CHIMEI INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: ED090NA-01D

Date: 2011/08/05

Version: 01

☐ Preliminary Specification

■ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
James Yu 2011/08/08	Charlie Chou 2011/08/08	David Lee 2011/08/08

Record of Revision

Version	Revise Date	Page	Content
Pre-Spec.01	2011/04/14		Initial Release.
Final-Spec.01	2011/08/05	1	Update power consumption & weight
		8	Update power on / off sequence.
		22	Add Firmware Management Flow
		29	Update mechanical drawing
		30	Update weight

CHIMEI INNOLUX

Contents

CHIMEI INNOLUX

1. General Specifications

No.	Item	Specification	Remark
1	LCD size	9.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1280 × 3(RGB) × 800	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.0505(W) × 0.1515(H) mm	
6	Active area	193.920(W) × 121.200(H) mm	
7	Module size(without CTP)	206.76 (W) ×135.06(H) ×3.6(D) mm	Note 1
8	Module size(with CTP)	235.12 (W) ×156.40(H) ×5.36(D) mm	Note 1
9	Sensing	4 points	
10	Surface Hardness	7H	
11	Surface treatment (LCD)	Hard Coating	
12	Color arrangement	RGB-stripe	
13	Interface	Digital	
14	View direction(Gray Inversion)	12 O'Clock	
15	Backlight power consumption	2.304W (Typ.)	
16	Panel power consumption	0.65W (Typ.)	
17	CTP power consumption	0.145 W (Max.)	
18	Weight	285g (Typ)	

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

FPC Connector is used for the module electronics interface. The model is F82151-H1210PI manufactured by Vigorconn

Pin No.	Symbol	I/O	Function	Remark
1	VDD	P	Power supply input for C-TP	
2	GND	P	Ground for C-TP	
3	Reset	I	Reset C-TP	
4	SCL	I	Clock pin for I2C communication	
5	SDA	I/O	Data pin for I2C communication	
6	INT	O	Interrupt pin	
7	NC		Not connected	
8	NC		Not connected	
9	GND	P	Ground	
10	GND	P	Ground	
11	GND	P	Ground	
12	VCOM	P	Common Voltage	
13	VDD	P	Power Voltage for digital circuit	
14	VDD	P	Power Voltage for digital circuit	
15	NC	---	No connection	
16	Reset	I	Global reset pin	
17	STBYB	I	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, source driver will turn off, all output are High-Z	
18	GND	P	Ground	
19	RXIN0-	I	- LVDS differential data input	
20	RXIN0+	I	+ LVDS differential data input	
21	GND	P	Ground	
22	RXIN1-	I	- LVDS differential data input	
23	RXIN1+	I	+ LVDS differential data input	
24	GND	P	Ground	
25	RXIN2-	I	- LVDS differential data input	

26	RXIN2+	I	+ LVDS differential data input	
27	GND	P	Ground	
28	RXCLKIN-	I	- LVDS differential clock input	
29	RXCLKIN+	I	+ LVDS differential clock input	
30	GND	P	Ground	
31	RXIN3-	I	- LVDS differential data input	
32	RXIN3+	I	+ LVDS differential data input	
33	GND	P	Ground	
34	NC	---	No connection	
35	NC	---	No connection	
36	GND	P	Ground	
37	NC	---	No connection	
38	DIMO	O	Backlight CABC controller signal output	
39	SELB	I	6bit/8bit mode select	Note1
40	AVDD	P	Power for Analog Circuit	
41	GND	P	Ground	
42	LED-	P	LED Cathode	
43	LED-	P	LED Cathode	
44	L/R	I	Horizontal inversion	Note3
45	U/D	I	Vertical inversion	Note3
46	VGL	P	Gate OFF Voltage	
47	CABCEN1	I	CABC H/W enable	Note2
48	CABCEN0	I	CABC H/W enable	Note2
49	VGH	P	Gate ON Voltage	
50	LED+	P	LED Anode	
51	LED+	P	LED Anode	

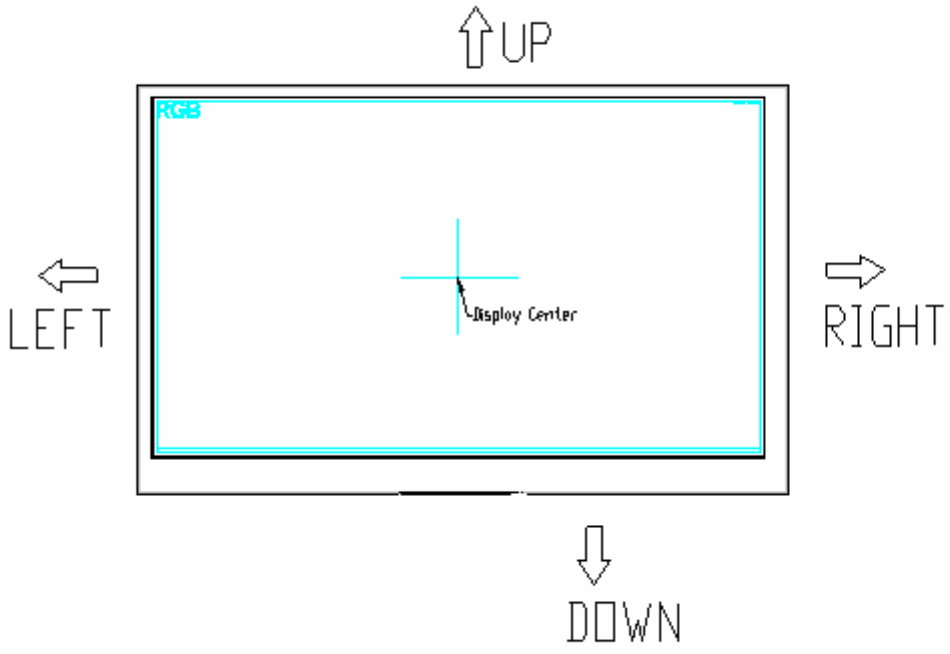
I: input, O: output, P: Power

Note1: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN=”00”, CABC OFF.
When CABC_EN=”01”, user interface image.
When CABC_EN=”10”, still picture.
When CABC_EN=”11”, moving image.
When CABC off, don’t connect DIMO, else connect it to backlight.

Note3: When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When U/D="0", set top to bottom scan direction.
When U/D="1", set bottom to top scan direction.

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



3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{DD}	-0.3	5.0	V	
	AV_{DD}	6.5	15	V	
	V_{GH}	-0.3	42.0	V	
	V_{GL}	-20.0	0.3	V	
	V_{GH}-V_{GL}	-	40.0	V	
Operation Temperature	T_{OP}	-10	50	℃	
Storage Temperature	T_{ST}	-20	60	℃	
LED Reverse Voltage	V_R	-	5	V	Each LED
LED Forward Current	I_F	-	20	mA	Each LED

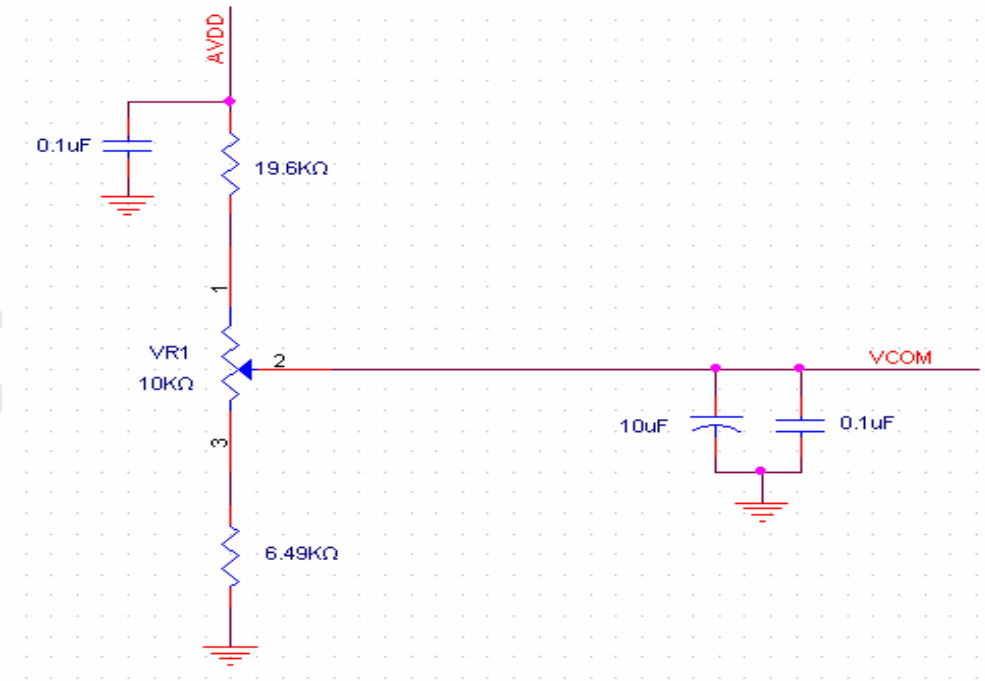
Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.1. Typical Operation Conditions

(Note 1)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{DD}	3.1	3.3	3.5	V	Note 2
	AV_{DD}	10.8	11	11.2	V	
	V_{GH}	19.7	20	20.3	V	
	V_{GL}	-6.5	-6.8	-7.1	V	
Input signal voltage	V_{COM}	2.5	3.5	4.5	V	Note 4
Input logic high voltage	V_{IH}	$0.8V_{DD}$	-	V_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	-	$0.2\ V_{DD}$	V	

Note 1: Be sure to apply V_{DD} and V_{GL} to the LCD first, and then apply V_{GH}.
Note 2: V_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.
Note 3: LVDS, Reset.
Note 4: Typical V_{COM} is only a reference value, it must be optimized according to each LCM. Be sure to use VR.



3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	0.52	1	mA	V_{GH} =20V
	I_{GL}	-	0.52	1	mA	V_{GL} = -6.8V
	IV_{DD}	-	62.5	95	mA	V_{DD} =3.3V
	IAV_{DD}	-	38.5	60	mA	AV_{DD} =11V

3.1.3. Backlight Driving Conditions

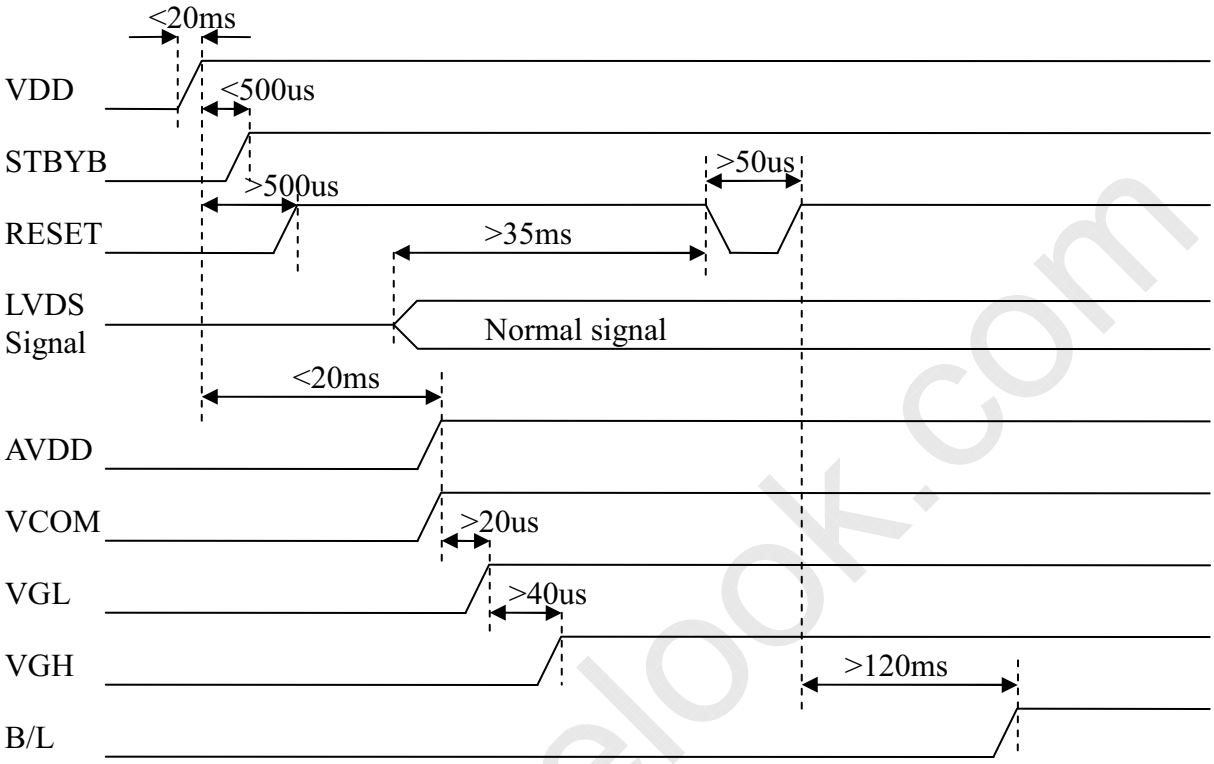
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	--	9.6	10.5	V	Note 1
Current for LED backlight	I_L	--	240	-	mA	
LED life time	-	-	20,000	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =240mA.

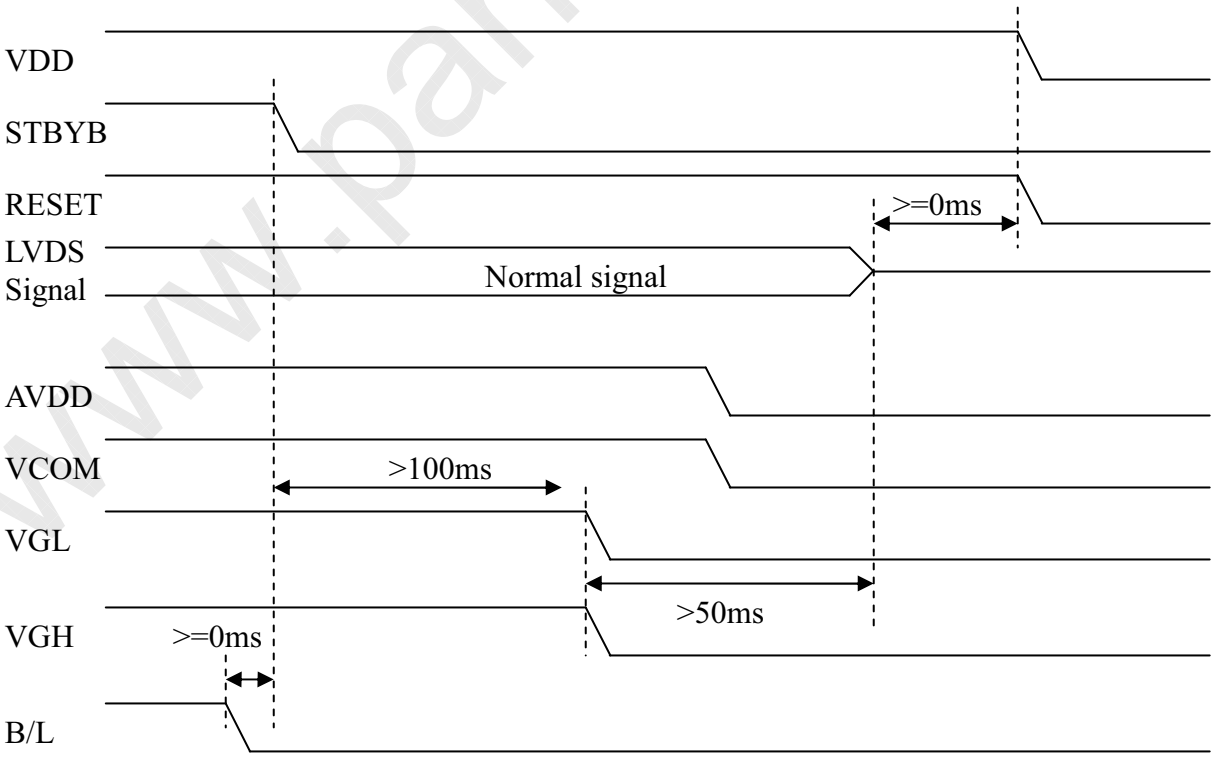
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =240mA. The LED lifetime could be decreased if operating I_L is lager than 240mA.

3.2. Power Sequence

a. Power on:



b. Power off:

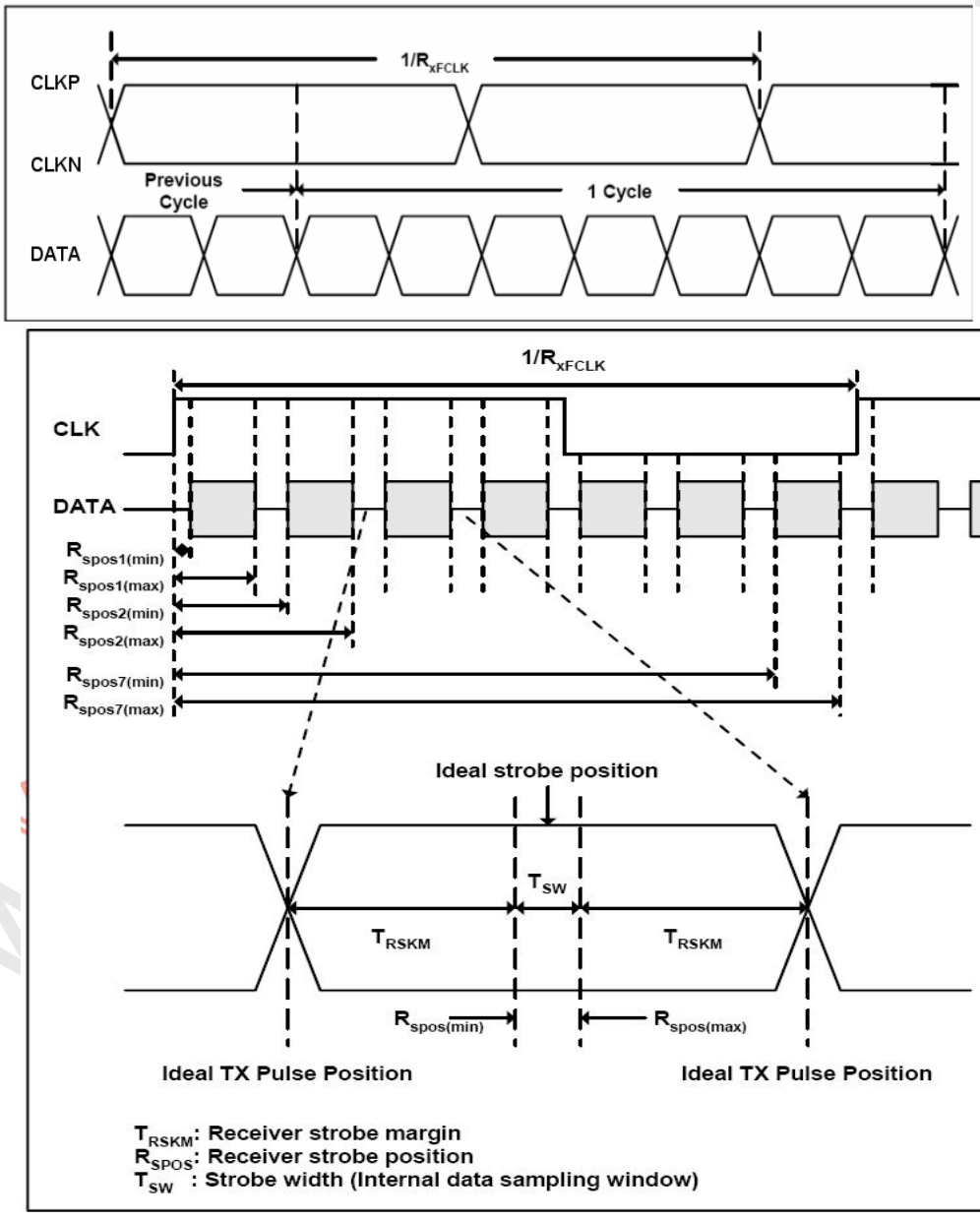


3.3. Timing Characteristics

3.3.1. AC Electrical Characteristics

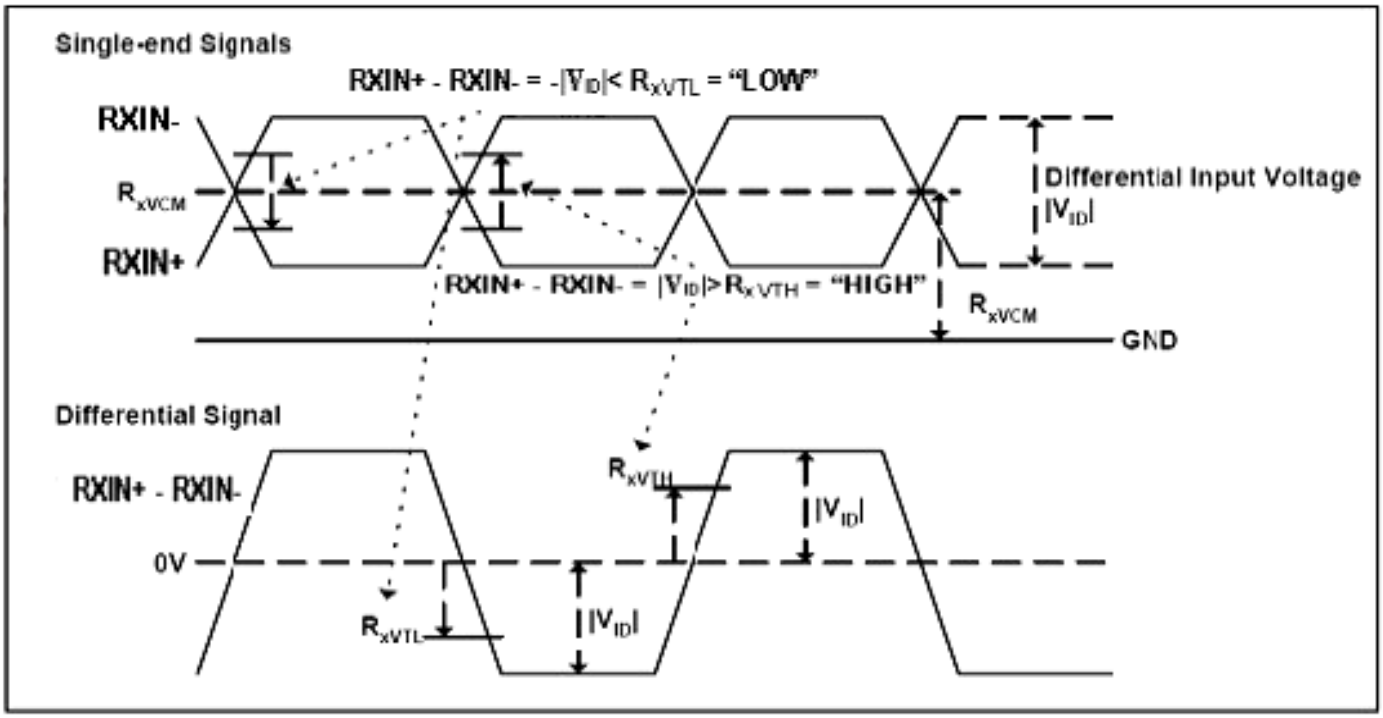
Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	R_{xFCLK}	20	-	81	MHz	
Input data skew margin	T_{RSKM}	500	-	-	ps	
Clock high time	T_{LVCH}	-	4/(7* R_{xFCLK})	-	ns	
Clock low time	T_{LVCL}	-	3/(7* R_{xFCLK})	-	ns	

3.3.2. Input Clock and Data Timing Diagram



3.3.3. DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	R_{XVCM}=1.2V
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$	-	$2.4-\|V_{ID}\|/2$	V	
Differential voltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Differential input leakage current	RV_{xliz}	-10	-	+10	uA	

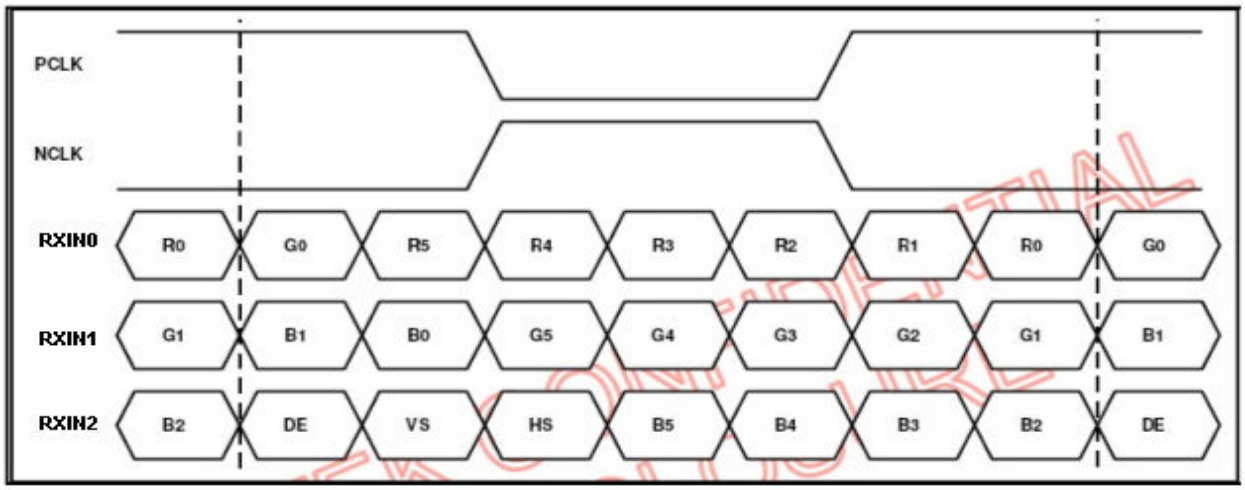


3.3.4. Timing

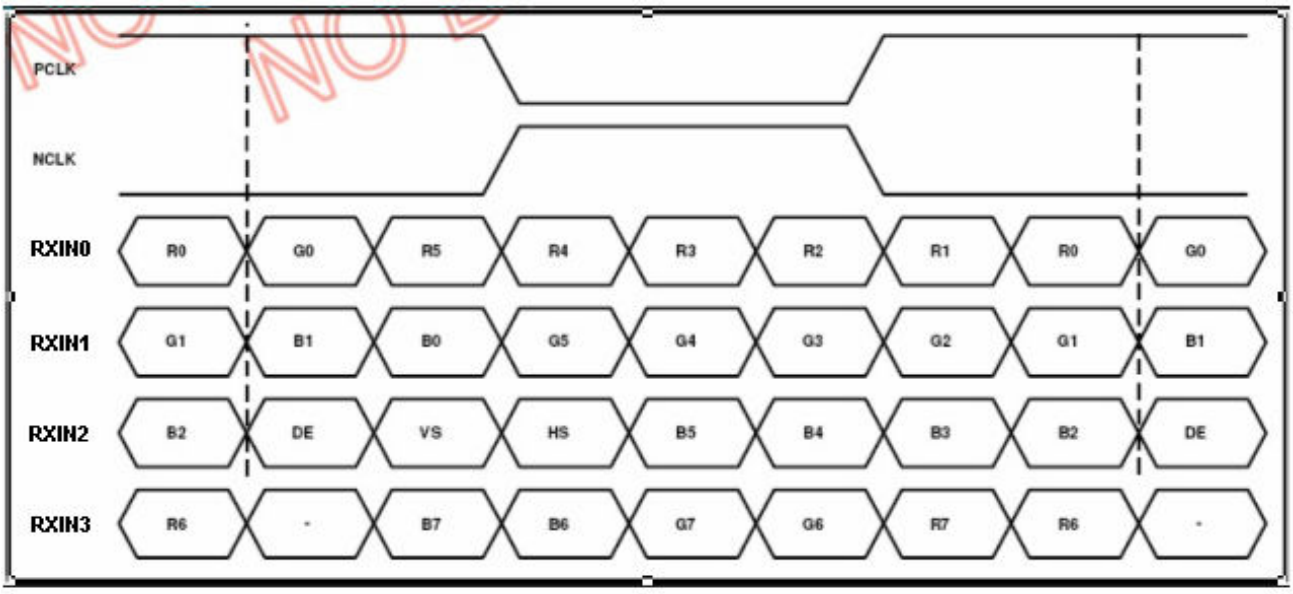
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	66.6	72.4	78.9	MHz	Frame rate =60Hz
Horizontal display area	thd		1280			
HS period time	th	1370	1440	1500	DCLK	
HS Blanking	thb	90	160	220	DCLK	
Vertical display area	tvd		800			
VS period time	tv	810	838	877	H	
VS Blanking	thb	10	38	77	H	

3.3.5. Data Input Format

6bit LVDS input



8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported.

4. Touch Panel Electrical Specifications

4.1. Electrical Characteristics

Item		Symbol	Specification			Unit	Remark
			Min.	Typ.	Max.		
Analog Power Supply Voltage		AVDD	2.7	3.3	3.6	V	
Digital Power Supply Voltage		VDD	2.7	3.3	3.6	V	
Power Supply Current	Active mode			40		mA	
	Idle mode			20			
	Sleep mode			0.04			
Data Report Rate		-		60		Hz	
Linearity		-		+/-2		mm	Φ9mm copper probe Without 5mm boarder

4.2. Absolute Maximum Ratings

Item	Minimum	Maximum
Analog Power Supply Voltage	-0.3V	+3.6V
Digital Power Supply Voltage	-0.3V	+3.6V

4.3. Pin Assignment

Pin No.	Pin Name	Description
1	VDD	Power supply input
2	GND	Ground pin
3	Reset	Reset pin
4	SCL	Clock pin for I2Ccommunication
5	SDA	Data pin for I2Ccommunication
6	INT	Interrupt pin
7	NC	Not connected
8	NC	Not connected

Connector: ZIF 8 pin ,pitch: 0.5mm

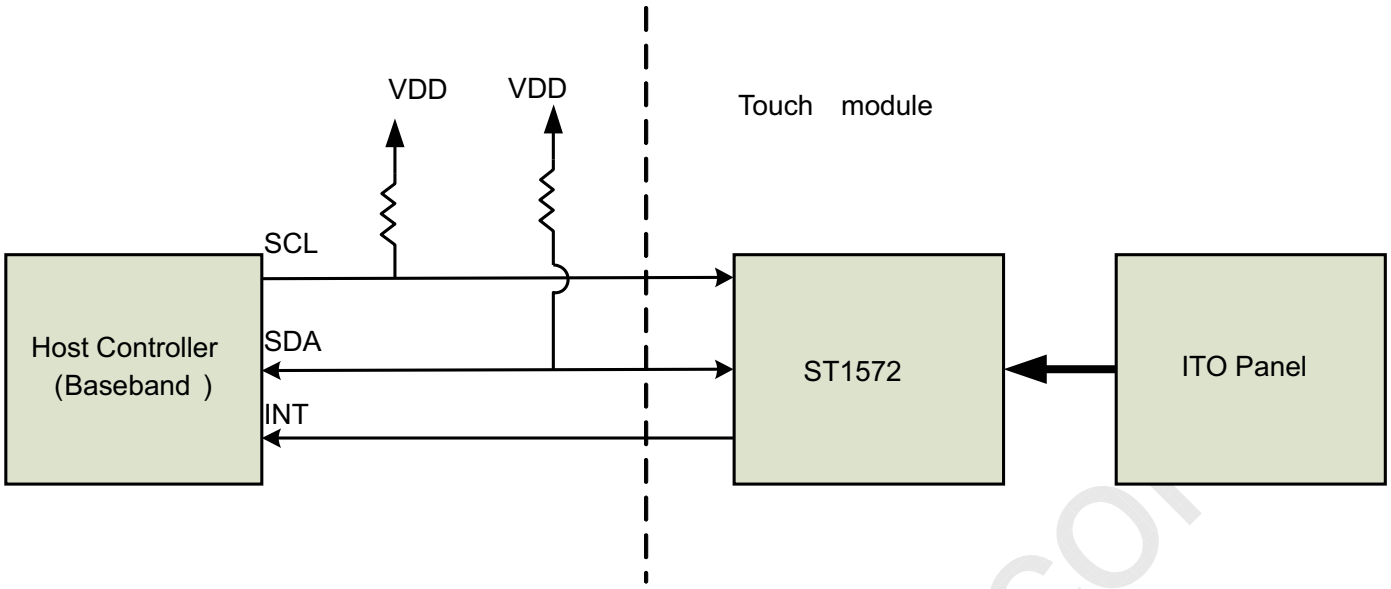


Figure 3 Touch module diagram

4.4. Operation

I2C address is default to **0x55** (7-bits address).

Register Write

For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure 4.

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	Value to Reg(a)	Value to Reg(a+1)	…	Value to Reg(a+n)	I2C Stop

Figure 4 Block Write diagram

Register Read

For reading register value from I2C device, host has to tell I2C device the Start Register Address before reading corresponding register value.

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

Figure 5 Block Read diagram

I2C host interface protocol supports Repeated Register Read. That is, once the Start Register Address has been set by host, consequent I2C Read(R) transactions will directly read register values starting from the Start Register Address without setting address first, as shown in Figure 6.

I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

Figure 6 Block Repeated Read diagram

4.5. I2C Communication AC timing

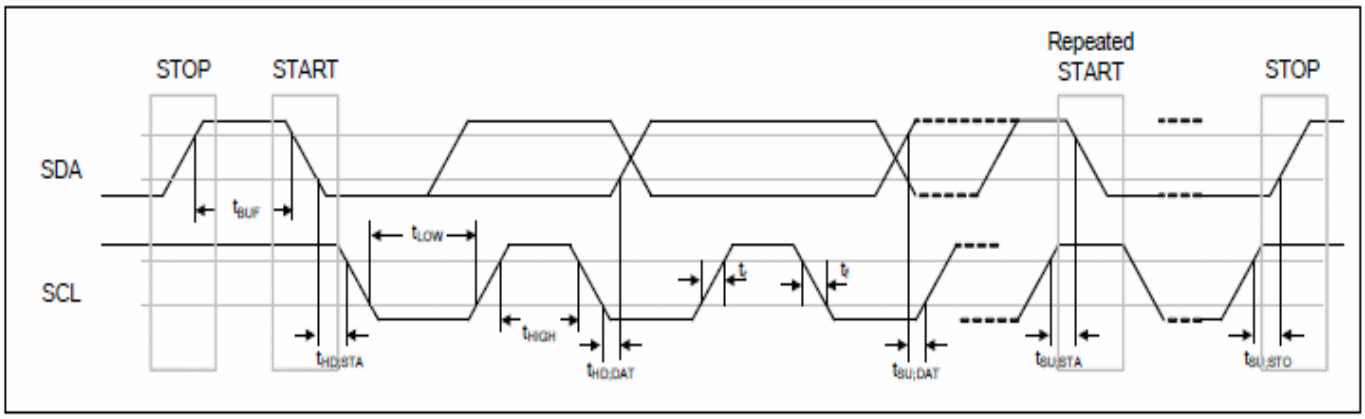


Figure 7 I2C Timing Characteristics

4.6. Register Map

Address	Name	Definition	Attribute	Bit Description and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x00	Firmware Version	Firmware Version	RO	Version 7	Version 6	Version 5	Version 4	Version 3	Version 2	Version 1	Version 0	
				TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
0x01	Status Reg.	Status Register	RO	Error Code 3	Error Code 2	Error Code 1	Error Code 0	Device Status 3	Device Status 2	Device Status 1	Device Status 0	
				0	0	0	0	0	0	0	0	
0x02	Device Control Reg	Device Control Register	RW	Reserved 3	Reserved 2	Reserved 1	Reserved 0	Gest. Enable	Proximity Enable	Power Down	Reset	
				0	0	0	0	0	0	0	0	
0x03	Timeout to Idle Reg	Timeout to Idle Register	RW	Timeout to Idle 7	Timeout to Idle 6	Timeout to Idle 5	Timeout to Idle 4	Timeout to Idle 3	Timeout to Idle 2	Timeout to Idle 1	Timeout to Idle 0	Unit : Sec
				0	0	0	0	1	0	0	0	
0x04	XY Resolution (High Byte)	XY Resolution (High Byte)	RW	Reserved	X_Res_H 2	X_Res_H 1	X_Res_H 0	Reserved	Y_Res_H 2	Y_Res_H 1	Y_Res_H 0	
				0	0	0	0	0	0	0	0	
0X05	X Resolution (Low Byte)	X Resolution (Low Byte)	RW	X_Res_L 7	X_Res_L 6	X_Res_L 5	X_Res_L 4	X_Res_L 3	X_Res_L 2	X_Res_L 1	X_Res_L 0	
				0	0	0	0	0	0	0	0	
0X06	Y Resolution (Low Byte)	Y Resolution (Low Byte)	RW	Y_Res_L 7	Y_Res_L 6	Y_Res_L 5	Y_Res_L 4	Y_Res_L 3	Y_Res_L 2	Y_Res_L 1	Y_Res_L 0	
				0	0	0	0	0	0	0	0	
0X07	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x08	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x09	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0A	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0B	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0C	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0D	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0E	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	
0x0F	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	

				0	0	0	0	0	0	0	0
0x10	Fingers	Fingers	RO	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Fingers 3	Fingers 2	Fingers 1	Fingers 0
				0	0	0	0	0	0	0	0
0x11	Keys Reg.	Keys Register	RO	Keys 7	Keys 6	Keys 5	Keys 4	Keys 3	Keys 2	Keys 1	Keys 0
				0	0	0	0	0	0	0	0
0x12	XY0 Coord. (High Byte)	XY0 Coordinate (High Byte)	RO	Valid 0	X0_H 2	X0_H 1	X0_H 0	Reserved	Y0_H 2	Y0_H 1	Y0_H 0
				0	0	0	0	0	0	0	0
0x13	X0 Coord. (Low Byte)	X0 Coordinate. (Low Byte)	RO	X0_L 7	X0_L 6	X0_L 5	X0_L 4	X0_L 3	X0_L 2	X0_L 1	X0_L 0
				0	0	0	0	0	0	0	0
0x14	Y0 Coord. (Low Byte)	Y0 Coordinate. (Low Byte)	RO	Y0_L 7	Y0_L 6	Y0_L 5	Y0_L 4	Y0_L 3	Y0_L 2	Y0_L 1	Y0_L 0
				0	0	0	0	0	0	0	0
0x15	Z0 Coord	Y0 Coordinate.	RO	Z0 7	Z0 6	Z0 5	Z0 4	Z0 3	Z0 2	Z0 1	Z0 0
				0	0	0	0	0	0	0	0
0x16	XY1 Coord. (High Byte)	XY1 Coordinate (High Byte)	RO	Valid 1	X1_H 2	X1_H 1	X1_H 0	Reserved	Y1_H 2	Y1_H 1	Y1_H 0
				0	0	0	0	0	0	0	0
0x17	X1 Coord. (Low Byte)	X1 Coordinate. (Low Byte)	RO	X1_L 7	X1_L 6	X1_L 5	X1_L 4	X1_L 3	X1_L 2	X1_L 1	X1_L 0
				0	0	0	0	0	0	0	0
0x18	Y1Coord. (Low Byte)	Y1 Coordinate. (Low Byte)	RO	Y1_L 7	Y1_L 6	Y1_L 5	Y1_L 4	Y1_L 3	Y1_L 2	Y1_L 1	Y1_L 0
				0	0	0	0	0	0	0	0
0x19	Z1 Coord	Y1 Coordinate.	RO	Z1 7	Z1 6	Z1 5	Z1 4	Z1 3	Z1 2	Z1 1	Z1 0
				0	0	0	0	0	0	0	0
:	:	:	:	:	:	:	:	:	:	:	:
0x36	XY9 Coord. (High Byte)	XY9 Coordinate (High Byte)	RO	Valid 9	X9_H 2	X9_H 1	X9_H 0	Reserved	Y9_H 2	Y9_H 1	Y9_H 0
				0	0	0	0	0	0	0	0
0x37	X9 Coord. (Low Byte)	X9 Coordinate. (Low Byte)	RO	X9_L 7	X9_L 6	X9_L 5	X9_L 4	X9_L 3	X9_L 2	X9_L 1	X9_L 0
				0	0	0	0	0	0	0	0
0x38	Y9 Coord. (Low Byte)	Y9 Coordinate. (Low Byte)	RO	Y9_L 7	Y9_L 6	Y9_L 5	Y9_L 4	Y9_L 3	Y9_L 2	Y9_L 1	Y9_L 0
				0	0	0	0	0	0	0	0
0x39	Z9 Coord	Y9 Coordinate.	RO	Z9 7	Z9 6	Z9 5	Z9 4	Z9 3	Z9 2	Z9 1	Z9 0
				0	0	0	0	0	0	0	0
0x40	Raw Data[0] (High Byte)	Raw Data[0] (High Byte)	RO	Data_H[0] 7	Data_H[0] 6	Data_H[0] 5	Data_H[0] 4	Data_H[0] 3	Data_H[0] 2	Data_H[0] 1	Data_H[0] 0
				0	0	0	0	0	0	0	0
0x41	Raw Data[0] (Low Byte)	Raw Data[0] (Low Byte)	RO	Data_L[0] 7	Data_L[0] 6	Data_L[0] 5	Data_L[0] 4	Data_L[0] 3	Data_L[0] 2	Data_L[0] 1	Data_L[0] 0
				0	0	0	0	0	0	0	0

0x42	Raw Data[1] (High Byte)	Raw Data[1] (High Byte)	RO	Data_H[1] 7	Data_H[1] 6	Data_H[1] 5	Data_H[1] 4	Data_H[1] 3	Data_H[1] 2	Data_H[1] 1	Data_H[1] 0	
				0	0	0	0	0	0	0	0	
0x43	Raw Data[1] (Low Byte)	Raw Data[1] (Low Byte)	RO	Data_L[1] 7	Data_L[1] 6	Data_L[1] 5	Data_L[1] 4	Data_L[1] 3	Data_L[1] 2	Data_L[1] 1	Data_L[1] 0	
				0	0	0	0	0	0	0	0	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
0xCE	Raw Data[71] (High Byte)	Raw Data[71] (High Byte)	RO	Data_H[71] 7	Data_H[71] 6	Data_H[71 5	Data_H[71] 4	Data_H[71] 3	Data_H[71] 2	Data_H[71] 1	Data_H[71] 0	
				0	0	0	0	0	0	0	0	
0xCF	Raw Data[71] (Low Byte)	Raw Data[71] (Low Byte)	RO	Data_L[71] 7	Data_L[71] 6	Data_L[71] 5	Data_L[71] 4	Data_L[71] 3	Data_L[71] 2	Data_L[71] 1	Data_L[71] 0	
				0	0	0	0	0	0	0	0	
0xFF	Reserved	Reserved	RW	Reserved 7	Reserved 6	Reserved 5	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	
				0	0	0	0	0	0	0	0	

4.6.1. Firmware Version Register(Address 0x00)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x00	Firmware Version	Firmware Version	RO	Version 7	Version 6	Version 5	Version 4	Version 3	Version 2	Version 1	Version 0	
				TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	

- Firmware Version Register provides version information about current firmware. Host application can support version control in firmware upgrade function by reading Firmware Version Register and comparing with the version of new firmware binary.

4.6.2. Status Register (Address 0x01)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x01	Status Reg.	Status Register	RO	Error Code 3	Error Code 2	Error Code 1	Error Code 0	Device Status 3	Device Status 2	Device Status 1	Device Status 0	
				0	0	0	0	0	0	0	0	

- Status Register shows current status of the device to host, including Device Status and Error Code. Init status represents that the device is in Init state and not ready for host access. Host has to wait for the device to change into Normal state before accessing registers other than Status Register. If Device Status shows Error, the Error Code field in the Status Register gives reason of the error.

Device Status	
0x0	Normal
0x1	Init
0x2	Error
0x3 … 0xF	*Reserved*

Error Code	
0x0	No Error
0x1	Invalid Address
0x2	Invalid Value
0x3	Invalid Platform
0x4 … 0xF	*Reserved*

4.6.3. Device Control Register (Address 0x02)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x02	Device Control Reg	Device Control Register	RW	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Reserved 0	Proximity Enable	Power Down	Reset	
				0	0	0	0	0	0	0	0	

Device Control Register provides device control bits for host to reset the device, power down the device, enable/disable proximity detection.

- Proximity Enable

0b→ Disable
1b→ Enable

- Power Down

0b→ NA
1b→ Active Power Down

- Reset

0b→ NA
1b→ Active Reset.

4.6.4. Timeout to Idle Register(Address 0x03)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x03	Timeout to Idle Reg	Timeout to Idle Register	RW	Timeout to Idle 7	Timeout to Idle 6	Timeout to Idle 5	Timeout to Idle 4	Timeout to Idle 3	Timeout to Idle 2	Timeout to Idle 1	Timeout to Idle 0	Unit : Sec
				0	0	0	0	1	0	0	0	

- Timeout to Idle Register provides timeout control to enter Idle Mode for host. The touch controller will enter Idle Mode after the number of seconds specified in Timeout to Idle Register if there is no touch detected in this period. Set this field to 0xFF will disable Idle Mode. Set this field to 0 will entering Idle Mode immediately. Idle state will be updated to Device Status field of Status Register, 0x01, after entering Idle Mode automatically. The default value of Timeout to Idle Register is set to 0x08 for 8 seconds to Idle Mode.

4.6.5. XY Resolution Register (Address 0x04 ~ 0x06)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x04	XY Resolution (High Byte)	XY Resolution (High Byte)	RW	Reserved	X_Res_H 2	X_Res_H 1	X_Res_H 0	Reserved	Y_Res_H 2	Y_Res_H 1	Y_Res_H 0	
				0	0	0	0	0	0	0	0	
0X05	X Resolution (Low Byte)	X Resolution (Low Byte)	RW	X_Res_L 7	X_Res_L 6	X_Res_L 5	X_Res_L 4	X_Res_L 3	X_Res_L 2	X_Res_L 1	X_Res_L 0	
				0	0	0	0	0	0	0	0	
0X06	Y Resolution (Low Byte)	Y Resolution (Low Byte)	RW	Y_Res_L 7	Y_Res_L 6	Y_Res_L 5	Y_Res_L 4	Y_Res_L 3	Y_Res_L 2	Y_Res_L 1	Y_Res_L 0	
				0	0	0	0	0	0	0	0	

- XY Resolution Registers represents resolution of X and Y coordinates of the touch screen. Host can change XY Resolution at run time by updating new resolution to these registers.

4.6.6. Finger Register (Address 0x10)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x10	Fingers	Fingers	RO	Reserved 4	Reserved 3	Reserved 2	Reserved 1	Fingers 3	Fingers 2	Fingers 1	Fingers 0	
				0	0	0	0	0	0	0	0	

- Fingers field represents number of fingers detected by touch controller. The coordinates of each finger detected are represents in X Coordinate and Y Coordinate fields.

4.6.7. Keys Register (Address 0x11)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x11	Keys Reg.	Keys Register	RO	Keys 7	Keys 6	Keys 5	Keys 4	Keys 3	Keys 2	Keys 1	Keys 0	
				0	0	0	0	0	0	0	0	

- Key field represents which key is pressed or released. Each bit in the Key field represents the pressed or released state of one key. If the bit is set, it means that the corresponding key is pressed. Otherwise, the key is released.

4.6.8. XYZ Coordinate Register (Address 0x12 ~ 0x39)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x12	XY0 Coord. (High Byte)	XY0 Coordinate (High Byte)	RO	Valid 0	X0_H 2	X0_H 1	X0_H 0	Reserved	Y0_H 2	Y0_H 1	Y0_H 0	
				0	0	0	0	0	0	0	0	
0x13	X0 Coord. (Low Byte)	X0 Coordinate. (Low Byte)	RO	X0_L 7	X0_L 6	X0_L 5	X0_L 4	X0_L 3	X0_L 2	X0_L 1	X0_L 0	
				0	0	0	0	0	0	0	0	
0x14	Y0 Coord. (Low Byte)	Y0 Coordinate. (Low Byte)	RO	Y0_L 7	Y0_L 6	Y0_L 5	Y0_L 4	Y0_L 3	Y0_L 2	Y0_L 1	Y0_L 0	
				0	0	0	0	0	0	0	0	
0x15	Z0 Coord	Y0 Coordinate.	RO	Z0 7	Z0 6	Z0 5	Z0 4	Z0 3	Z0 2	Z0 1	Z0 0	
				0	0	0	0	0	0	0	0	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
0x36	XY9 Coord. (High Byte)	XY9 Coordinate (High Byte)	RO	Valid 9	X9_H 2	X9_H 1	X9_H 0	Reserved	Y9_H 2	Y9_H 1	Y9_H 0	
				0	0	0	0	0	0	0	0	
0x37	X9 Coord. (Low Byte)	X9 Coordinate. (Low Byte)	RO	X9_L 7	X9_L 6	X9_L 5	X9_L 4	X9_L 3	X9_L 2	X9_L 1	X9_L 0	
				0	0	0	0	0	0	0	0	
0x38	Y9 Coord. (Low Byte)	Y9 Coordinate. (Low Byte)	RO	Y9_L 7	Y9_L 6	Y9_L 5	Y9_L 4	Y9_L 3	Y9_L 2	Y9_L 1	Y9_L 0	
				0	0	0	0	0	0	0	0	
0x39	Z9 Coord	Y9 Coordinate.	RO	Z9 7	Z9 6	Z9 5	Z9 4	Z9 3	Z9 2	Z9 1	Z9 0	
				0	0	0	0	0	0	0	0	

- XY Coordinate Registers represent the XY coordinates for each touch point ID. Valid bit field tells that this point ID is valid and the XY information represents a real touch point on touch sensor.
- Z Coordinate Register indicates the touch strength of corresponding touch point ID. Z0 represents touch strength of point ID 0 and Z1 represents touch strength of point ID 1, and so on.

4.6.9. Data Register (Address 0x40 ~ 0xCF)

Address	Name	Definition	Attribute	Bit Descripyion and Default Value								Note
				D7	D6	D5	D4	D3	D2	D1	D0	
0x40	Raw Data[0] (High Byte)	Raw Data[0] (High Byte)	RO	Data_H[0] 7	Data_H[0] 6	Data_H[0] 5	Data_H[0] 4	Data_H[0] 3	Data_H[0] 2	Data_H[0] 1	Data_H[0] 0	
				0	0	0	0	0	0	0	0	
0x41	Raw Data[0]	Raw Data[0]	RO	Data_L[0] 7	Data_L[0] 6	Data_L[0] 5	Data_L[0] 4	Data_L[0] 3	Data_L[0] 2	Data_L[0] 1	Data_L[0] 0	

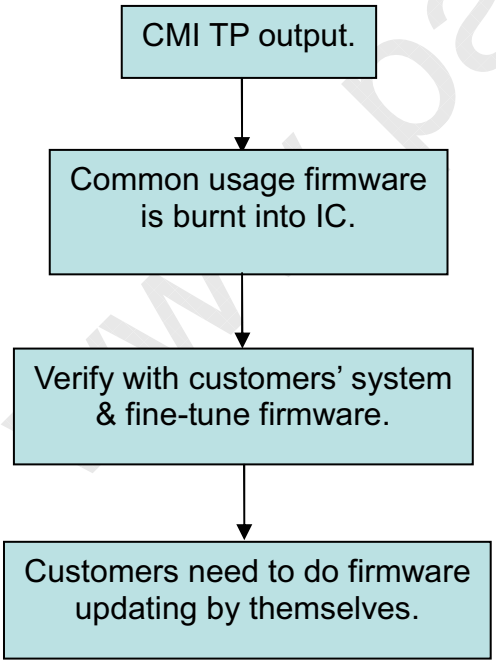
	(Low Byte)	(Low Byte)		0	0	0	0	0	0	0	0	
0x42	Raw Data[1] (High Byte)	Raw Data[1] (High Byte)	RO	Data_H[1] 7	Data_H[1] 6	Data_H[1] 5	Data_H[1] 4	Data_H[1] 3	Data_H[1] 2	Data_H[1] 1	Data_H[1] 0	
				0	0	0	0	0	0	0	0	
0x43	Raw Data[1] (Low Byte)	Raw Data[1] (Low Byte)	RO	Data_L[1] 7	Data_L[1] 6	Data_L[1] 5	Data_L[1] 4	Data_L[1] 3	Data_L[1] 2	Data_L[1] 1	Data_L[1] 0	
				0	0	0	0	0	0	0	0	
: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	
0xCE	Raw Data[71] (High Byte)	Raw Data[71] (High Byte)	RO	Data_H[71] 7	Data_H[71] 6	Data_H[71 5	Data_H[71] 4	Data_H[71] 3	Data_H[71] 2	Data_H[71] 1	Data_H[71] 0	
				0	0	0	0	0	0	0	0	
0xCF	Raw Data[71] (Low Byte)	Raw Data[71] (Low Byte)	RO	Data_L[71] 7	Data_L[71] 6	Data_L[71] 5	Data_L[71] 4	Data_L[71] 3	Data_L[71] 2	Data_L[71] 1	Data_L[71] 0	
				0	0	0	0	0	0	0	0	

- Data Registers provide raw data detected by touch sensor controller.

4.7. Firmware Management Flow

As this touch panel (NC090GG01) is a standard product, there are difference applications in end-customer systems. So, CMI will provide a common usage firmware and burn into IC for mass production.

CMI will co-operate with IC vendor to provide the customer service of firmware tuning. After firmware fine-tuning, end-customer will obtain an updated firmware which is belong to each system (Note). Customers need to do firmware updating by themselves.



Note: The peak-to-peak ripple voltage of power supply needs to below 150 mV.

5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	60	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	60	70	-		
	θ_B	Φ=270°(6 o'clock)	40	50	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		500	700	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		160	200	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. V_{DD}=3.3V, I_L=240mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

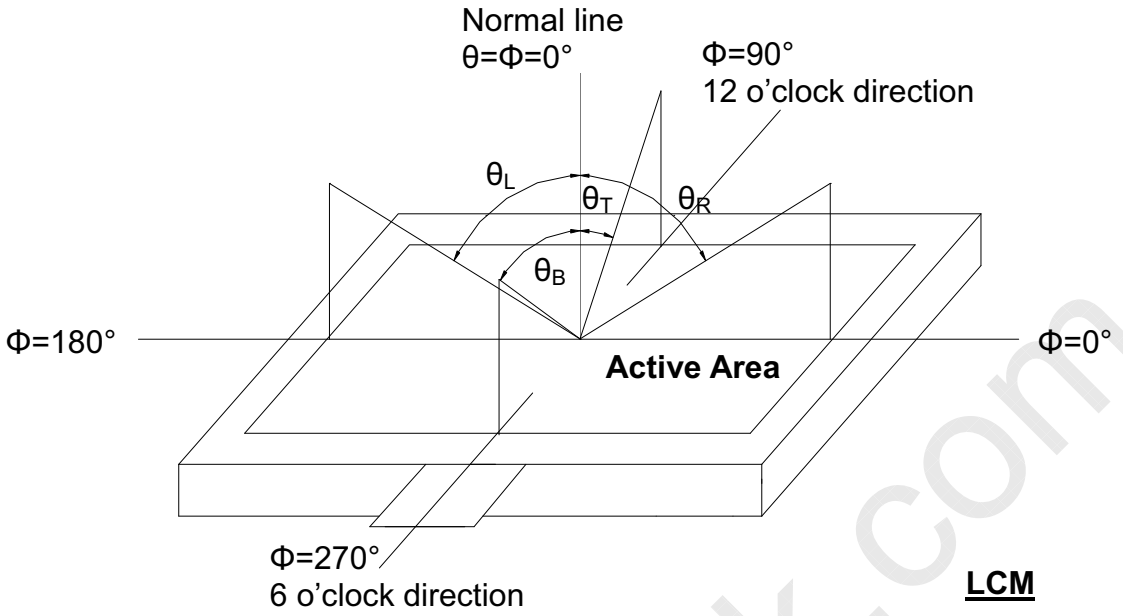


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

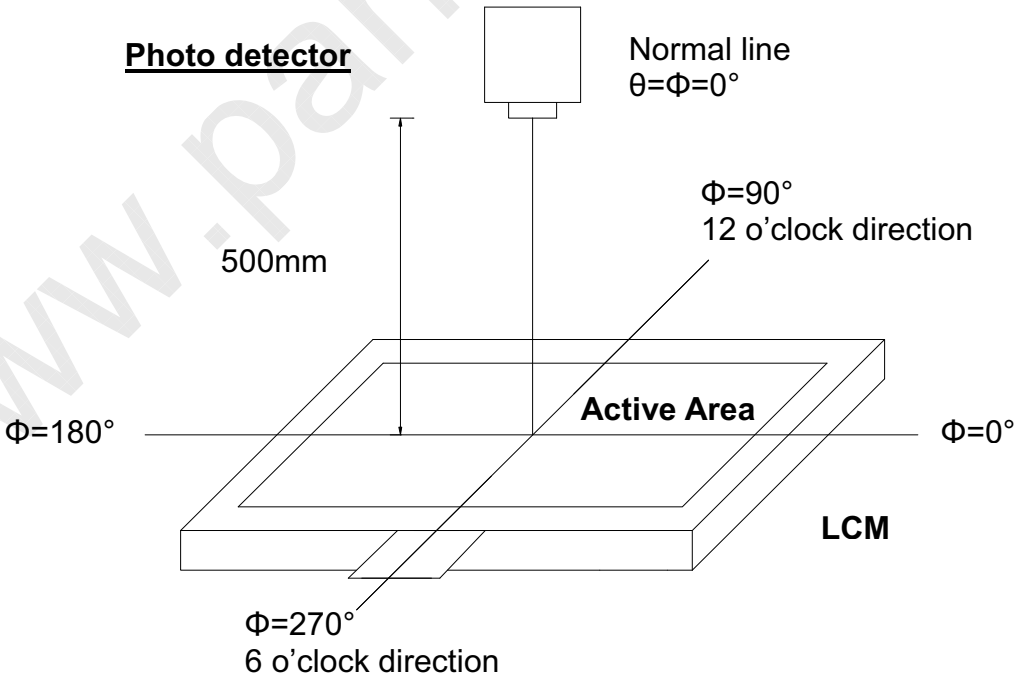


Fig. 4-2 Optical measurement system setup

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 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

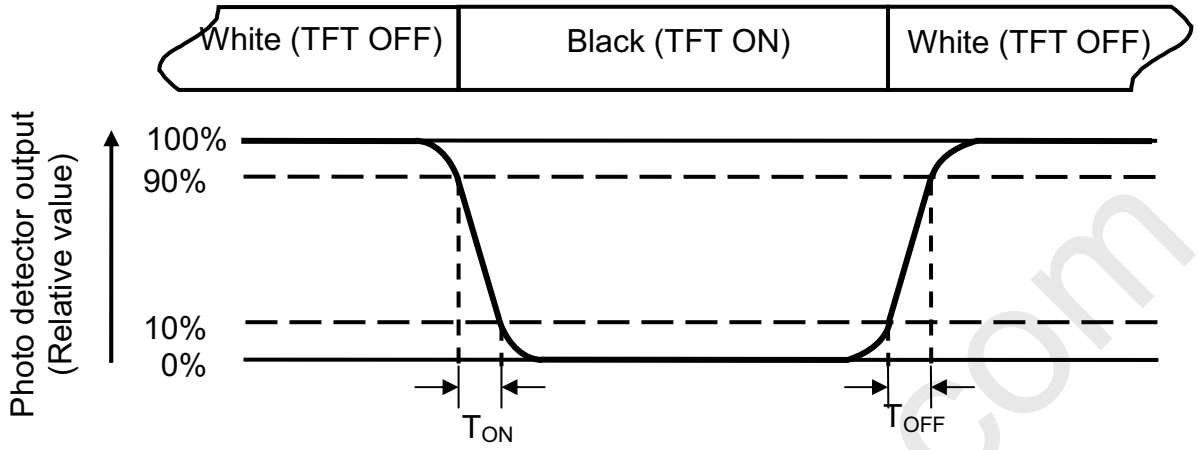


Fig. 4-3 Definition of response time

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 color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is I_L=240mA .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

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

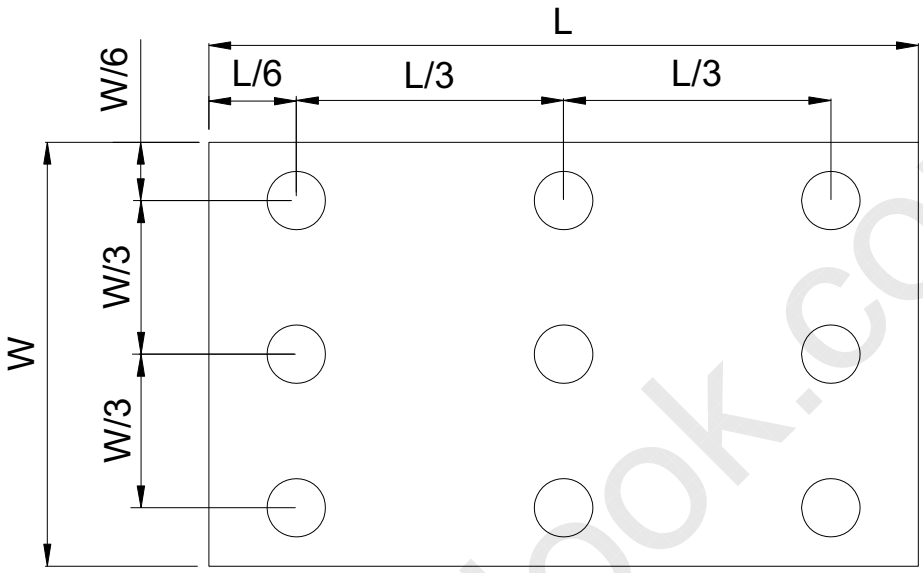


Fig. 4-4 Definition of measuring points

$\mathbf{B_{max}}$: The measured maximum luminance of all measurement position.
$\mathbf{B_{min}}$: The measured minimum luminance of all measurement position.

6. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 60℃ 240hrs	Note 1，Note 4
Low Temperature Storage	Ta = -20℃ 240hrs	Note 1，Note 4
High Temperature Operation	Ts = 50℃ 240hrs	Note 2，Note 4
Low Temperature Operation	Ta = -10℃ 240hrs	Note 1，Note 4
Operate at High Temperature and Humidity	+40℃, 90%RH 240hrs	Note 4
Thermal Shock	-20℃/30 min ~ +60℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke: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 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

7. General Precautions

7.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

7.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

7.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

7.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

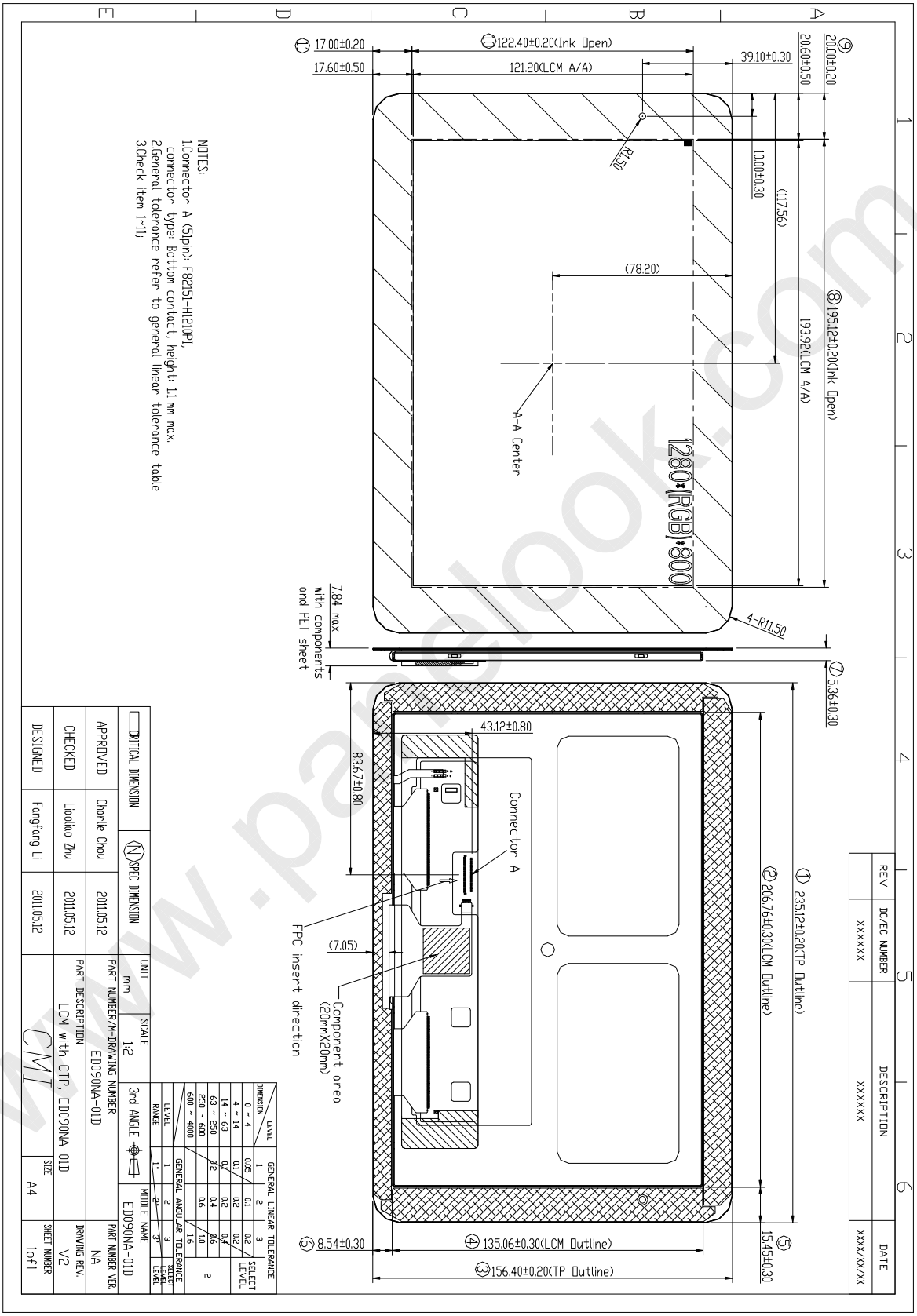
7.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

CHIMEI INNOLUX

Date :2011/08/05 Page:29/31

8. Mechanical Drawing



9. Package Drawing

9.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	ED090NA-01D	235.12 ×156.40 ×5.36	0.285	20pcs	
2	Anti-Static Bag	PE	215 × 175	0.007	20pcs	
3	Corrugated Paper	B Corrugated paper	513 × 242	0.083	2pcs	
4	Partition	BC Corrugated paper	513 × 350 × 232	1.400	1set	
5	Dust-Proof Bag	PE	700 × 530	0.048	1pcs	
6	Carton	Corrugated paper	530 × 355 × 255	1.100	1pcs	
8	Total weight	8.55 Kg±5%				

9.2. Packaging Quantity

Total LCM quantity in Carton: no. of Partition 1 Rows × quantity per Row 20 = 20

9.3. Packaging Drawing