INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: CT024TN02 (Suez)
Part No.: AC02400030D1/E1
Spec. No.: C024-02-TT-01
Date: 2008/06/11
Version: 1.0

For Customer's Acceptance

Approved by	Comment

Record of Revision

Version	Revise Date	Page	Content
1.0	2008/06/11	All	Initial release

Contents

1. General Specifications

1.1 Description

The CT024TN02 is a color active matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) that uses amorphous silicon (a-Si) TFT as a switching device. This model is composed of a single 2.4 inches transmissive type main TFT-LCD panel and a resistive touch screen display. The resolution of the panel is 240x320 pixels and can display up to 262K color.

1.2 Features

-TM type for main TFT-LCD panel
-Resistive type touch panel
-One backlight with 4 white LED
-80-system 18-bit parallel bus
-Full, Still, Partial & Standby modes are available

1.3 Application

-Display terminals for cellular phone

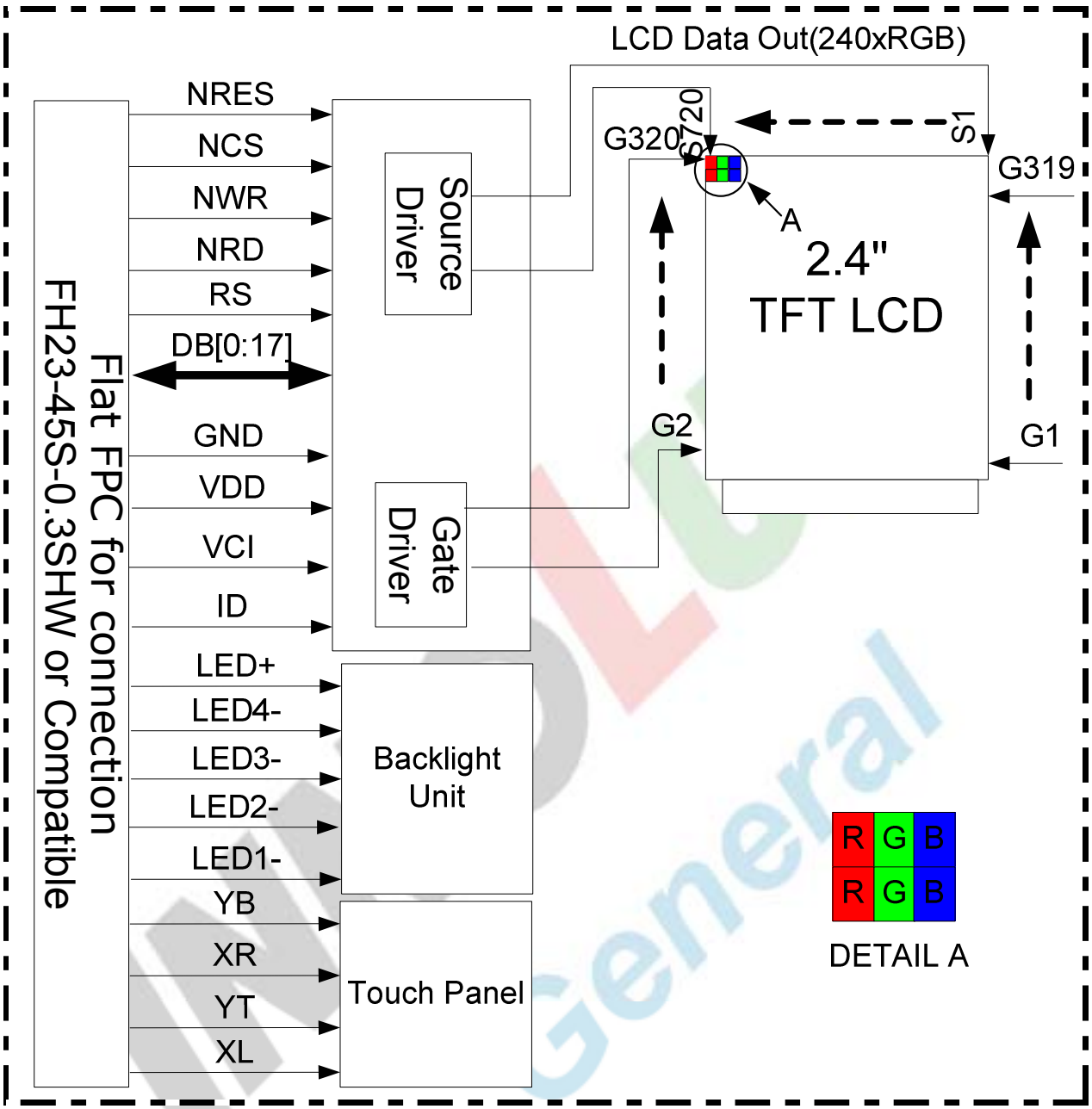
1.4 General Specification

No.	Item	Specification	Unit	Remark
1	LCD Size	2.4	inch	-
2	Panel Type	a-Si TFT active matrix	-	-
3	Touch Panel Type	4-wire Analog Resistive	-	-
4	Resolution	240 x RGB x 320	pixel	-
5	Display Mode	Normally white, Transmissive	-	-
6	Display Number of Colors	262K	-	-
7	Viewing Direction	12 o'clock	-	Note 1
8	Contrast Ratio	300	-	-
9	Luminance	160	cd/m^2	Note 2
10	Module Size	44.52(W) x 63.38(L) x 3.85 (T)	mm	Note 1
11	Panel Active Area	36.72(W) x 48.96(L)	mm	Note 1
12	Touch Panel Active Area	37.72(W) x 53.76(L)	mm	Note 1
13	Touch Panel View Area	39.72(W) x 55.26(L)	mm	Note 1
14	Pixel Pitch	0.153(W) x 0.153(L)	mm	-
15	Weight	19±0.1	g	-
16	Driver IC	HX8347	-	-
17	Driver IC RAM Size	240 x 18 x 320	bit	-
18	Light Source	4 white LEDs	-	-
19	Interface	80-system 18-bit parallel bus	-	-
20	Operating Temperature	-20~70	℃	-
21	Storage Temperature	-30~80	℃	-

Note 1: Please refer to the mechanical drawing.

Note 2: Luminance is measured with touch panel attached.

2. Block Diagram



3. Pin Assignments

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Ground	-
2	GND	P	Ground	-
3	VCI	P	Analog supply power	-
4	VCI	P	Analog supply power	-
5	VDD	P	Logic supply power	-
6	VDD	P	Logic supply power	-
7	NCS	I	Chip select signal (Low: active)	-
8	RS	I	Data/Command Selection	-
9	NWR	I	Write signal (Low: active)	-
10	NRD	I	Read signal (Low: active)	-
11	DB0	I/O	Data bus (Bit 0)	-
12	DB1	I/O	Data bus (Bit 1)	-
13	DB2	I/O	Data bus (Bit 2)	-
14	DB3	I/O	Data bus (Bit 3)	-
15	DB4	I/O	Data bus (Bit 4)	-
16	DB5	I/O	Data bus (Bit 5)	-
17	DB6	I/O	Data bus (Bit 6)	-
18	DB7	I/O	Data bus (Bit 7)	-
19	DB8	I/O	Data bus (Bit 8)	-
20	DB9	I/O	Data bus (Bit 9)	-
21	DB10	I/O	Data bus (Bit 10)	-
22	DB11	I/O	Data bus (Bit 11)	-
23	DB12	I/O	Data bus (Bit 12)	-
24	DB13	I/O	Data bus (Bit 13)	-
25	DB14	I/O	Data bus (Bit 14)	-
26	DB15	I/O	Data bus (Bit 15)	-
27	DB16	I/O	Data bus (Bit 16)	-
28	DB17	I/O	Data bus (Bit 17)	-
29	NRES	I	Reset signal (Low: active)	-
30	NC	-	Dummy Pin	-
31	NC	-	Dummy Pin	-
32	NC	-	Dummy Pin	-
33	GND	P	Ground	-

34	LED+	-	LED anode	-
35	LED+	-	LED anode	-
36	LED4-	-	LED cathode 4	-
37	LED3-	-	LED cathode 3	-
38	LED2-	-	LED cathode 2	-
39	LED1-	-	LED cathode 1	-
40	GND	P	Ground	-
41	XL	-	Touch panel signal (X+)	-
42	YT	-	Touch panel signal (Y+)	-
43	XR	-	Touch panel signal (X-)	-
44	YB	-	Touch panel signal (Y-)	-
45	ID	P	Internal pull high voltage, equals 4/5 VDD	-

4. Electrical Specifications

4.1 Absolute Maximum Rating

(T_a=+25℃)

Item		Symbol	Values		Unit	Remark
			Min.	Max.		
TFT Module	Logic Supply Voltage	VDD	-0.3	+3.3	V	Note 1
	Analog Supply Voltage	VCI	-0.3	+4.6	V	Note 1
Backlight Unit	Current	I_B	-	120	mA	Note 2
	Power Consumption	P_{BL}	-	480	mW	Note 2

Note1: Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is applied.

Note2: Without LED driver IC, please refer to 4.3.

4.2 Typical Operation Conditions

4.2.1 DC Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Logic Supply Voltage	VDD	2.7	2.8	3.0	V	Ta=25℃
Analog Supply Voltage	VCI	2.7	2.8	3.0	V	
Input High Voltage	V_{IH}	0.8 VDD	-	VDD	V	
Input Low Voltage	V_{IL}	0	-	0.2VDD	V	
Output High Voltage	V_{OH}	0.8 VDD	-	-	V	
Output Low Voltage	V_{OL}	-	-	0.2VDD	V	
Frame Frequency	f_{FRAME}	-	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.

4.2.2 Current Consumption

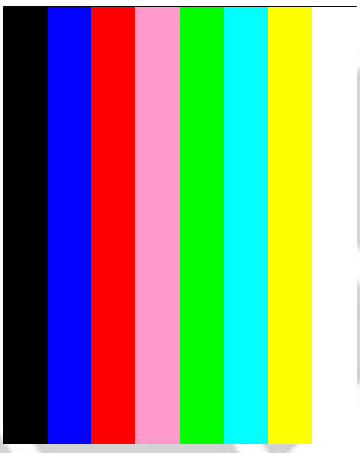
Item	Symbol	Values		Unit	Remark
		Typ.	Max.		
MPU Interface (80-system 18-bit parallel bus)					
Still Mode	VDD	1	1.5	mA	Note1
	VCI	5	6	mA	
Standby Mode	VDD	45	55	uA	Note1, Note2
	VCI	1	5	uA	

Note1: Test Condition

Typ: VDD=2.8V
VCI=2.8V
Display Pattern: 8 Color Bar
Frame Rate=80Hz at Line Inversion
Operating Temperature: 25℃

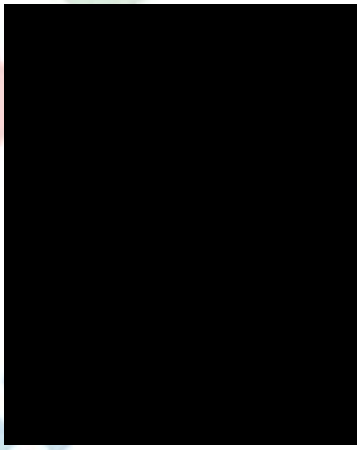
Max: VDD=3.0V
VCI=3.0V
Display Pattern: All Pixel Black
Frame Rate=80Hz at Line Inversion
Operating Temperature: 25℃

Typ. current check pattern:



8-Color Bar

Max. current check pattern:

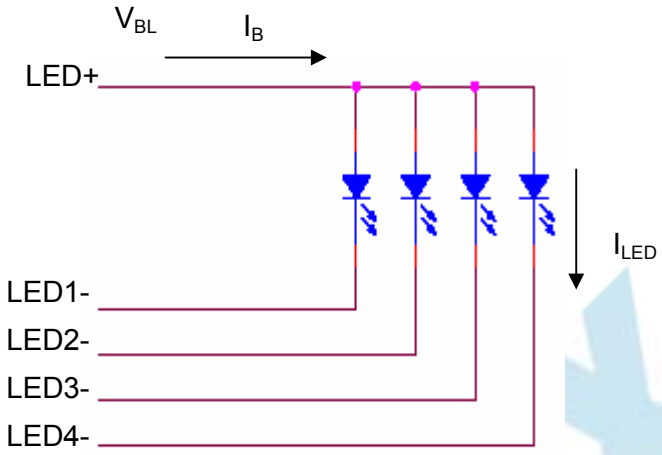


Black

Note2: In the standby mode, all the internal display operations are suspended including the internal R-C oscillator.

4.3 Backlight Unit

The backlight system is an edge lighting type with 4 white LEDs.



(T_a=+25℃)

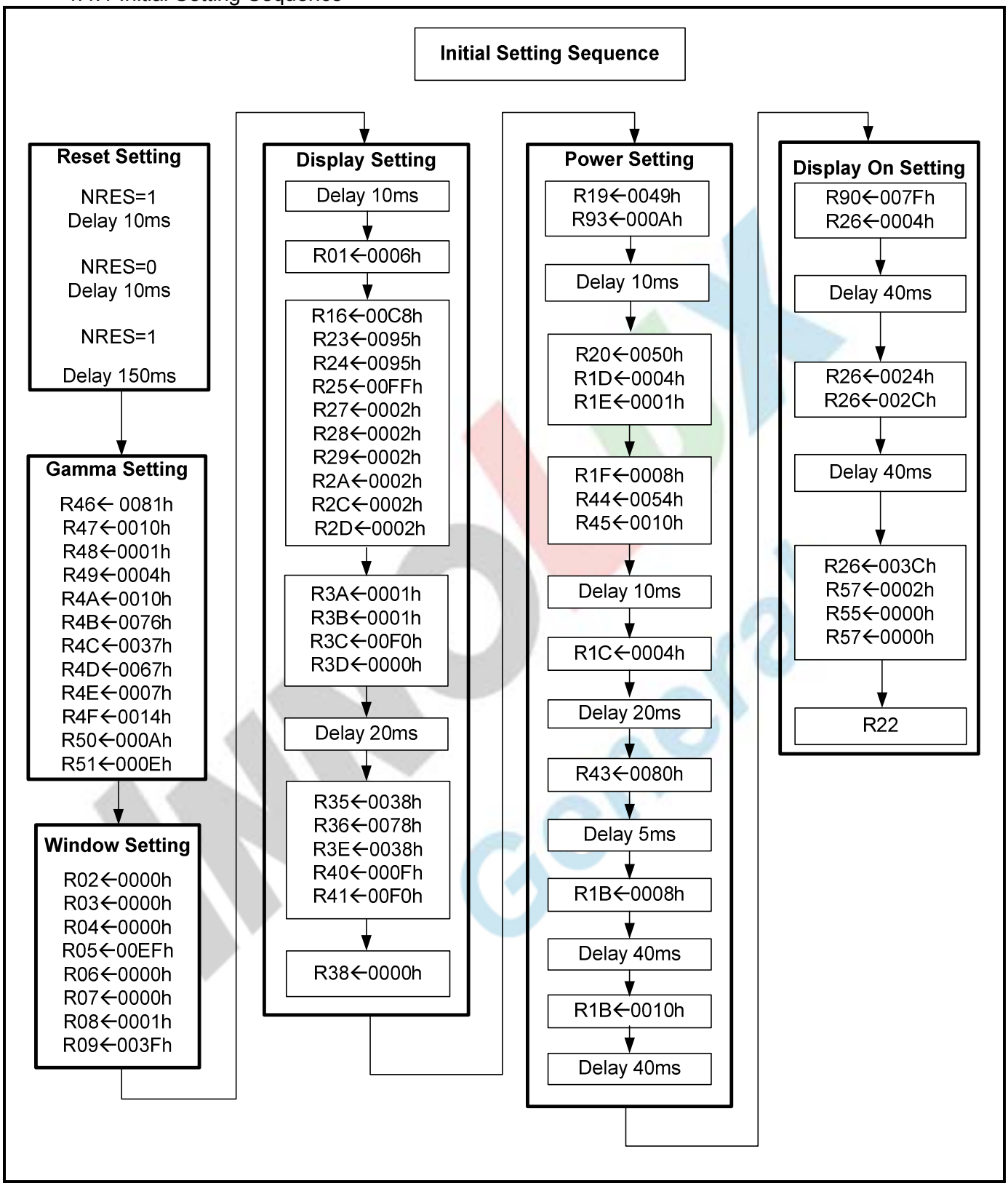
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current	I_B	-	80	-	mA	Note 1
Power Consumption	P_{BL}	-	290	-	mW	Note 2

Note1: 4 LEDs are connected in parallel; each LED's current consumption is 20mA

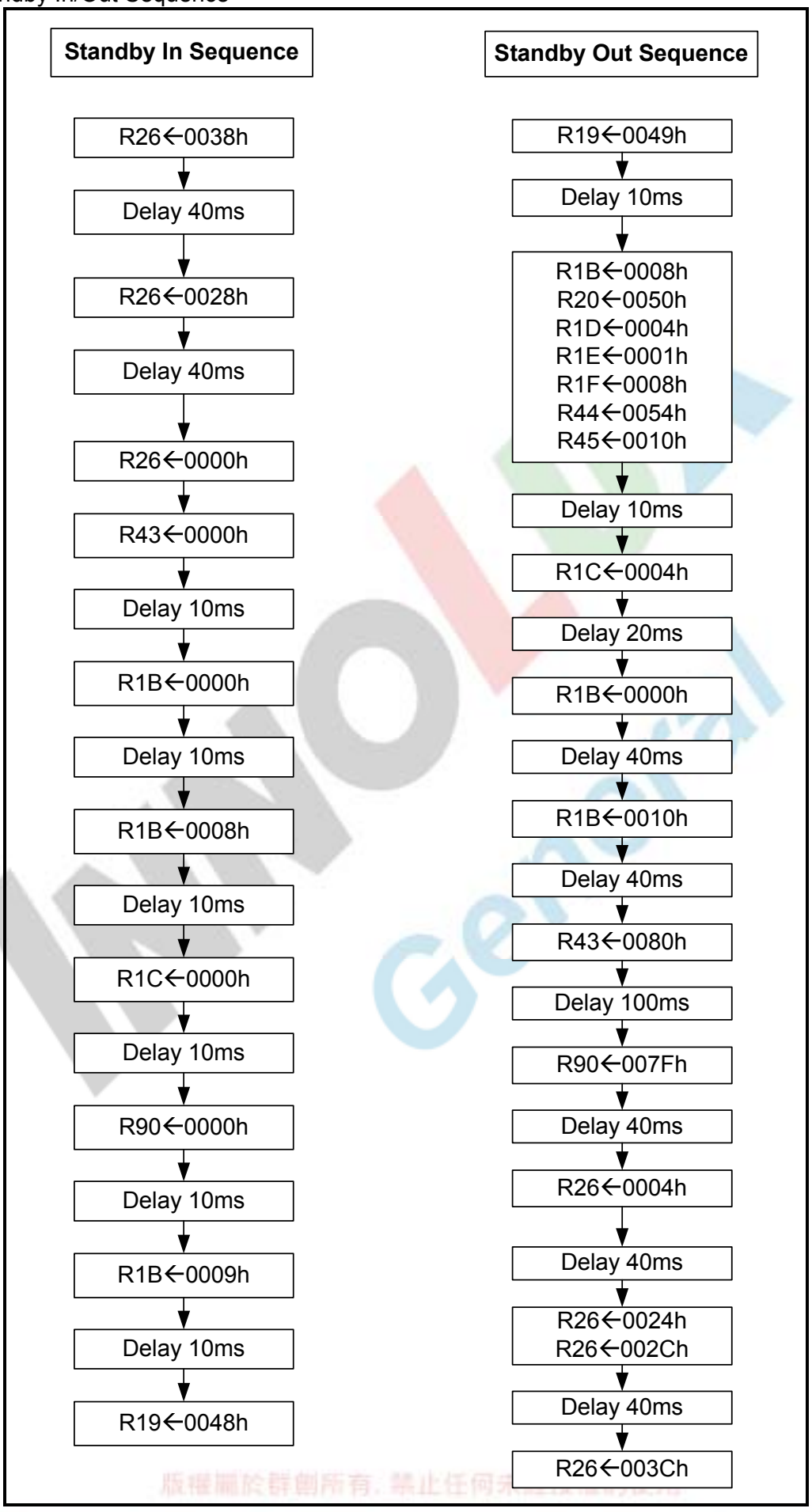
Note2: Where I_B= 80mA, P_{BL} = I_B x V_{BL}, V_{BL} is backlight forward voltage.

4.4 Instruction Setting Flow

4.4.1 Initial Setting Sequence

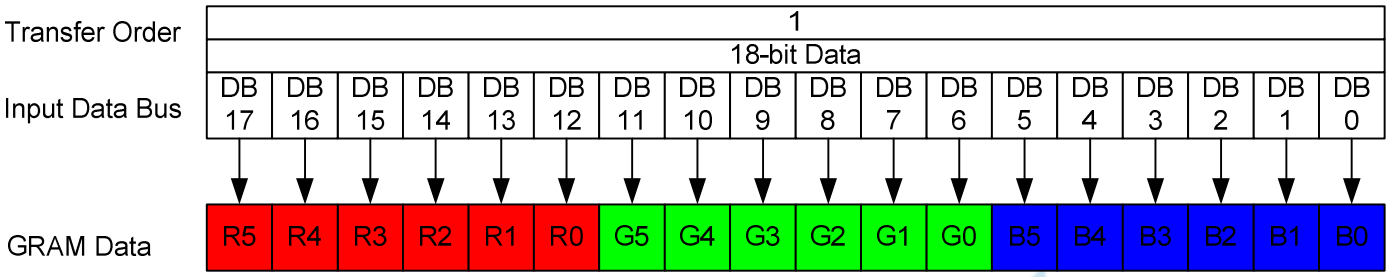


4.4.2. Standby In/Out Sequence



4.5 Display RAM Data Format and Input Bus

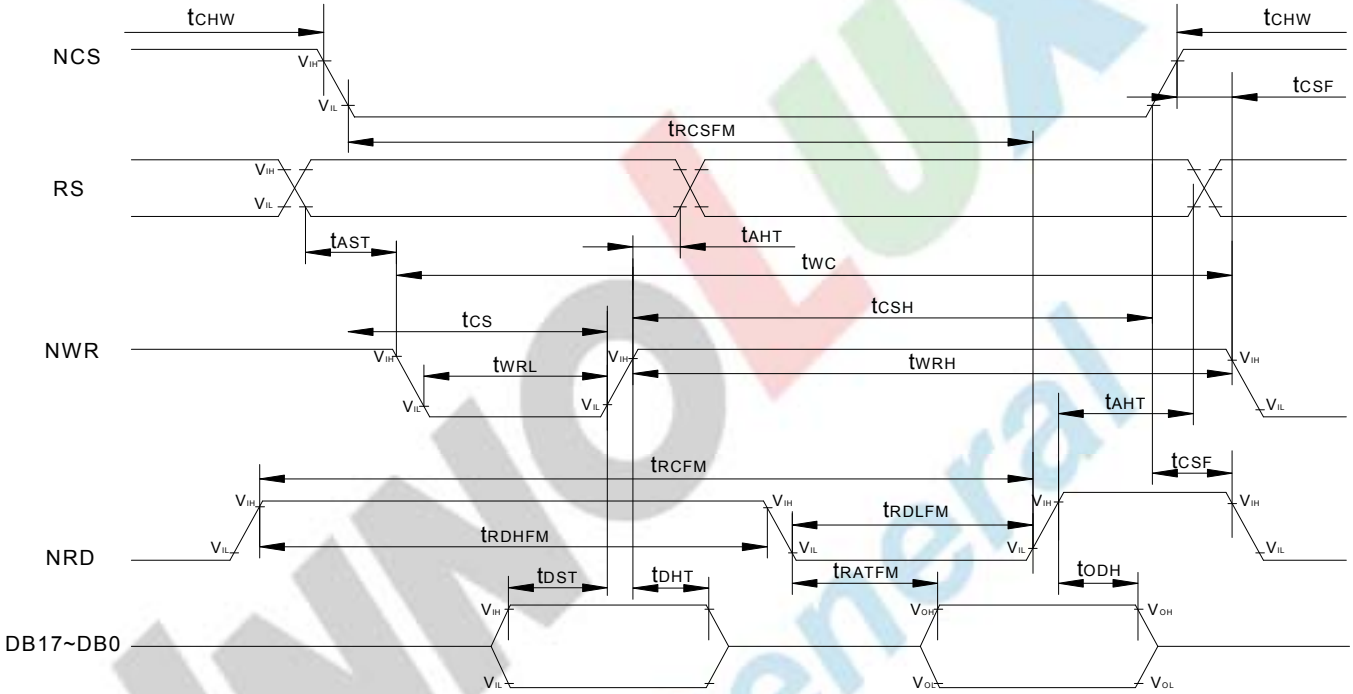
Input Data Bus and GRAM Data Mapping in 18-Bit Bus System Interface



262,144 colors are available

4.6 Timing Characteristic

4.6.1 Parallel Interface Characteristics (8080-series MPU)

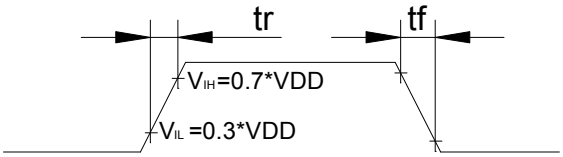


(VDD=2.7 to 3.0V, VCI=2.7 to 3.0V, Ta=25℃)

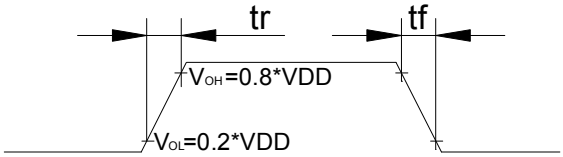
Signal	Symbol	Parameter	Min.	Max	Unit	Description
RS	t_{AST}	Address setup time	10	-	ns	-
	t_{AHT}	Address hold time (Write/Read)	10	-		
NCS	t_{CHW}	Chip select “H” pulse width	0	-	ns	-
	t_{CS}	Chip select setup time (Write)	35	-		
	t_{RCSFM}	Chip select setup time	355	-		
	t_{CSF}	Chip select wait time (Write/Read)	10	-		
	t_{CSH}	Chip select hold time	10	-		
NWR	t_{WC}	Write cycle	100	-	ns	-
	t_{WRH}	Control pulse “H” duration	35	-		
	t_{WRL}	Control pulse “L” duration	35	-		
NRD	t_{RCFM}	Read cycle	450	-	ns	When read from GRAM
	t_{RDHFM}	Control pulse “H” duration	90	-		
	t_{RDLFM}	Control pulse “L” duration	355	-		
DB17 to DB0	t_{DST}	Data setup time	15	-	ns	For maximum C_L=30pF For minimum C_L=8pF
	t_{DHT}	Data hold time	10	-		
	t_{RATFM}	Read access time	-	340		
	t_{ODH}	Output disable time	20	80		

Note: The input signal rise time and fall time (tr, tf) is specified at 15ns or less.
Logic high and low levels are specified as 30% and 70% of VDD for input signals.

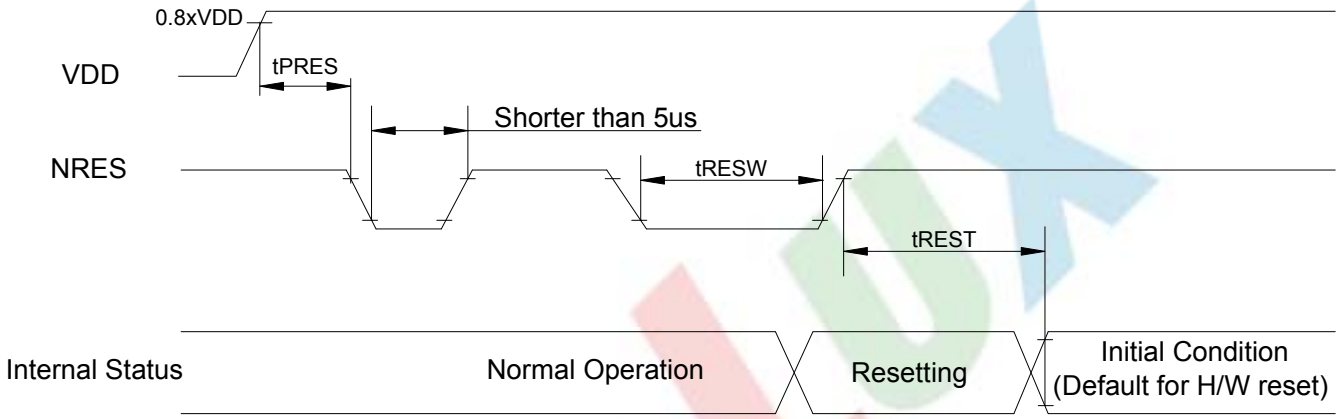
Input Signal Slope



Output Signal Slope



4.6.2 Reset Input Timing



Symbol	Parameter	Related Pins	Min.	Typ.	Max.	Note	Unit
tRESW	Reset low pulse width(1)	NRES	10	-	-	-	μs
tREST	Reset complete time(2)	-	-	-	5	When reset applied during STB mode	ms
		-	-	-	120	When reset applied during STB mode	ms
tPRES	Reset goes high level after Power on time	NRES &VDD	1	-	-	Reset goes high level after Power on	ms

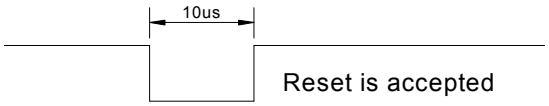
Note: (1) Spike due to an electrostatic discharge on NRES line does not cause irregular system reset according to the table below.

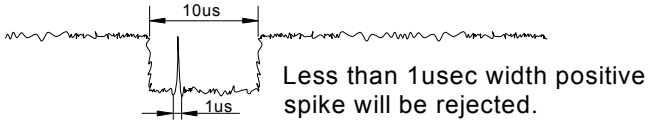
NRES Pulse	Action
Shorter than 5μs	Reset Rejected
Longer than 10μs	Reset
Between 5μs and 10μs	Reset Start

(2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in STB Out-mode, the display remains the blank state in STB-mode) and then return to Default condition for H/W reset.

(3) During Reset Complete Time, ID2 and VCOMOF value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of NRES.

(4) Spike Rejection also applies during a valid reset pulse as shown below:





(5) It is necessary to wait 5msec after releasing NRES before sending commands. Also STB Out command cannot be sent for 120msec.

5. Touch Panel Specifications

5.1 Electrical Characteristics

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Linearity	-1.5	-	1.5	%	After environment and life test
Terminal Resistance	180	-	510	Ω	X
	250	-	680	Ω	Y
Insulation resistance	25	-	-	MΩ	DC 25V 1min
Operating Voltage	-	5	7	V	DC

5.2 Optical Characteristics

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Response Time	-	-	10	ms	100kΩ pull-up
Light Transparency	80	-	-	%	-

5.3 Mechanical Characteristics

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Active Force	-	-	80	gf	Note1
Surface Hardness	3	-	-	H	-
Pen Sliding Durability	100,000	-	-	time	Note 2
Hitting Durability	1,000,000	-	-	time	Note 3

Note 1: Do not operate it with a stylus other than a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Note 2: Test Condition:
End shape: R0.8mm and R8.0mm, Resistance between X and Y axis must be equal or lower than 2KΩ, the test voltage =DC5V.

Note 3: Measurement For Linearity. (After environment and life test)
-Load: 150g with End shape R0.8 mm Polyacetal resin.
-Measuring area: 1.0mm inside the edge of touch panel active area, pitch 5mm. (Fig. 1)

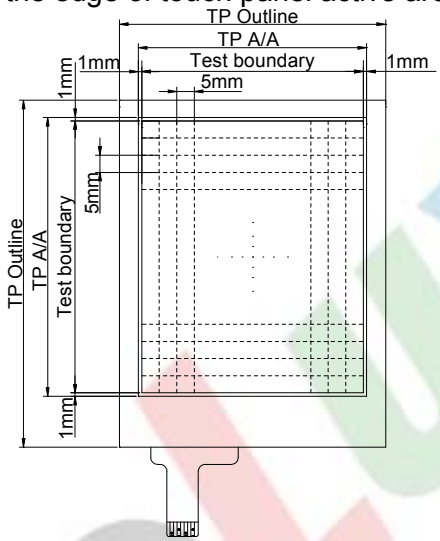


Fig. 1 Measuring area for Linearity

Note 4: Measurement for surface area.
-Scratch 100,000 times of straight line on the screen with a stylus which is changed every 20,000 times. One time is defined in one direction, strike one time, and then in the reverse direction strike one time that defined 2nd time.
-Force: 150gf.
-Speed: 120mm/sec.
-Writing Length: 35mm.
-Stylus: R0.8 polyacetal tip.
-Measuring area: 2.0mm inside the edge of touch panel active area, any line. (Fig. 2)
-Result: the SPEC of Electrical Characteristics pass.

Note 5: Hit 1,000,000 times on the screen with a R0.8mm Polyacetal resin By stylus tapping at same points.
-Force: 250gf.
-Speed: 3times/sec.
-Measuring area: 2.0mm inside the edge of touch panel active area, any point. (Fig. 2)
-Result: The SPEC of Electrical Characteristics pass.

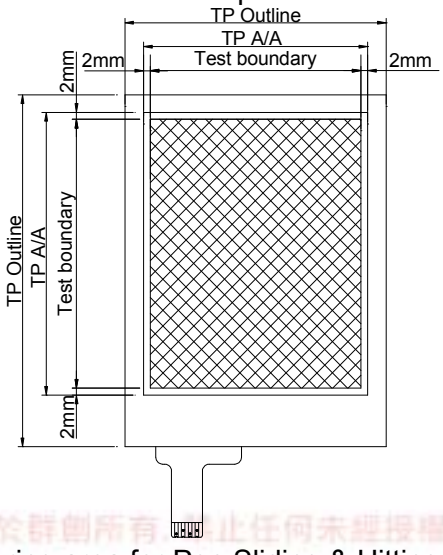
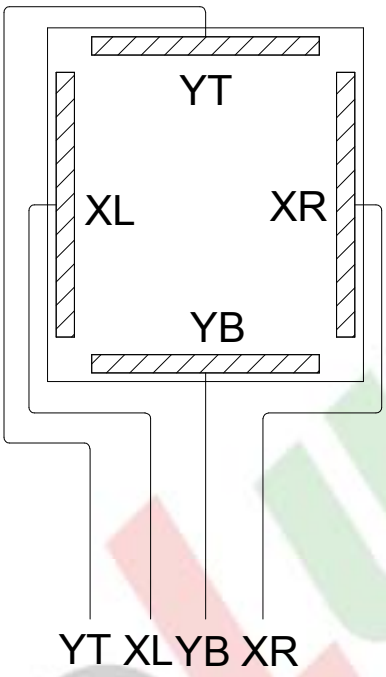
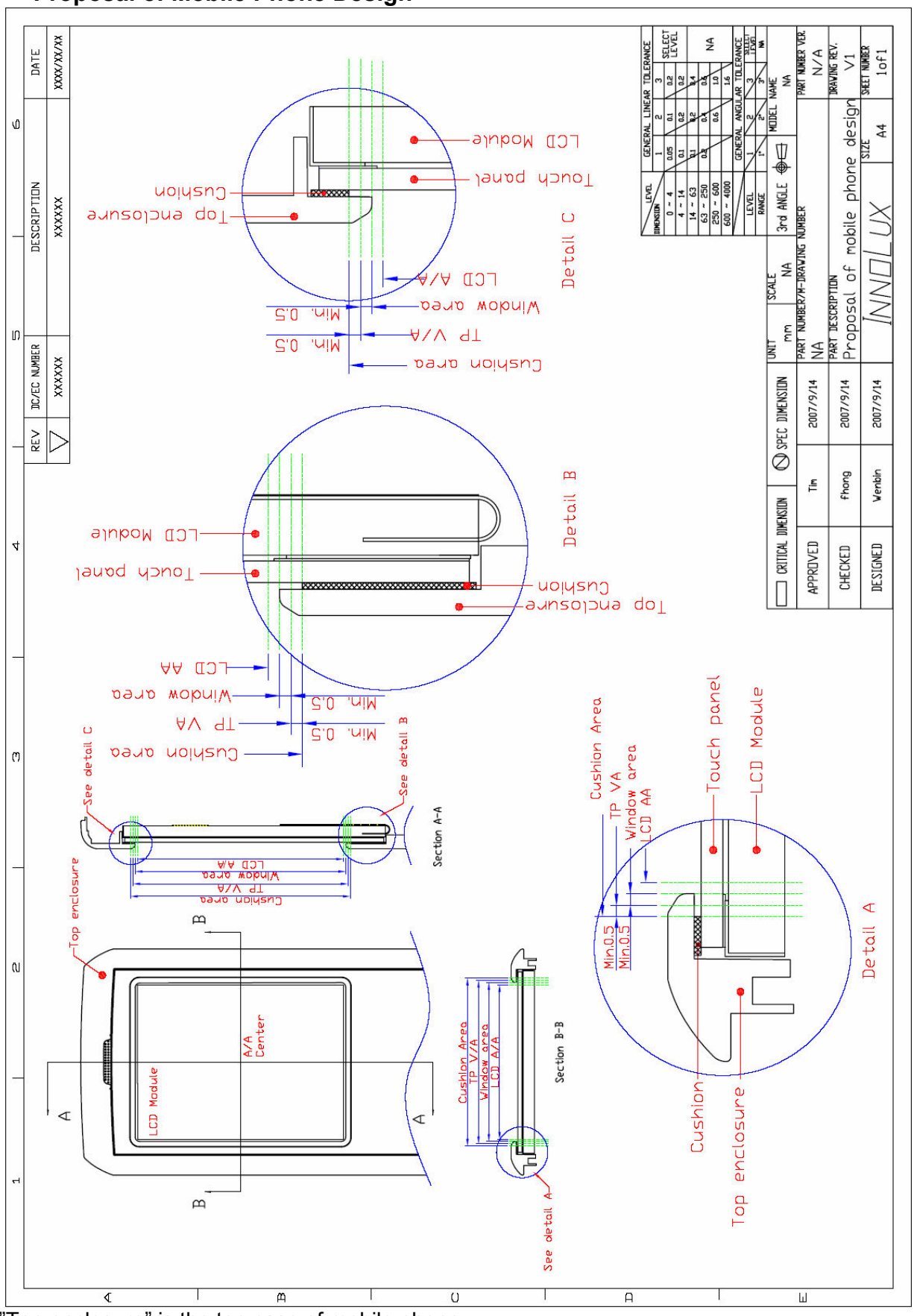


Fig. 2 Measuring area for Pen Sliding & Hitting Durability.

5.4 Touch Panel Circuit Block



5.5 Proposal of Mobile Phone Design



Note 1:"Top enclosure" is the top case of mobile phone.

Note 2:"Window Area" is the opening area of top enclosure of the mobile phone, we suggest customers design it following the drawing and there should be no defect in the LCD module within the area.

Note 3:"Cushion Area" is the cushion customer use between top enclosure and LCM, we suggest customers design it following the drawing and the cushion should not press the TP V/A.

6. Optical Specifications

(Ta=+25℃, VCI=VDD=+2.8V, I_B=80mA)

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR≧10	40	45	-	degree	Note 1,2
	Right	θ_R		40	45	-		
	Top	θ_T		45	50	-		
	Bottom	θ_B		15	20	-		
Response Time		$T_{on}+T_{off}$	Normal θ=Φ=0°	-	30	40	ms	Note 2,3
Contrast Ratio		CR	Normal θ=Φ=0°	200	300	-	-	Note 2,4
Luminance		L	Normal θ=Φ=0°	120	160	-	cd/m^2	Note 2,5
Color Chromaticity (CIE1931)	White	W_x	Normal θ=Φ=0°	0.23	0.28	0.33	-	Note 2,6
		W_y		0.22	0.27	0.32		
	Red	R_x		0.55	0.60	0.65		
		R_y		0.30	0.35	0.40		
	Green	G_x		0.29	0.34	0.39		
		G_y		0.53	0.58	0.63		
	Blue	B_x		0.09	0.14	0.19		
		B_y		0.02	0.07	0.12		
Color Gamut		NTSC	CIE1931	-	60	-	%	-
Luminance Uniformity		U_L	Normal θ=Φ=0°	75	80	-	%	Note 2,7
Flicker		-	-	No Visible			-	Note 8
Crosstalk		-	-	No Visible			-	Note 9

Note 1: Definition of viewing angle range

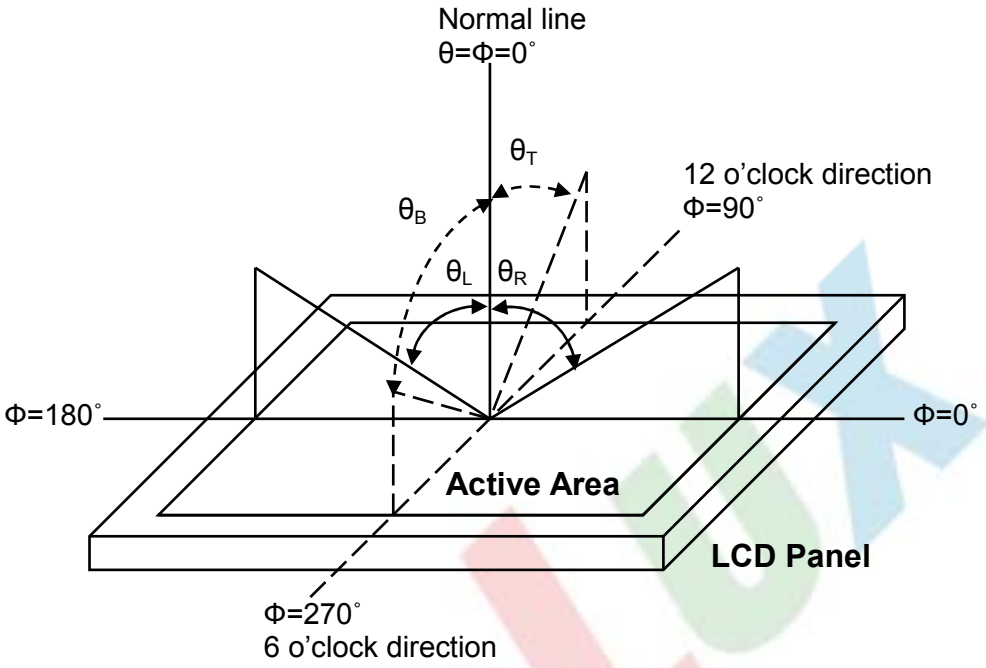


Fig. 1 Definition of viewing angle

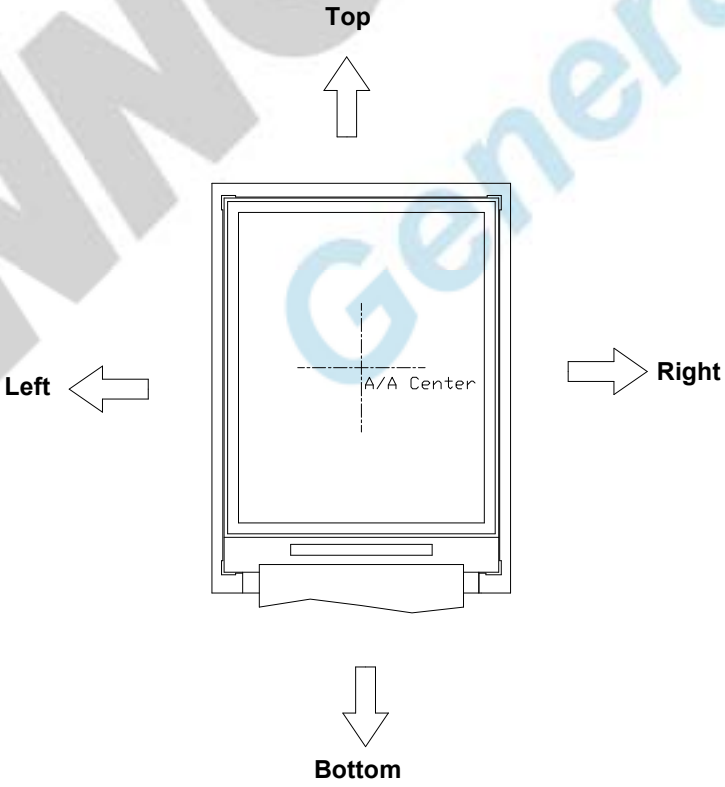


Fig. 2 Definition of viewing angle for display

Note 2: Definition of optical measurement system

The optical characteristics should be measured in a dark room with ambient temperature T_a=+25. The optical properties are measured at the center point of the LCD screen after 5 minutes operation. (Equipment: Photo detector TOPCON BM-5A or BM-7 /Field of view: 1˚ /Height: 500mm.)

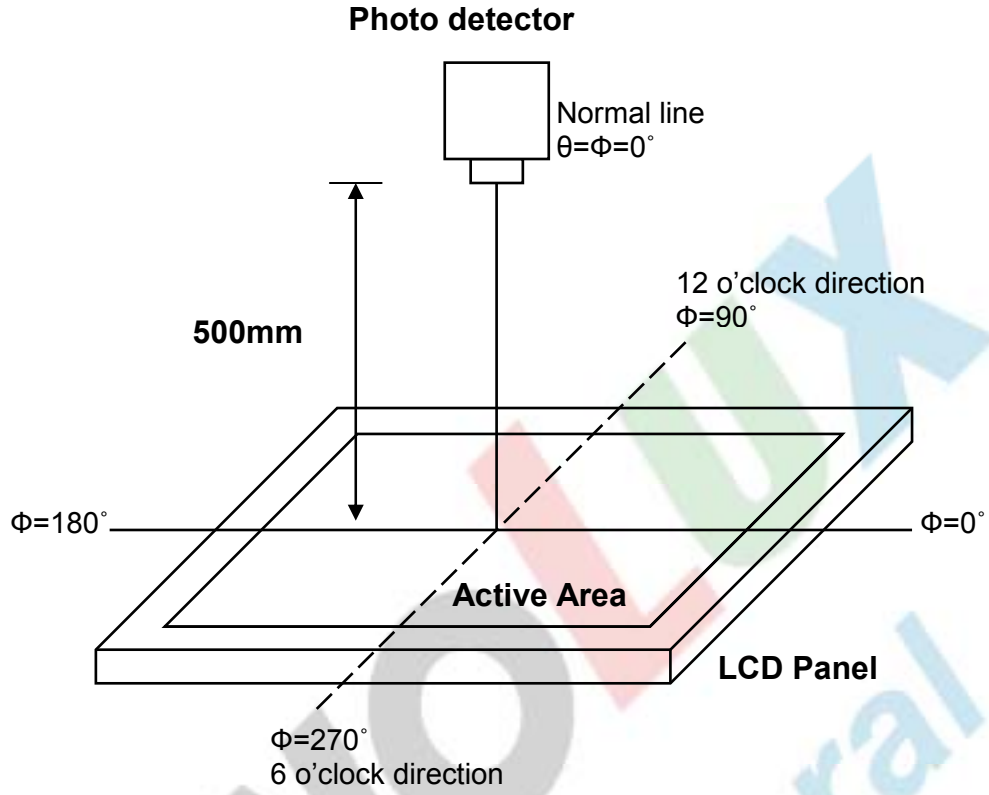


Fig. 3 Optical measurement system setup

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

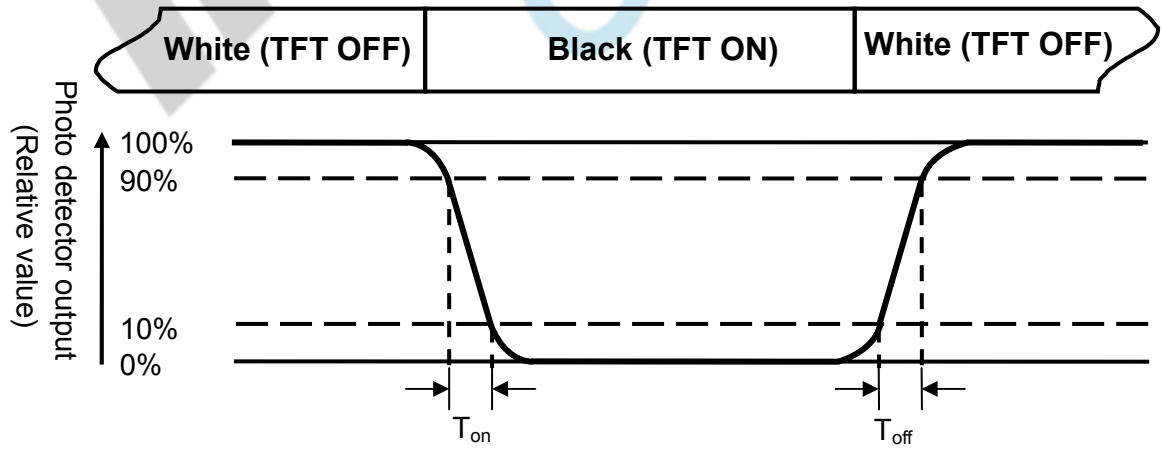


Fig. 4 Definition of response time

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”, “Red”, “Green” and “Blue” 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 circle as below.

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

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

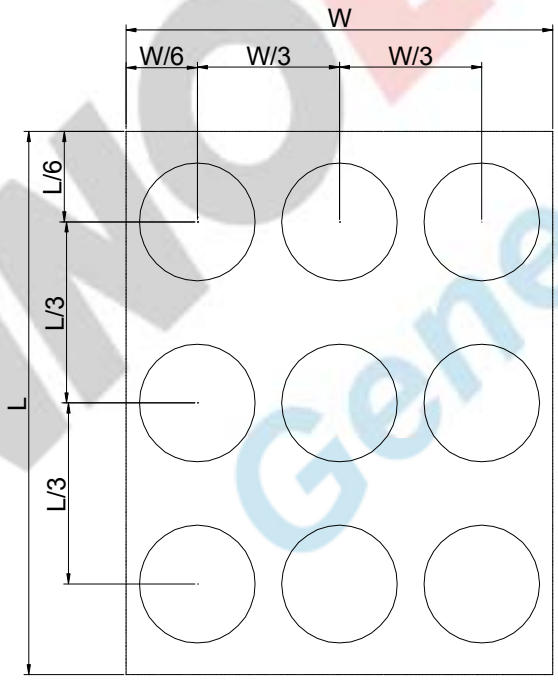


Fig. 5 Definition of luminance uniformity

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

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

Note8: Definition of Flicker

Flicker is the term usually used to describe the visual sensation produced by a rapidly varying light intensity. There should be no visible flicker in normal direction of the display when the following figures are loaded.

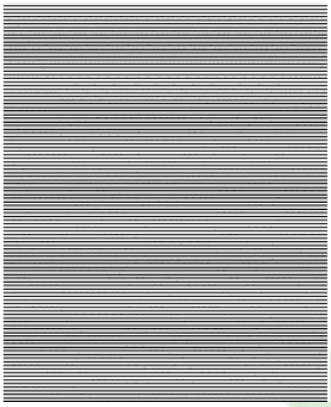


Fig. 6 Flicker checker pattern

Note 9: Definition of Crosstalk

There should be no visible crosstalk in normal direction of the display when the following figures are loaded.

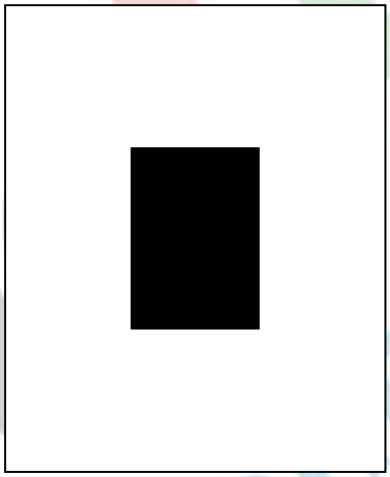


Fig. 7 Crosstalk checker pattern

7. Reliability Test Items

Test Items	Test Conditions	Remark
High Temperature Storage	+80℃±3℃ for 240 hours	-
Low Temperature Storage	-30℃±3℃ for 240 hours	-
High Temperature Operation	+70℃±3℃ for 240 hours	-
Low Temperature Operation	-20℃±3℃ for 240 hours	-
High Temperature and Humidity Operation	+60℃±3℃, 90%±3%RH max. for 240 hours	-
Thermal Shock	-30℃/0.5h ~ +80℃/0.5h for a total 100 cycles, Start with cold temp and end with high temp	-
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 3 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	-
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	-

Note1: During the display practical test under normal operation condition, there shall be not change or effect to the display function.

Note2: Before function check, the test sample requires 2 hours storage at room temperature.
Before test the function of TP, the sample must be placed in room temperature for 24hrs after RA test.

8. Handling Precautions

8.1 Safety

8.1.1. 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.

8.2 Handling

8.2.1 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.
8.2.2 **Do not** handle the product by holding the flexible pattern portion in order to assure the reliability
8.2.3 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.
8.2.4 Provide a space so that the panel does not come into contact with other components.
8.2.5 To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
8.2.6 Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
8.2.7 Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
8.2.8 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.

8.3 Static Electricity

8.3.1 Ground soldering iron tips, tools and testers when they are in operation.
8.3.2 Ground your body when handling the products.
8.3.3 Power on the LCD module **BEFORE** applying the voltage to the input terminals.
8.3.4 **DO NOT** apply voltage which exceeds the absolute maximum rating.
8.3.5 Store the products in an anti-electrostatic bag or container.

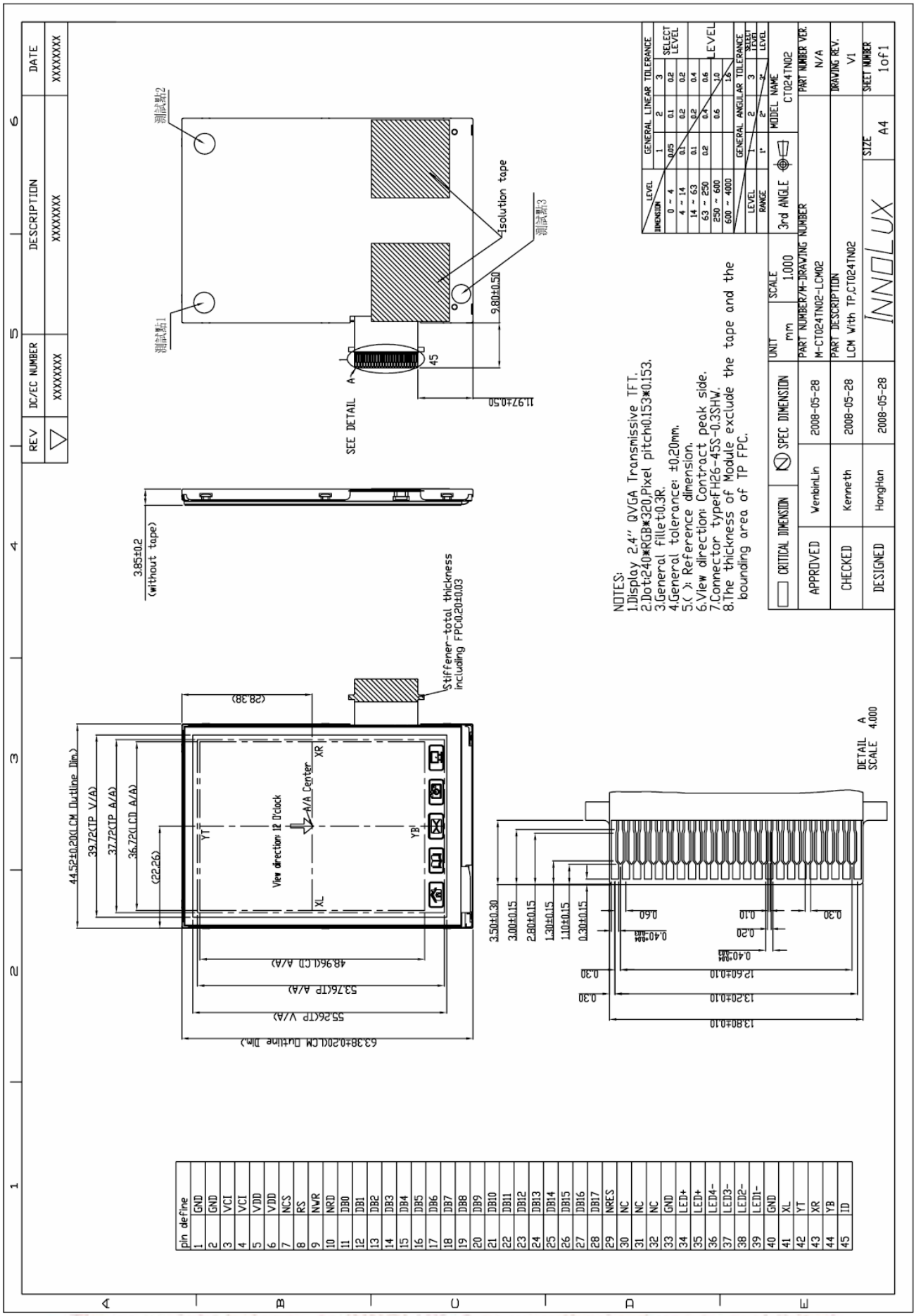
8.4 Storage

8.4.1 Store the products in a dark place at +25℃±10℃ with low humidity (65%RH or less).
8.4.2 **DO NOT** store the products in an atmosphere containing organic solvents or corrosive gas.

8.5 Cleaning

8.5.1 **DO NOT** wipe the touch panel with dry cloth, as it may cause scratch.
8.5.2 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.

9 Mechanical Drawing



10 Package Drawing

10.1 Packing Material Per Carton

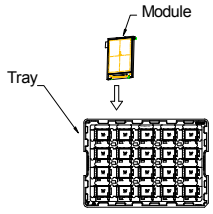
No.	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	CT024TN02	44.52(W)x63.38(L)x 3.85(T)	0.019	384	-
2	Tray	PET	345x245x18	0.10	32	Anti-static
3	Empty Tray	PET	345x245x18	0.10	4	Anti-static
4	DUST-PROOF BAG	PE	----------	0.03	4	-
5	Small Box	CORRUGATED PAPER	351x253x109	0.32	4	-
6	Carton	CORRUGATED PAPER	530x355x255	0.85	1	-
7	Total weight	13.15 kg±3%				

10.2 Packing Specification and Quantity

	Module/Tray (pcs)	Module/Carton (pcs)	Carton/Floor (pcs)	Module/Floor (pcs)	Floor/Pallet	Module/pallet (pcs)
Quantity	12	384	6	6X384=2304	5	5X2304=11520

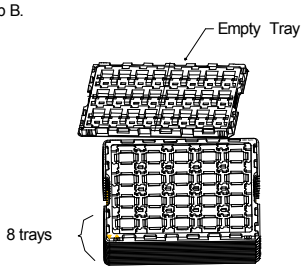
10.3 Illustration

Step A.



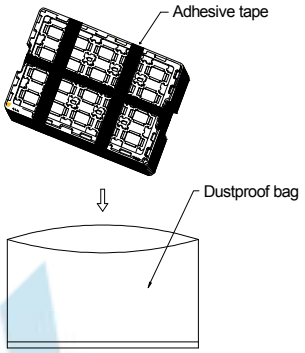
Put products into the trays.
The top surface of product is face to us.
There are 12 pcs modules in a tray.

Step B.



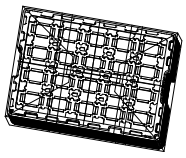
There are total 384 modules in a box.
Note: Every second tray turn 180 degrees to stack up.
The upmost tray of all should be keeped empty.

Step C.



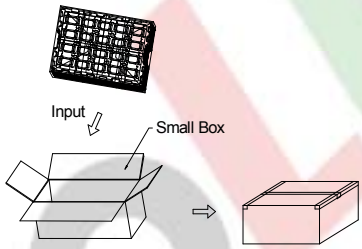
Fasten the trays with adhesive tape,
then put trays into this bag.

Step D.



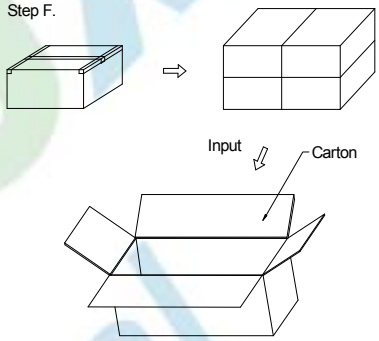
Seal the bag.

Step E.



Pack the trays using Small Box,
then sealed the box with tape.

Step F.

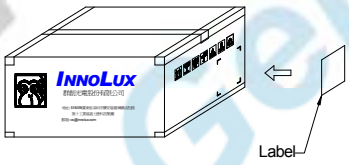


Load 4 Small Boxs with 2 floors,and input to the carton.

Step G.

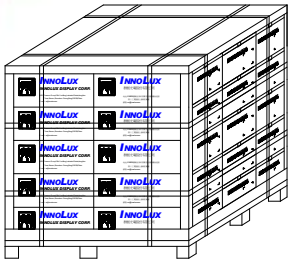
Seal carton.

Step H.



Paste the label on outer caton

Step J.



Put the 30 loaded packages on a pallet.
There are 6 packages on a storey, 5 stores on a pallet.

Lable

INNOLUX DISPLAY

Customer Name:

Customer P/N:

Box ID:

Model No:

Quantity:

MFG Date:

QC:

INNOLUX QA DISPLAY
OQC
DATE
PASS

11 Cosmetic Specification

11.1 Incoming Inspection

Both parties agree that the inspection specifications of TFT-LCD Modules (hereinafter known as "Modules") stipulated hereunder is the only and final standard applicable in the process of inspection. InnoLux shall be under no liability or obligation (including incidental loss, products liability or other consequential loss) whatsoever for any defect in quality or performance or shortage in quantity of the Modules that have passed such inspection.

11.2 Liability

11.2.1 Inspection Deadline

The Customer should inspect the Modules either at the Delivery Point or within twenty (20) calendar days after arrival at the Delivery Destination.

11.2.2 Notification of Rejection

The Customer may reject one or more defective or non-conforming Modules if the Modules fail to meet the AQL (Acceptable Quality Level) and pass the inspection. In that case, the customer should notify InnoLux of the rejection by either documents or mail within in five (5) business days from the date of reception of the Modules. Otherwise, the Modules shall be deemed to have met the AQL and passed the inspection.

11.3 Inspection Specifications

Both parties agree that the inspection shall contain and follow the inspection specifications stipulated in the Inspection Specifications (see attachment), including:

Scope
Sampling Plan
Panel Inspection Condition
Display Quality
Mechanics Specifications
Notification for Storage Handling

11.4 Limited Warranty

InnoLux represents and warrants that all Modules shall (i) conform to the specifications set hereunder, and (ii) be free from any defects in material and workmanship for twelve (12) months after the Customer's acceptance or deemed acceptance. InnoLux will replace, rework or refund the Customer for the defective or non-conforming Modules at InnoLux's option, provided that the Customer (i) promptly informs InnoLux of the defects or non-conformities within the warranty period, (ii) complies with the specifications and conditions hereunder, and (iii) complies with InnoLux's procedure for Modules replacement, reworking and/or return. The warranty period for the Modules replaced or reworked shall be the remaining term for such Modules.

11.5 THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, TERMS OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. INNOLUX'S WARRANTIES HEREIN APPLY ONLY TO THE CUSTOMER AND ARE NOT TO BE EXTENDED TO ANY THIRD PARTY.

11.6 Governing Law

This Agreement shall be governed and construed in accordance with the laws of the Republic of China. Both parties agree to submit any dispute, which cannot be amicably resolved, to Taipei District Court for the first instance.

11.7 Inspection Specifications

11.7.1 SCOPE

Specifications contain

- Display Quality Evaluation
- Mechanics Specification

11.7.2 SAMPLING PLAN

Unless there is other agreement , sampling plan for incoming inspection should follow MIL-STD-105E.

11.7.2.1 Lot size: Quantity per shipment as one lot (different model as different lot .)

11.7.2.2 Sampling type: Normal inspection, single sampling.

11.7.2.3 Sampling level: Level II.

11.7.2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.40%

Minor defect: AQL=0.65%.

11.7.3 PANEL INSPECTION CONDITION

11.7.3.1 Environment:

Room Temperature: 23±3℃.

Humidity: 55±5% RH.

Illumination: 800~1200Lux.

11.7.3.2 Inspection Distance

35±5 cm from the inspector to the module.

11.7.3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the module.

11.7.4 Display Quality

11.7.4.1 Function Related:

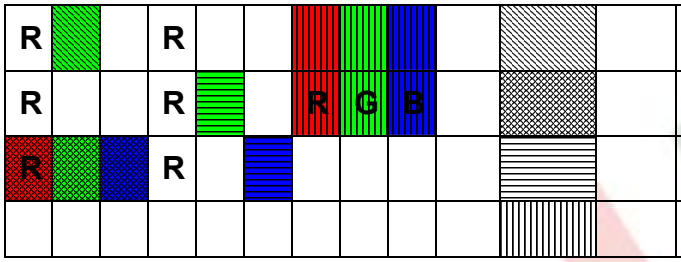
The function defects such as line defect, abnormal display, no display are considered as the major defects.

11.7.4.2 Bright/Dark Dots

Defect Type	Specification	Major	Minor
Bright Dots	N = 0		●
Dark Dots	N <= 2		●
Total Bright and Dark Dots	N <= 2		●
Distance between defect dots	L>= 10 mm		●
Distance between dark dots	L >=10 mm		●

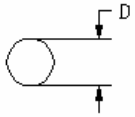
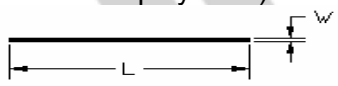
Note: Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

11.7.4.3 Pixel Definition

	Dot Defective
	Defective Pixel
	Defective Adjacent Sub-Pixels
	Defective Adjacent Pixels

Note: In cases where partial sub-pixel or pixel defects exceed 50% of the affected sub-pixel or pixel area, it will be counted as 1 defect.

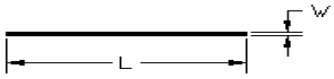
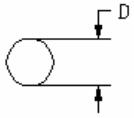
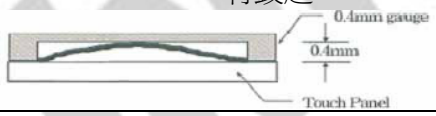
11.7.4.4 Visual Inspection specification

Defect Type		Specification Size	Count (N)	Major	Minor
Dot Shape (Particle、Scratch and Bubbles in display area) 		D <= 0.1 mm	Ignored		●
		0.1mm < D <= 0.2mm	N <= 2		
		D > 0.2mm	N=0		
Line Shape (Particles、Scratch、Lint and Bubbles in display area) 		W<= 0.03 mm	Ignored		●
		0.03< W <= 0.05mm & L <=5mm	N <= 2		
		W > 0.05mm or L >5mm	N=0		
Bubble in cell (active area)		It should not be found by eyes.			●
Dent/Bump on Polarizer		The defects confirmed only in a glare state in which the light is reflected on the polarizer are neglect.			●
Bezel	Scratch	No harm			●
	Dirt				●
	Wrap	No harm			●
	Sunken	No harm			●
Label	No label	NG			●
	Invert label				●
	Broken				●

	Dirt	Word can be read.		●
	Not clear			●
	Mistake	NG		●
	Position	Be attached on right position		●
Connector	Connection status	No bend on pins and damage		●
FPC	Broken	NG		●

Note: Extraneous substance and scratch do not affect the display of image, for instance, the extraneous substance under polarizer film but outside the display area, scratch on metal bezel and backlight module or pola.

11.7.4.5 Touch Panel Visual Inspection specification

項目		規格		備註
TP	TP 异物(線狀) 	W<=0.03mm	OK	
		0.03mm<W<=0.05mm&L<=5mm&N<=2	OK	
		W>0.05mm or L>5mm.	NG	
	TP 异物(點狀) 	D<=0.15mm	OK	
		0.15mm<D<=0.25mm&N<=2	OK	
		D>0.25mm	NG	
	TP film 材鼓起 	高度<=0.4mm	OK	
	牛頓環 	D<=3mm,N<=2	OK	
		D>3mm	NG	

11.7.5. MECHANICS SPECIFICATION

As for the outside dimension, weight of the modules, please refer to product Specification for more details.

11.7.6. NOTIFICATION FOR STORAGE AND HANDLING

11.7.6.1 Storage

11.7.6.1.1 Environment condition must be within the product specification, otherwise module might be damaged.

11.7.6.1.2 Pile of stacking should follow the advice from InnoLux.

11.7.6.2 Handling

11.7.6.2.1 Twist or Bending is not allowed for the module.

11.7.6.2.2 All chemicals are not fit for use unless there is advice from InnoLux.

11.7.6.2.3 Plug in & out
Be sure to make the module power off before plugging in or out the connector.

11.7.6.2.4 ESD protection
No touch on module without grounding.

11.7.6.2.5 High Voltage
No touch on the rear side of module without protection.

11.7.6.2.6 Power sequence
Should follow the instruction of InnoLux.

11.7.7 LIMITED WARRANTY

11.7.7.1 InnoLux represents and warrants that all Modules shall (i) conform to the specifications set forth in Article 5, 6 hereof and (ii) be free from any defects in material and workmanship for 12 month(s) after Customer's acceptance or deemed acceptance. InnoLux will replace, rework or refund the defective or non-conforming Modules; Provided that Customer (i) promptly informs Supplier of the defects or non-conformities within the warranty period, (ii) comply with the Specification and conditions hereunder and (iii) comply with InnoLux's procedure for Modules replace, rework and return. The warranty period for the Modules replaced or reworked shall be the remaining term for such Modules.

11.7.7.2 THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, TERMS OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. INNOLUX'S WARRANTIES HEREIN APPLY ONLY TO CUSTOMER AND ARE NOT TO BE EXTENDED TO ANY THIRD PARTY.

11.7.8 Governing Law

This Agreement shall be governed and construed in accordance with the laws of the R.O.C. Both parties agree to submit any dispute, which cannot be amicably resolved, to Taipei District Court for the first instance.