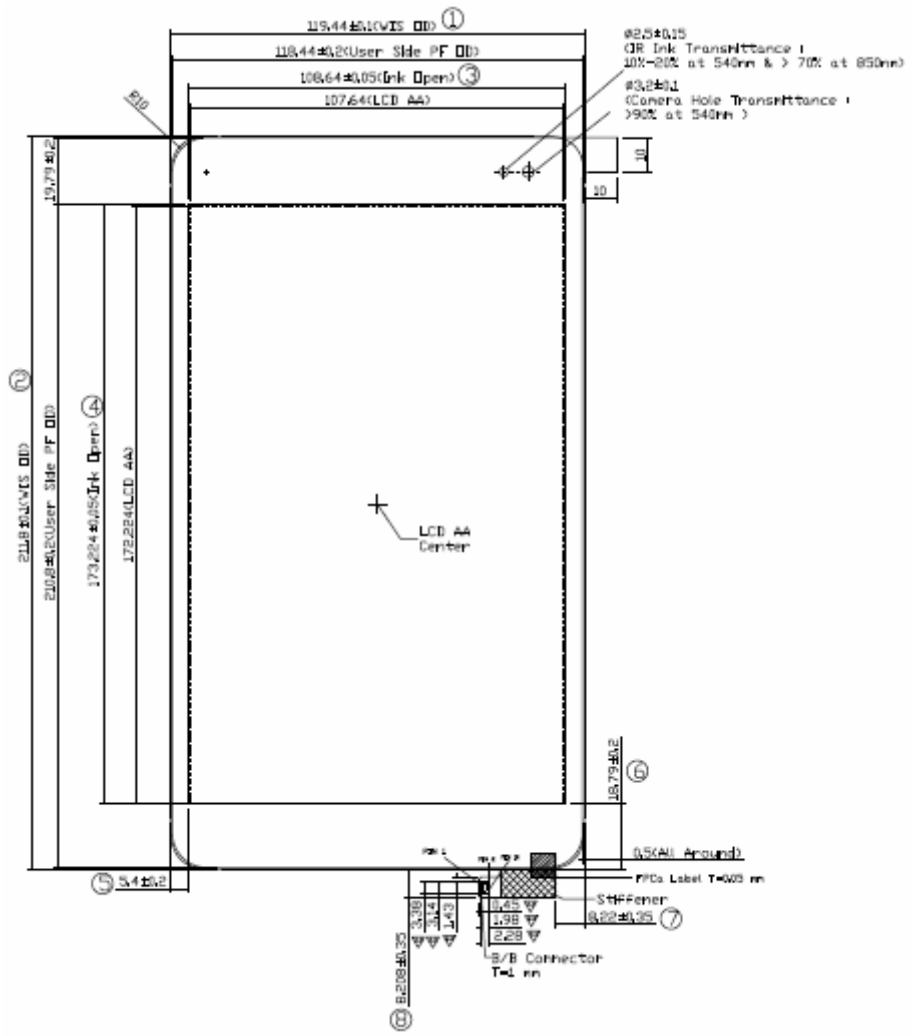
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

5.2 TDM Explosion Figure

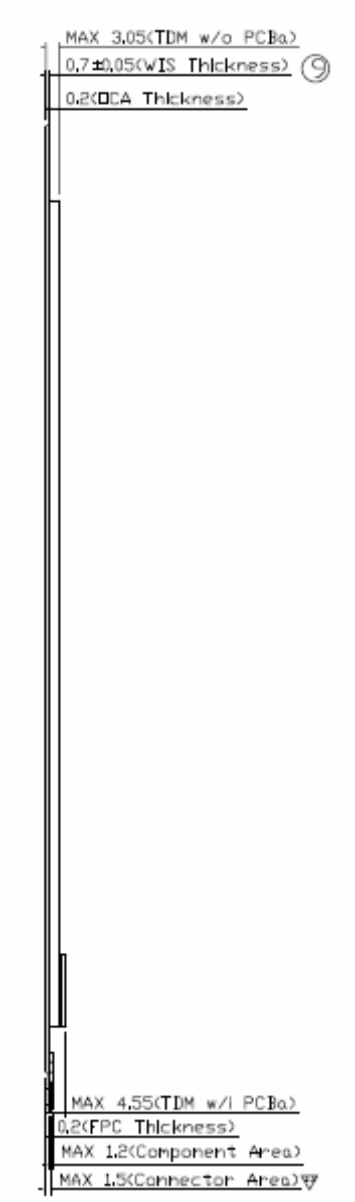


The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

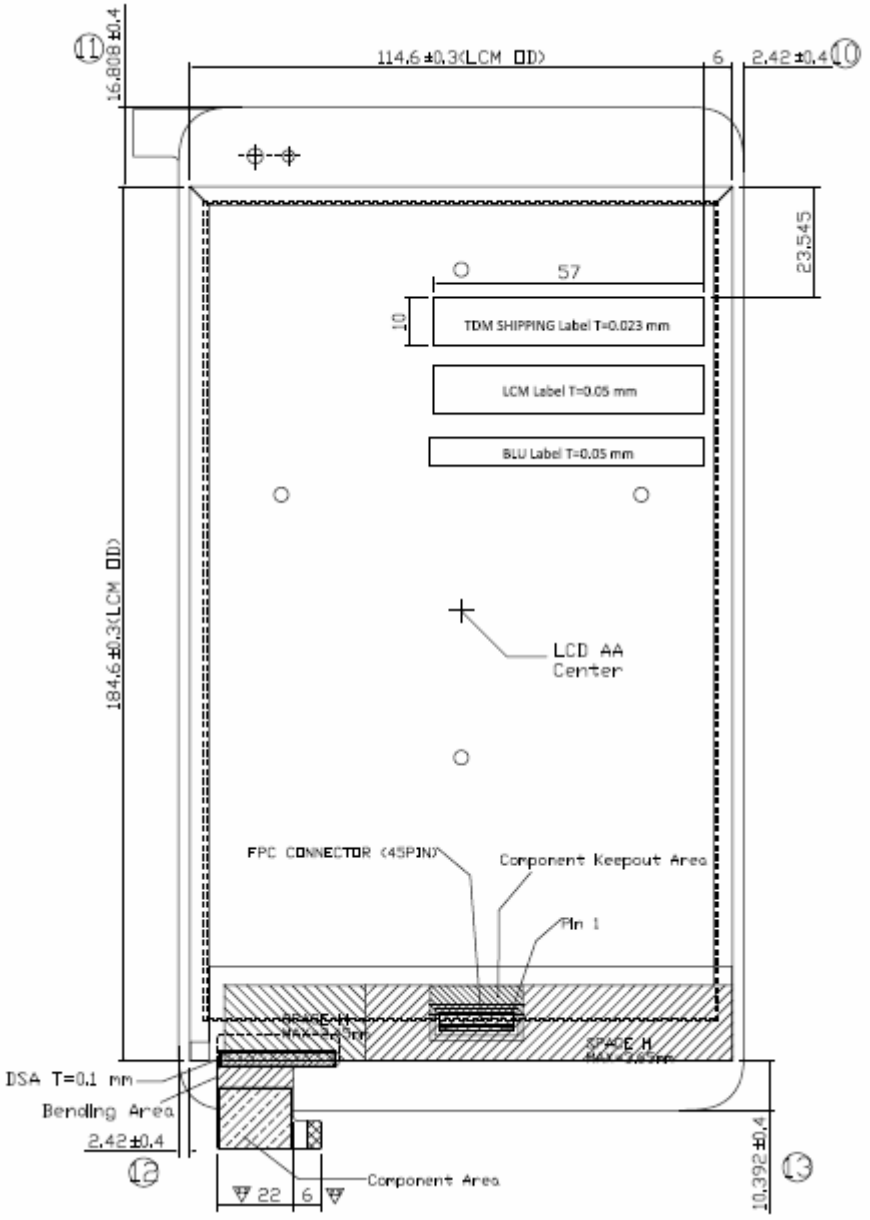
5.3 TDM Drawing



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.



版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

6. Absolute Maximum Ratings of LCM

6.1 Absolute Ratings of Environment

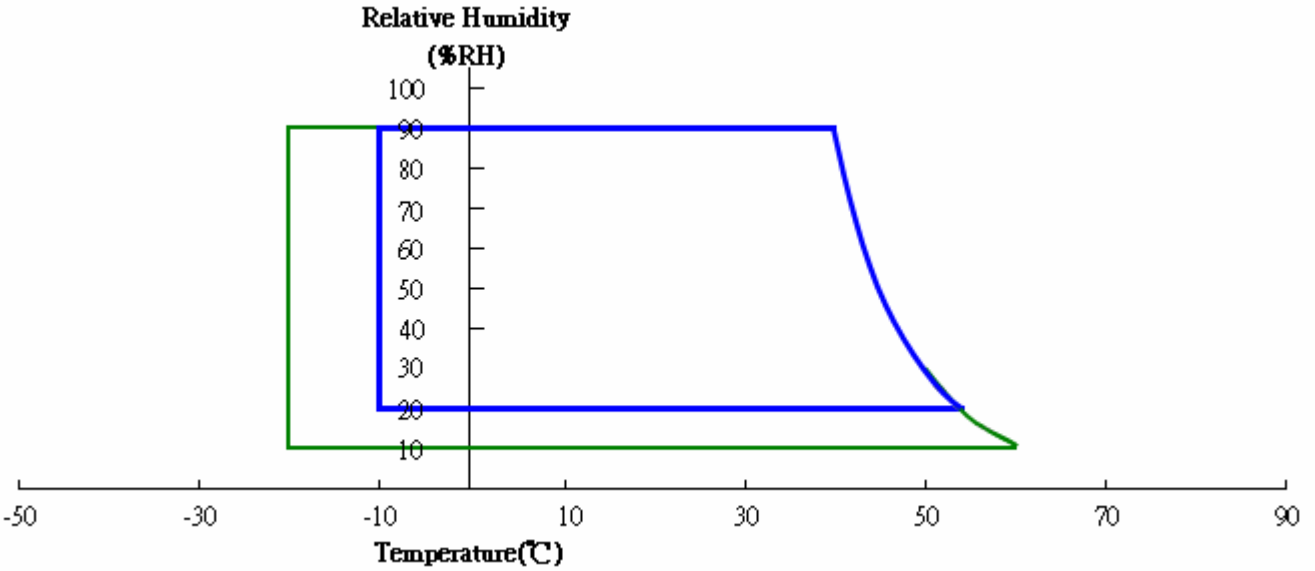
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	-10	+50	ºC	(1), (2)

Note (1) (a) 90 %RH Max.

(b) Wet-bulb temperature should be 39 ºC Max.

(c) No condensation.

Note (2) The temperature of panel surface should be -10 ºC min. and 60 ºC max.



6.2 Electrical Absolute Ratings

6.2.1 TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	**VDD**	**+2.7**	**+3.6**	**V**	(1)

Note (1) Stresses beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

7. Reliability Test Item of TDM

Test Item	Test Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃ , 80%RH, 240hours	(1) (2)
High Temperature Operation (HTO)	Ta= 50℃ , 240hours	
Low Temperature Operation (LTO)	Ta= -10℃ , 240hours	
High Temperature Storage (HTS)	Ta= 60℃ , 240hours	
Low Temperature Storage (LTS)	Ta= -20℃ , 240hours	
Thermal Shock Test (TST)	-20℃/30min , 60℃ / 30min , 100 cycles	
ESD Test(Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : Contact Discharge, ±8KV	(1)
	150pF, 330Ω, 1sec/cycle Condition 2 : Air Discharge, ±12KV	
Shock (Non-Operating)	(non-operation) 220G, 2ms, half sine wave,1 time for each direction of ±X,±Y,±Z	(1) (3)
Vibration (Non-Operating)	(non-operation) 1.5G/10-500 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	(1) (3)

Note (1) Criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hours.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

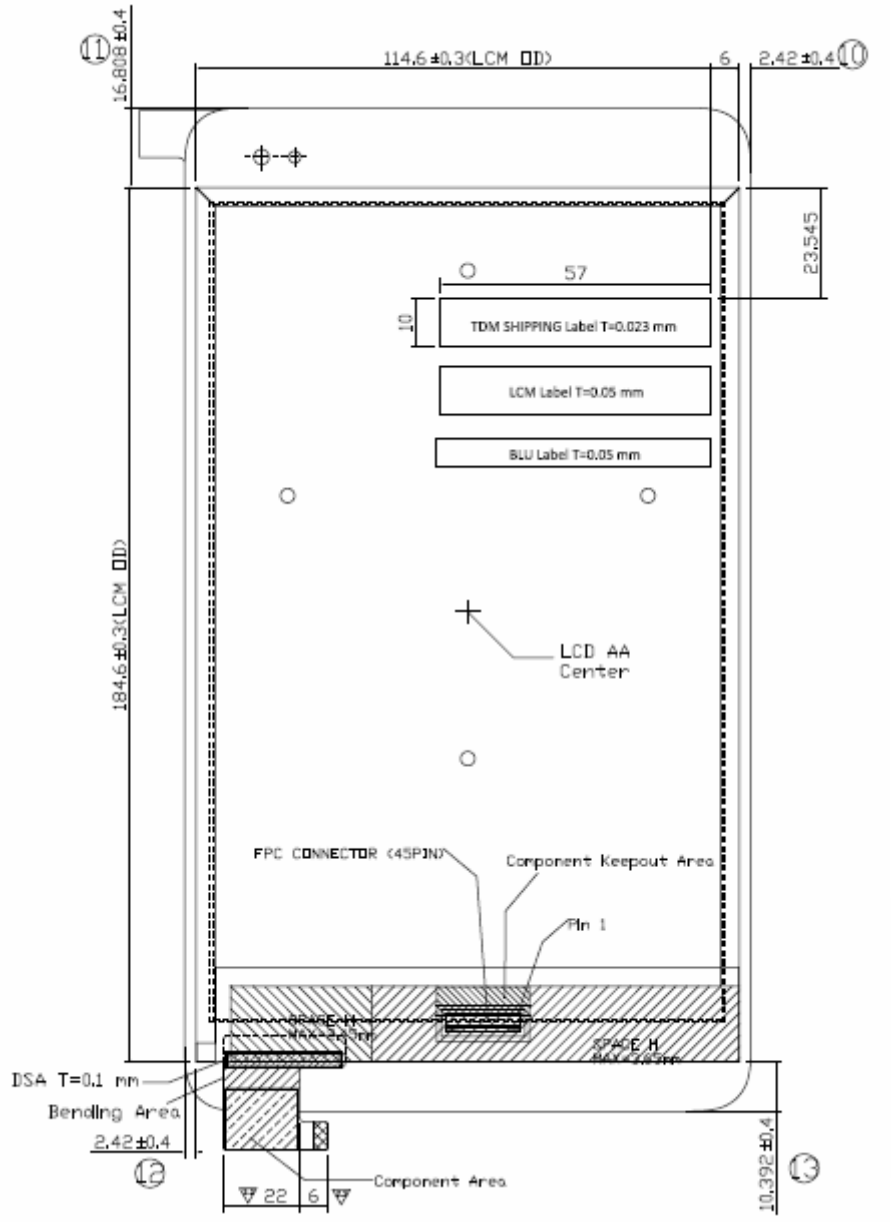
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

8. Shipping and Package of TDM

8.1 Label Position

(a) Label : Means TDM Label

(b) Module Label : Means LCM Label

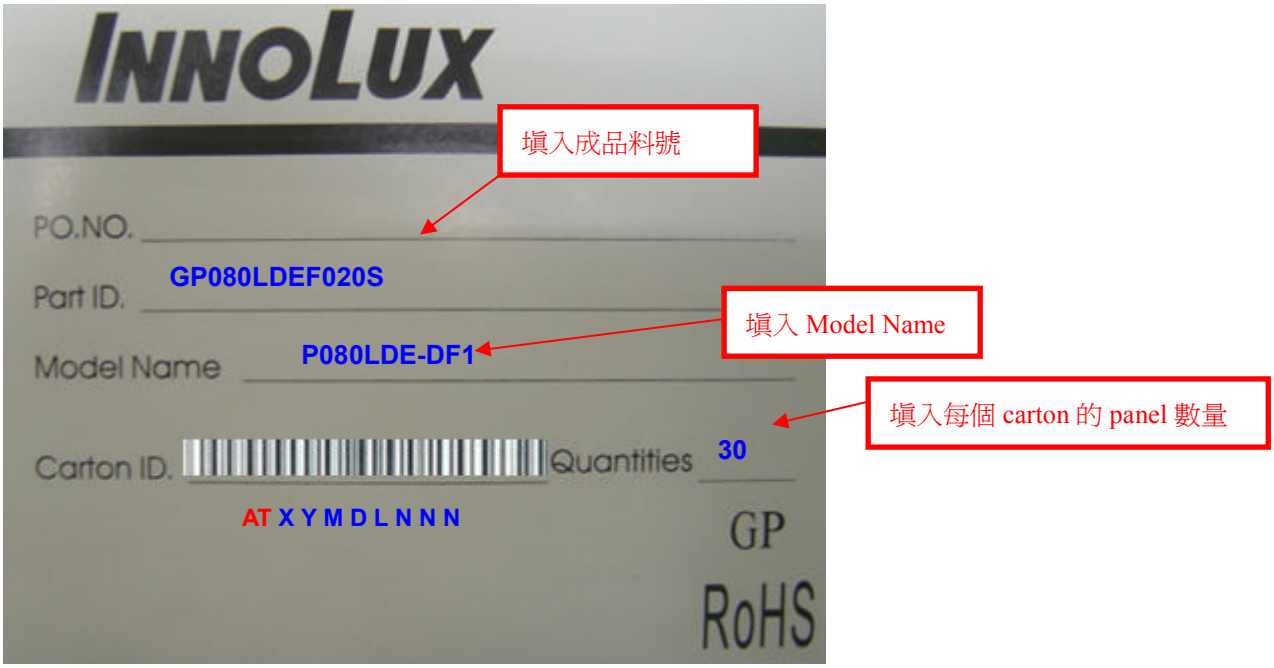


版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

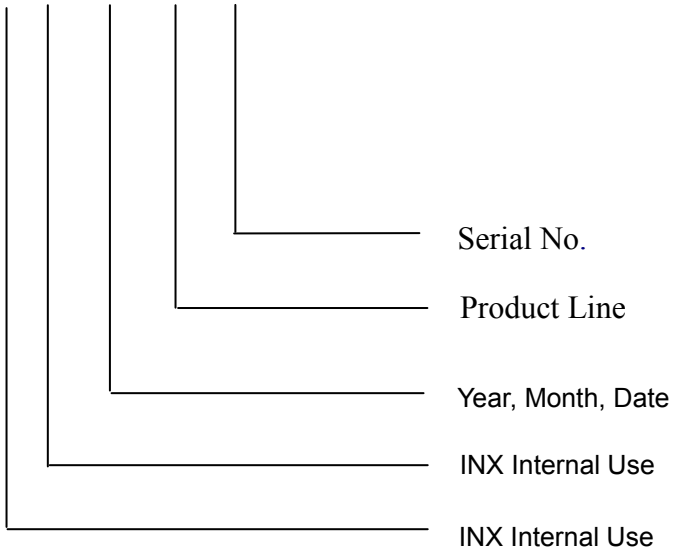
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

8.2 Label Definition of TDM

(a) Carton Label Format

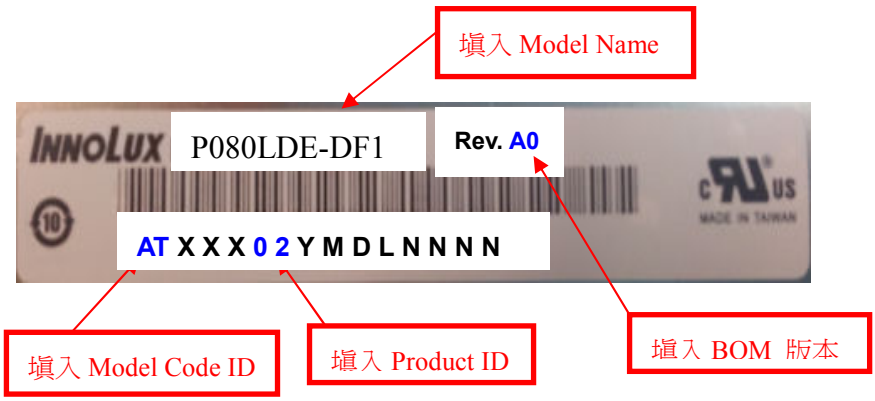


(a) Carton ID: A T X Y M D L N N N



The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

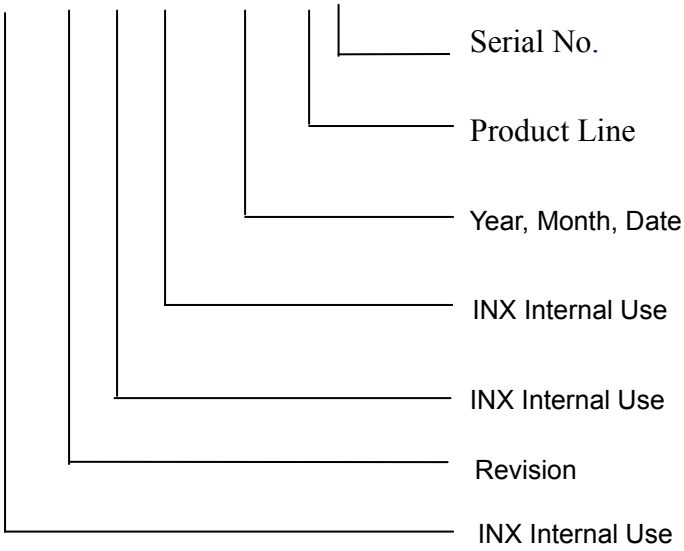
(b)SN Label Definition



(a) Model Name: **P080LDE-DF1**

(b) Revision: Rev. **A0**, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D L N N N N



(d) Production Location: MADE IN XXXX. XXXX stands for production location.

(e) UL logo: “AAAA” especially stands for panel manufactured by INX China satisfying UL requirement.
“LEOO” and “COCKN” is the INX’s UL factory code for Ningbo factory..

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

8.3 Package of TDM

(a) Packing

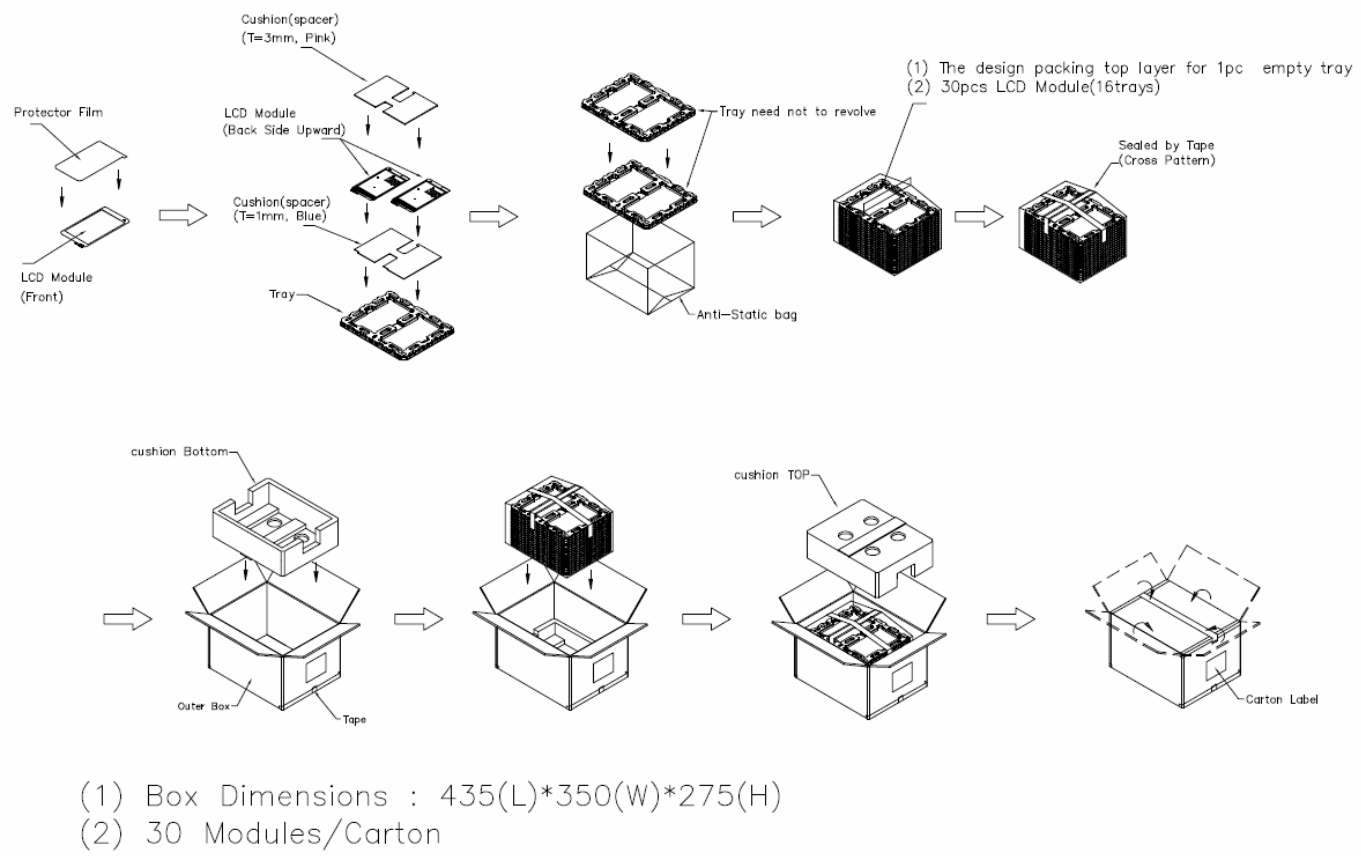


Figure. 7-1 Packing method

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

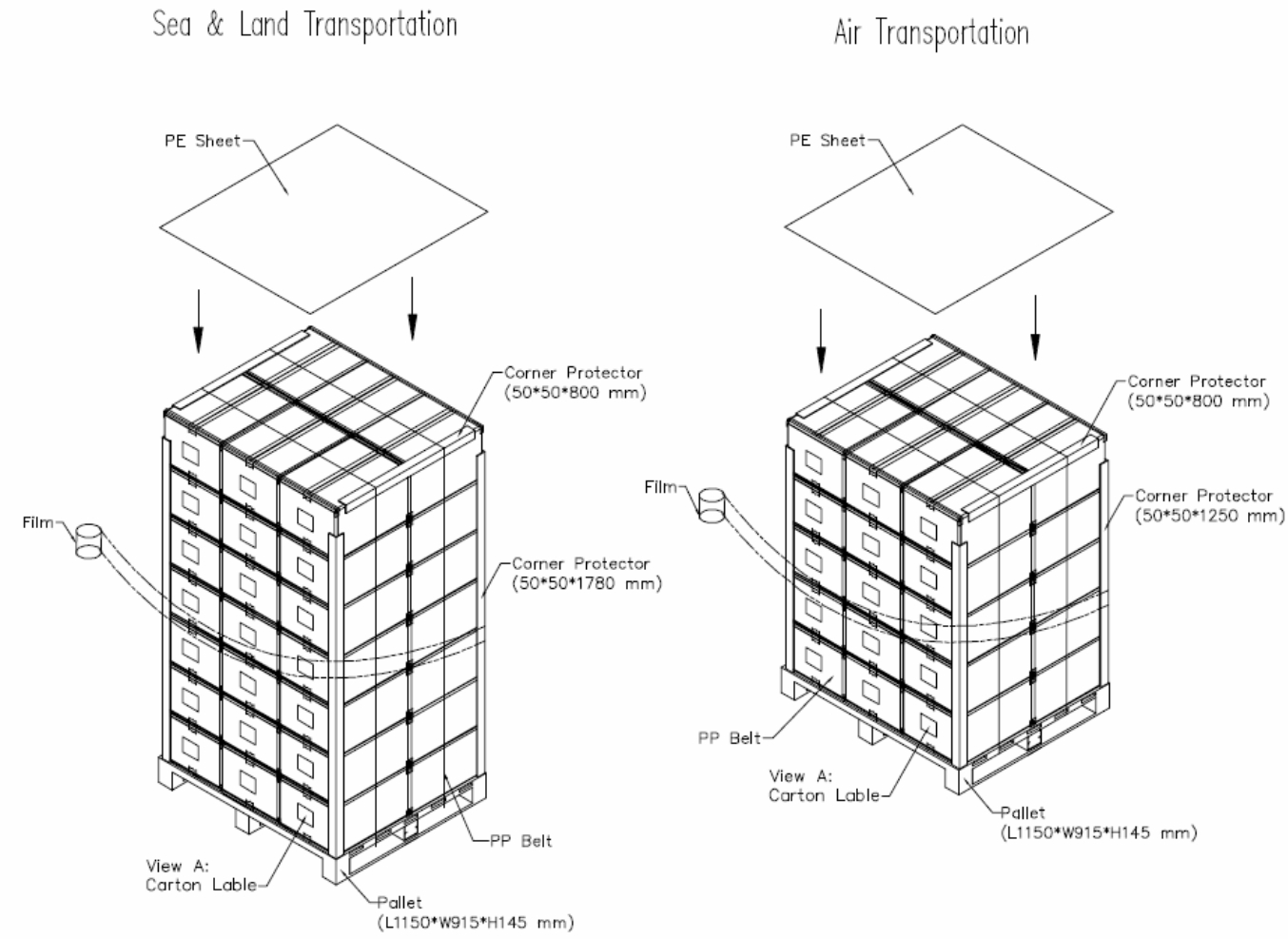


Figure. 7-2 Packing method

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

(b) Un-Packing

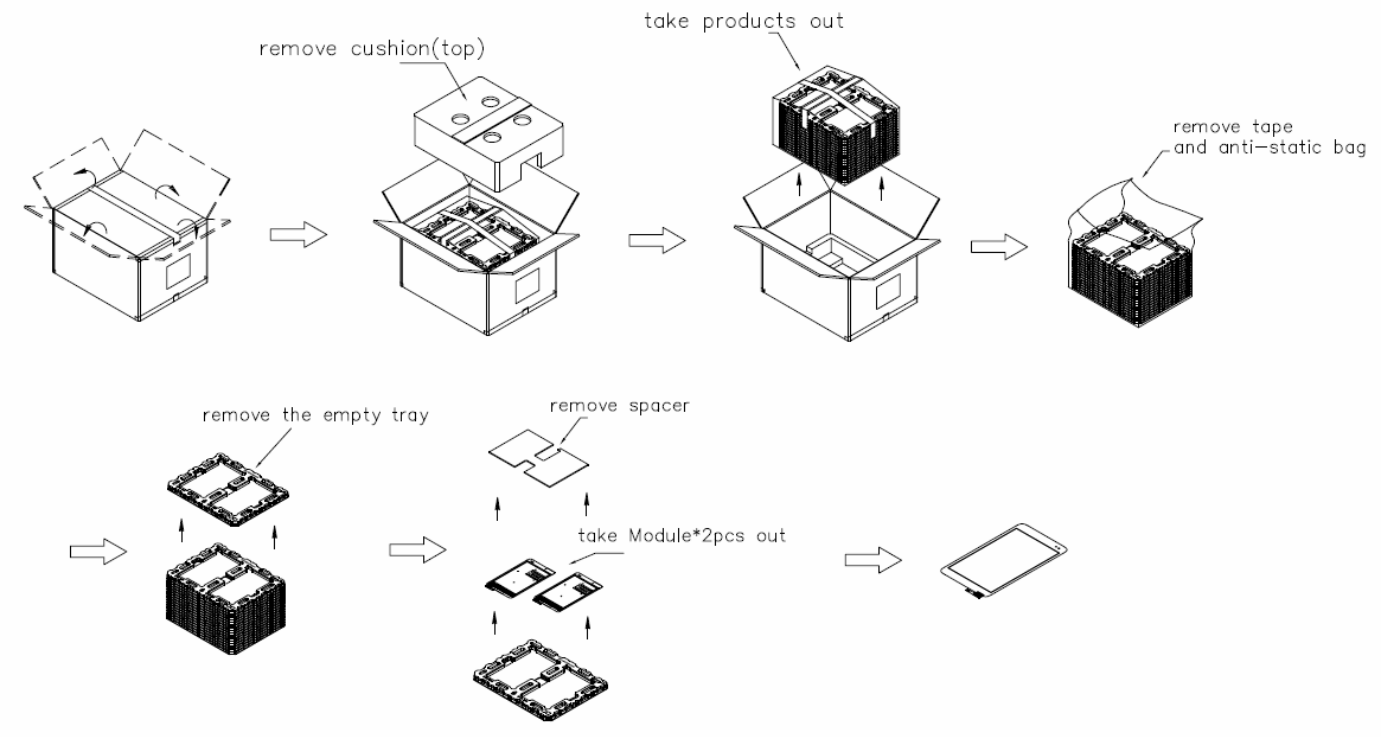


Figure. 7-3 Un-Packing method

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.

9. Precautions

9.1 Handing Precautions

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the LED wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

9.2 Storage Precautions

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of LED will be higher than the room temperature.

9.3 Operation Precautions

(1) Do not pull the I/F connector in or out while the module is operating.

版權屬於群創所有，禁止任何未經授權的使用
The copyright belongs to INNOLUX. Any unauthorized use is prohibited.

The copyright belongs to InnoLux. Any unauthorized use is prohibited.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

(4) ight unit.

版權屬於群創所有，禁止任何未經授權的使用

The copyright belongs to INNOLUX. Any unauthorized use is prohibited.
The copyright belongs to InnoLux. Any unauthorized use is prohibited.