REV	01

SPECIFICATIONS

MODEL NO.	LTF240CS
TYPE	LCD MODULE, 240(RGB) * 320 PIXELS

■Preliminary Specification
□ Final Specification

LONGECH			CUSTOMER
PREPARED	CHECKED	APPROVED	APPROVED

厦门龙特电子有限公司

LONGTECH ELECTRONICS LTD

RECORDS OF REVISION

REV.	DATE	Page	DESCRIPTION OF CHANGES
01	2010.12.27	24	FIRST ISSUE

CONTENT

1. GENERAL SPECIFICATION.....4
2. BLOCK DIAGRAM.....5
3. MECHANICAL DRAWING.....6
4. INTERFACE ASSIGNMENT.....7
5. ELECTRICAL SPECIFICATION.....8
6. TOUCH PANEL SPECIFICATION.....14
7. OPTICAL CHARACTERISTICS.....18
8. RELIABILITY TESTS.....22
9. PACKAGE DRAWING.....23
10. PRECAUTIONS.....24
11. LIMITED WARRANTY.....24

1. GENERAL SPECIFICATION

1.1 Description

The LTF240CS 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. The resolution of the panel is 240x320 pixels and can display up to 65K color.

1.2 Feature

-TM type for main TFT-LCD panel
-Structure COG+FPC+BL+TP
-Full, Normal (Still), Partial, Sleep, Standby mode are available

1.3 Application

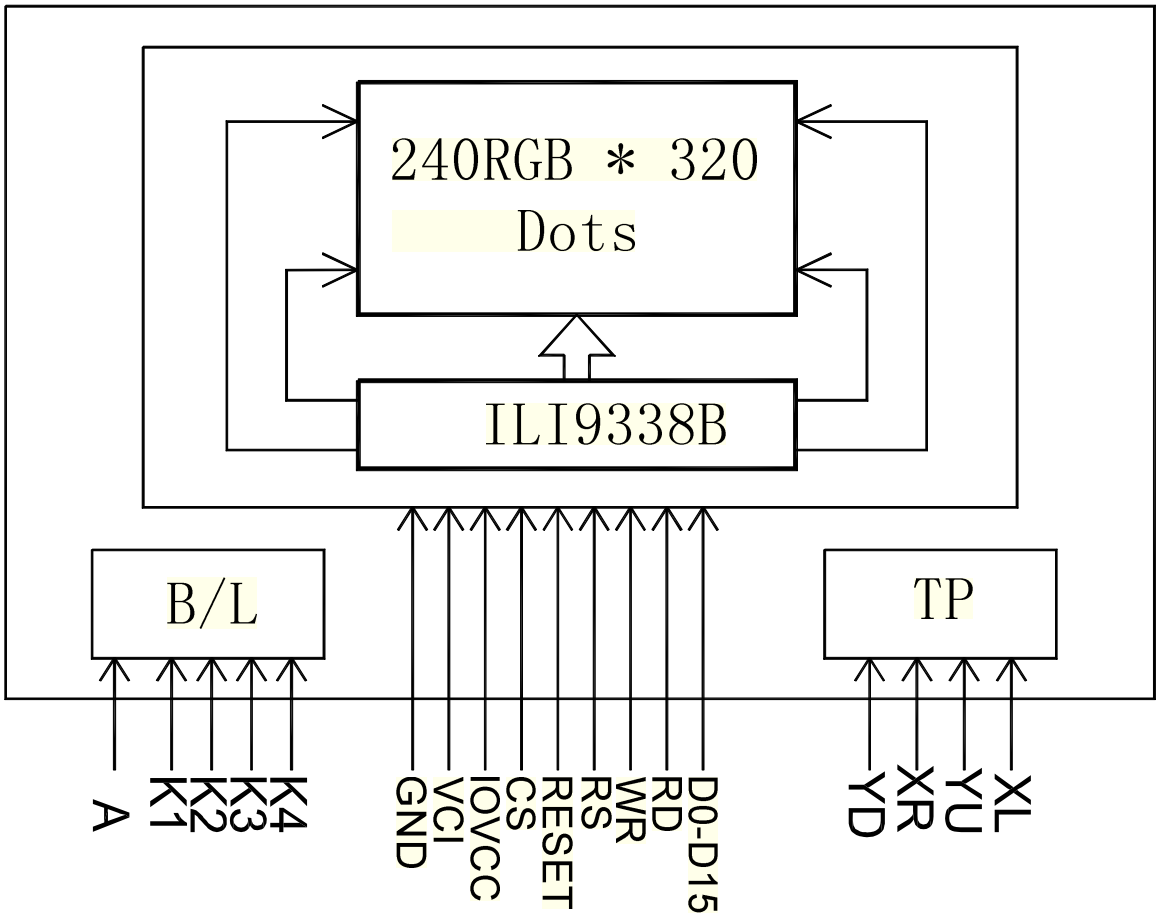
-Display terminals for cellular phone

1.4 General Specification

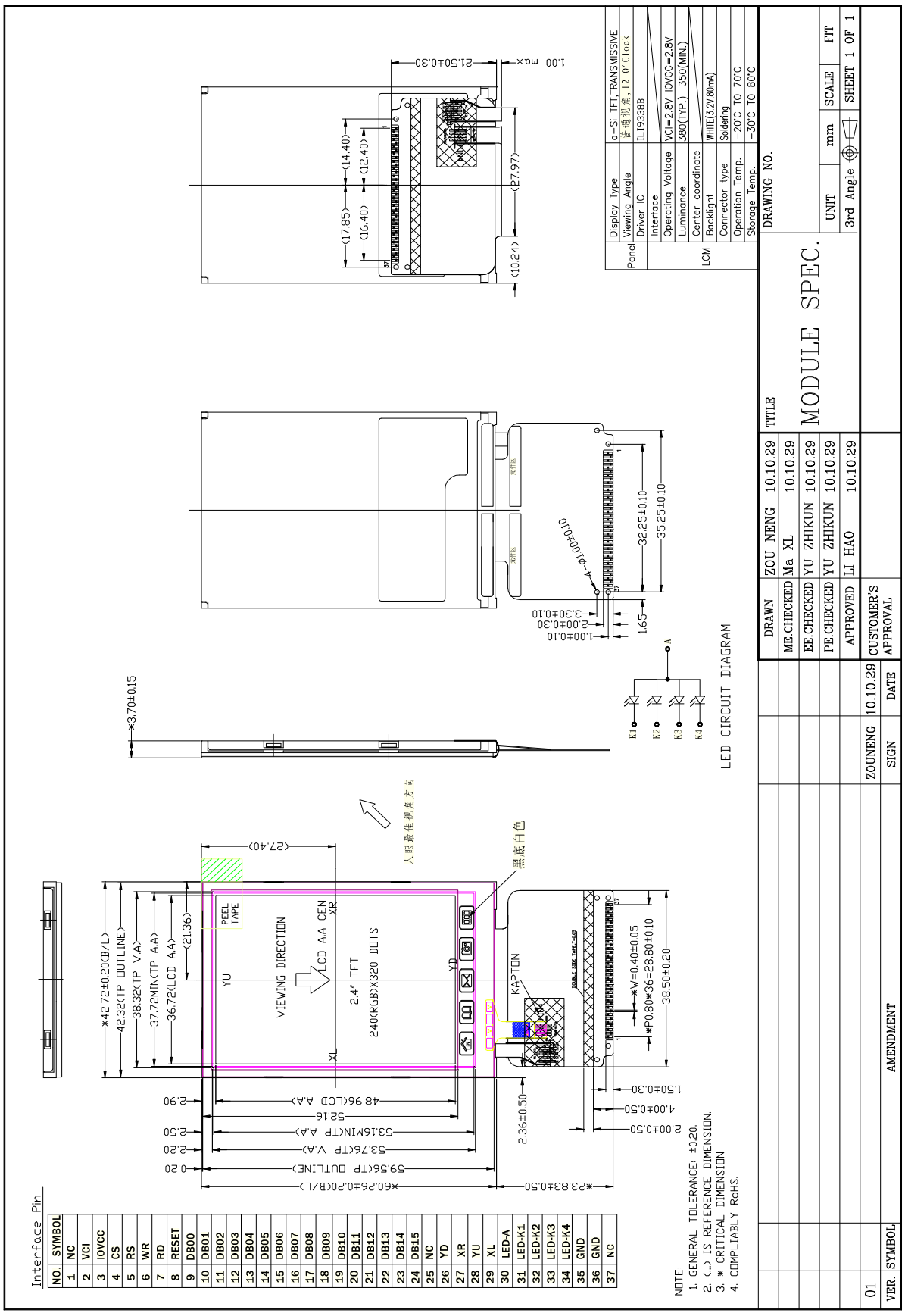
No.	Item	Specification	Unit	Remark
1	LCD Size	2.4	inch	-
2	Panel Type	a-Si TFT active matrix	-	-
3	Resolution	240 x (RGB) x 320	pixel	-
4	Display Mode	Normally white,Transmissive	-	-
5	Display Number of Colors	65K	-	-
6	Viewing Direction	12 o'clock(Peak CR) /6 o'clock(Good View)	-	Note
7	Contrast Ratio	300（TYP）	-	-
8	Luminance	380（TYP）	cd/m^2	-
9	Module Size	42.72(W) x 60.26(L) x 3.70(T)	mm	Note
10	Active Area	36.72(W) x 48.96(L)	mm	Note
11	Pixel Pitch	0.153(W) x 0.153(L)	mm	-
12	Weight	TBD(TYP)	g	-
13	Driver IC	ILI9338B	-	-
14	Driver IC RAM Size	240x18x320	bit	-
15	Light Source	4 LEDs White	-	-
16	Interface	80-system 16-bit Parallel	-	-
17	Operating Temperature	-20~70	℃	-
18	Storage Temperature	-30~80	℃	-

Note: Please refer to the mechanical drawing.

2. BLOCK DIAGRAM



3. MECHANICAL DRAWING

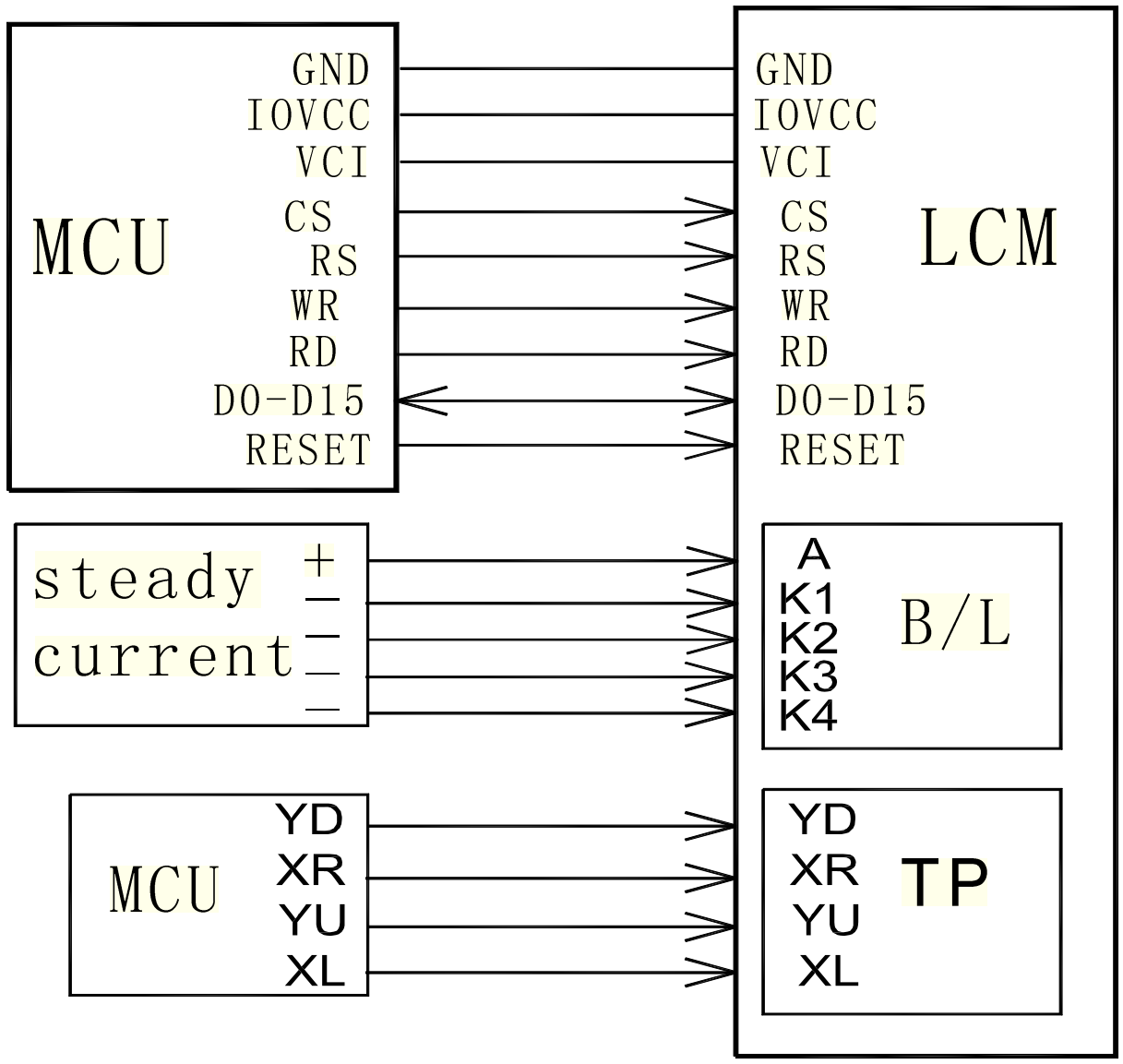


4. INTERFACE ASSIGNMENT

PIN NO.	SYMBOL	FUNCTION DESCRIPTIONS
1	NC	No connection.
2	VCI	Analog power supply
3	IOVCC	Digital IO pad power supply
4	CS	A chip selection signal. When CS is low,the chip can be accessed.
5	RS	Display data or Command selection pin RS='HIGH': Display data. RS='LOW': Command data.
6	WR	Serves as a write signal and writes data at the rising edge.
7	RD	Serves as a read signal and read data at the rising edge.
8	RESET	The external reset input. Initializes the chip with a low input. Be sure to execute a power-on reset after supplying power.
9	D0	16-bit parallel bi-directional data bus.
10	D1	
11	D2	
12	D3	
13	D4	
14	D5	
15	D6	
16	D7	
17	D8	
18	D9	
19	D10	
20	D11	
21	D12	
22	D13	
23	D14	
24	D15	
25	NC	No connection.
26	YD	TP Singnal
27	XR	
28	YU	
29	XL	
30	LED_A	Power supply for backlight (anode).
31~34	LED_K1~K4	Power supply for backlight (cathode).
35/36	GND	Ground.
37	NC	No connection.

5. ELECTRICAL SPECIFICATION

5.1. APPLICATION CIRCUIT



5.2. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
Power Supply for Analog	V_{CI}	Ta=25 ºC	-0.3	-	4.6	V
Power Supply for Digital IO	IOV_{CC}	Ta=25 ºC	-0.3	-	4.6	V

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

5.3. TYPICAL OPERATION CONDITION

5.3.1 DC Characteristics

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
Power Supply for Analog	V_{CI}	Ta=25 ºC	2.5	2.8	3.3	V
Power Supply for Digital IO	IOV_{CC}	Ta=25 ºC	1.65	2.8	3.3	V
Input Signal “H” Level	V_{IH}	-	$0.7V_{CC2}$	-	V_{CC2}	V
Input Signal “L” Level	V_{IL}	-	-0.3	-	$0.3V_{CC2}$	V
Output Signal “H” Level	V_{OH}	I_{OH}=-0.1mA	$0.8V_{CC2}$	-	-	V
Output Signal “L” Level	V_{OL}	I_{OL}=0.1mA	-	-	$0.2V_{CC2}$	V
Frame Frequency	f_{FRAME}	-	-	60	-	Hz

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

5.3.2 Current Consumption

Item	Symbol	Values		Unit	Remark
		TYP	Max.		
80-system 8-bit parallel Interface					
Normal(Still) Mode	I_{CC1}	5	10	mA	Note1
Sleep Mode	I_{CC2}	-	50	uA	Note2

Note1: Test Condition

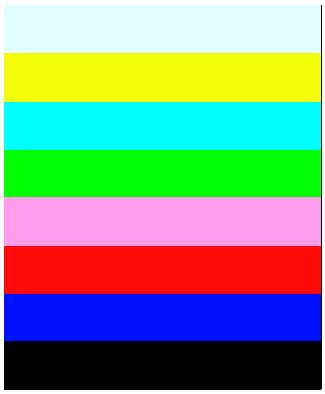
IOVCC=VCI=2.8V;

Display Pattern: 8 Color Bar

Frame Rate=60Hz at Line Inversion

Operating Temperature: 25℃

Typ. current check pattern:



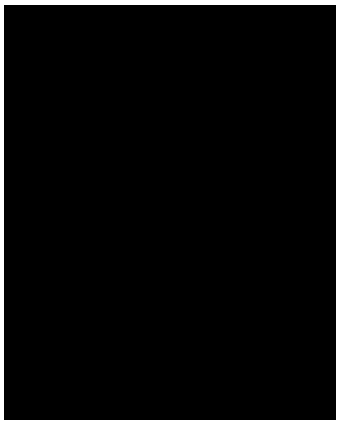
8-Color Bar

Display Pattern: All Pixel Black

Frame Rate=60Hz at Line Inversion

Operating Temperature: 25℃

Max. current check pattern:

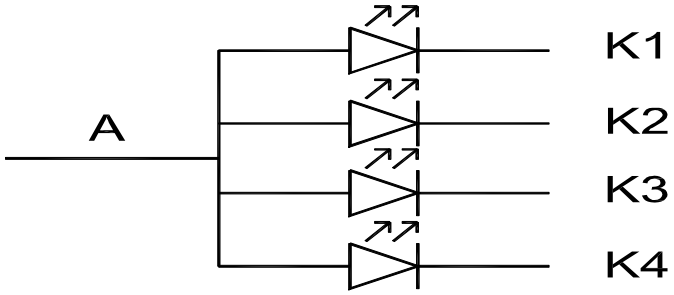


Black

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

5.4. BACKLIGHT SPECIFICATION

5.4.1 BACKLIGHT CIRCUIT

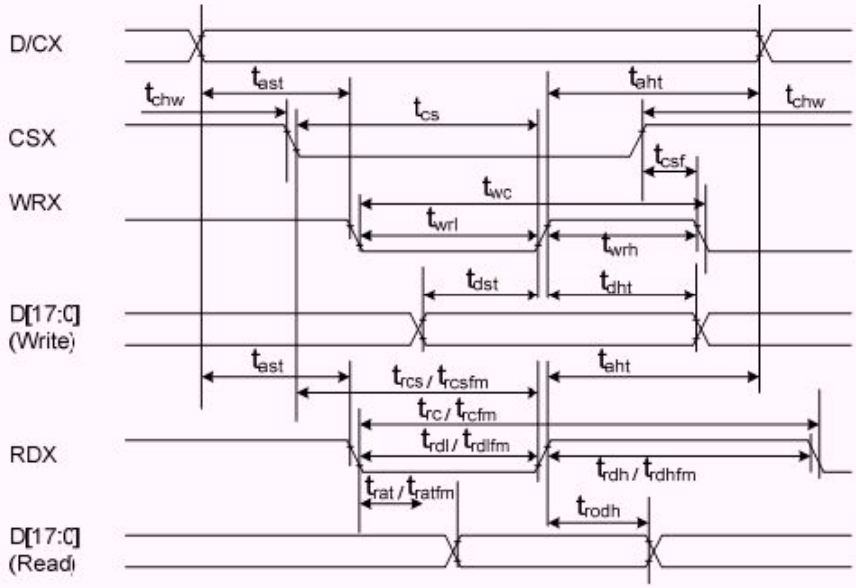


5.4.2 ELECTRICAL CHARACTERISTICS

(T=25℃)

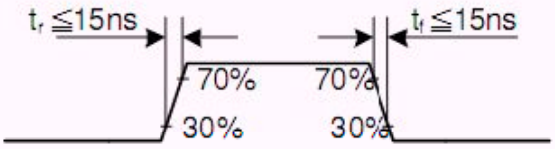
PARAMETER	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
FORWARD VOLTAGE (Single Chip)	VF	IF=27mA	2.9	3.2	3.4	V

5.5. INTERFACE TIMING CHARACTERISTICS

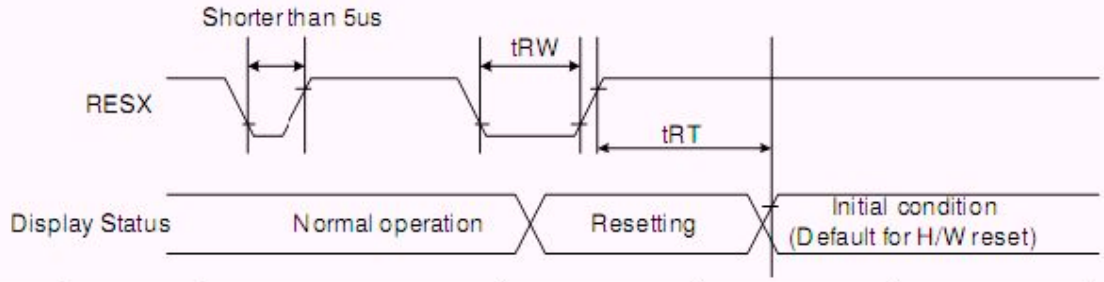


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	33	-	ns	
	twrl	Write Control pulse L duration	33	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45			
D[17:0], D[15:0], D[8:0], D[7:0]	tdst	Write data setup time	20			For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	60	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read Control pulse L duration	20	80	ns	

Note: Ta = -30 to 70 ℃, VDDI=1.65V to 3.3V, VDD=2.5V to 3.3V, DGND=0V



5.6. RESET TIMING CHARACTERISTICS



Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

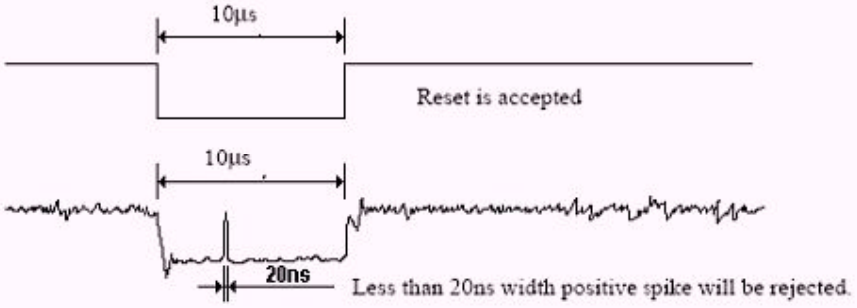
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 9us	Reset starts

Note 3: 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 Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

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



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

6. TOUCH PANEL SPECIFICATION

6.1. ELECTRICAL CHARACTERISTICS

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Linearity	-1.5	-	+1.5	%	After environment and life test
Terminal Resistance	100	-	900	Ω	X(Film side)
	200	-	900	Ω	Y(Glass side)
Insulation resistance	20	-	-	MΩ	DC 25V 1min
Operating Voltage	-	5	7	V	DC

6.2. OPTICAL CHARACTERISTICS

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

6.3. MECHANICAL CHARACTERISTICS

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Active Force	70	-	120	gf	Note1
Surface Hardness	3	-	-	H	-
Pen Sliding Durability	50,000	-	-	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: 70g with End shape R0.8 mm Polyacetal resin.
-Measuring area: 1.0mm inside the edge of touch panel active area, pitch 5mm. (Fig. 1)

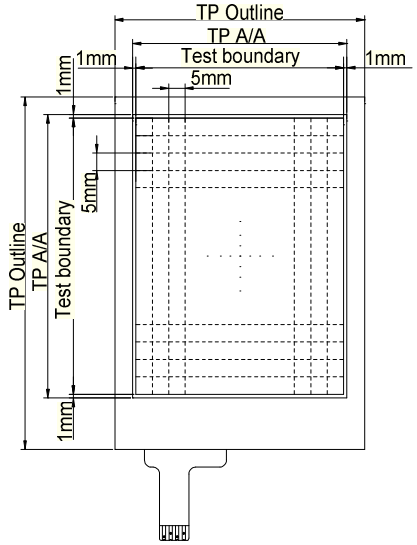


Fig. 1 Measuring area for Linearity

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: 150mm/sec.

-Writing Length: 25mm.

-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: 5times/sec.

-Measuring area: 2.0mm inside the edge of touch panel active area, any point. (Fig. 2)

-Result: The SPEC of Electrical Characteristics pass.

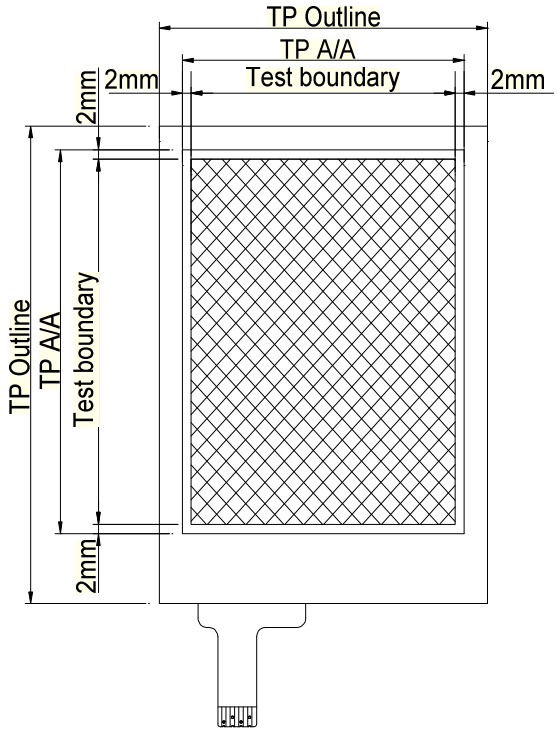
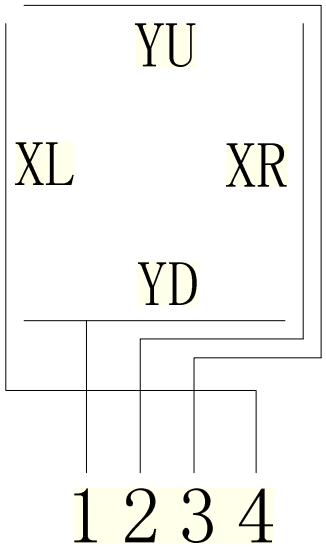


Fig. 2 Measuring area for Pen Sliding & Hitting Durability

6.4. TOUCH PANEL CIRCUIT BLOCK



6.5. PROPOSAL OF MOBILE PHONE DESIGN

7. OPTICAL CHARACTERISTICS

(T_a=+25°C,VCI=IOVCC=+2.8V,I_{BI}=108mA)

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR≧10	50	60	-	degree	Note 1,2
	Right	θ_R		50	60	-		
	Top	Φ_T		55	65	-		
	Bottom	Φ_B		40	50	-		
Response Time		$T_{on}+T_{off}$	Normal θ=Φ=0°	-	30	60	ms	Note 2,3
Contrast Ratio		CR	Normal θ=Φ=0°	200	300	-	-	Note 2,4
Luminance		L	Normal θ=Φ=0°	350	380	-	cd/m^2	Note 2,5
Color Chromaticity (CIE1931)	White	W_x	Normal θ=Φ=0°	0.232	0.282	0.332	-	Note 2,6
		W_y		0.243	0.293	0.343		
	Red	R_x		0.528	0.578	0.628		
		R_y		0.282	0.332	0.382		
	Green	G_x		0.286	0.336	0.386		
		G_y		0.538	0.588	0.638		
	Blue	B_x		0.096	0.146	0.196		
		B_y		0.025	0.075	0.125		
Color Gamut		NTSC	CIE1931	-	54	-	%	-
Luminance Uniformity		U_L	Normal θ=Φ=0°	75	80	-	%	Note 2,7

Note 1: Definition of viewing angle range

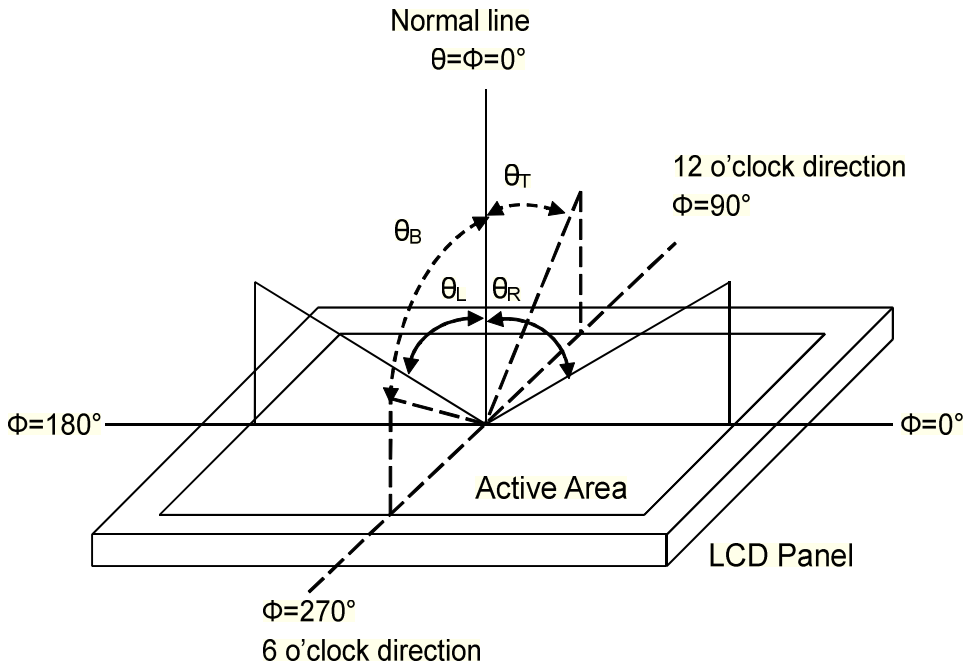


Fig. 1 Definition of viewing angle

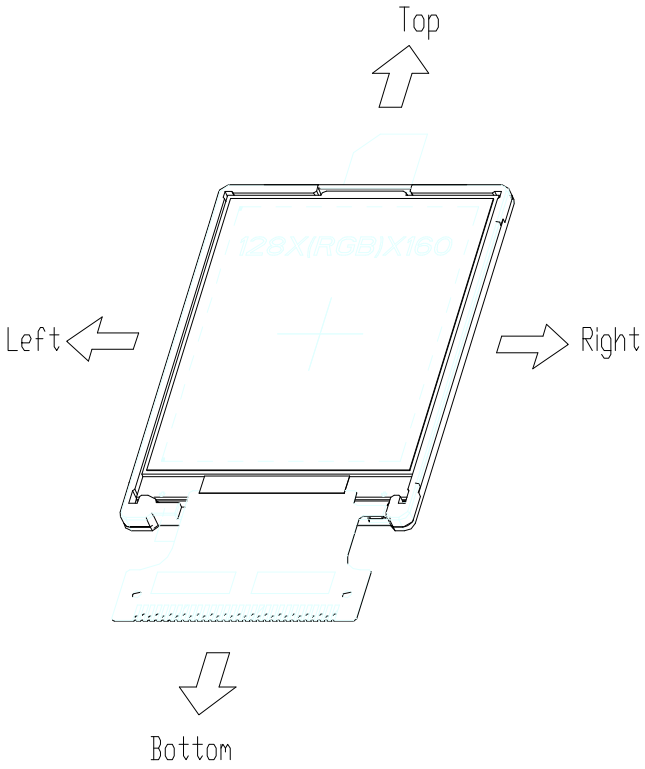


Fig. 2 Definition of viewing angle for display

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-5AS Field of view: 1°/Height: 500mm.)

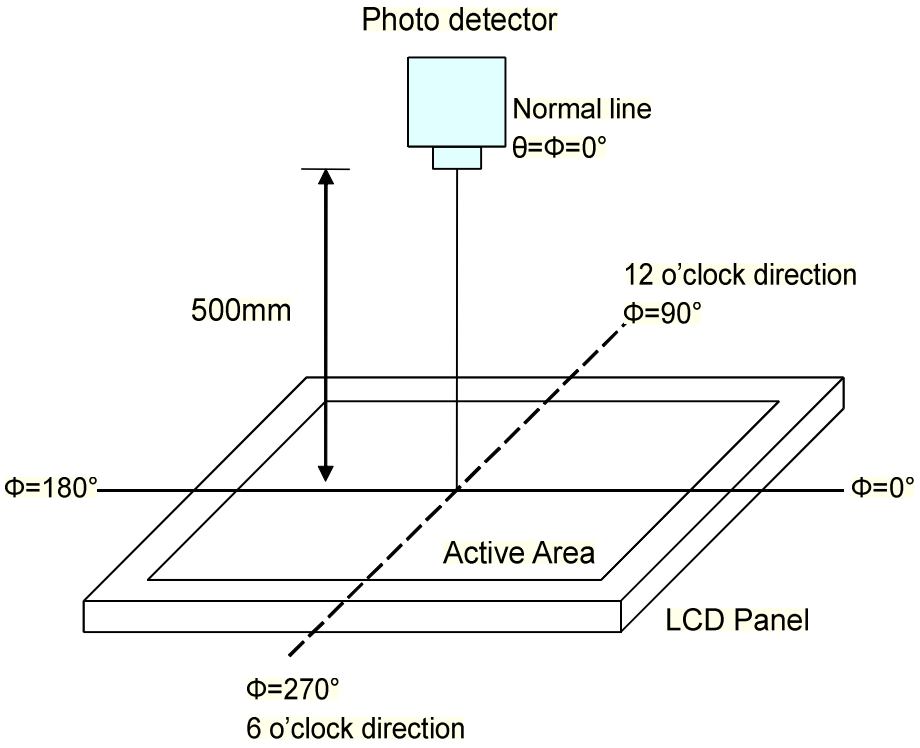


Fig. 3 Optical measurement system setup

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%.

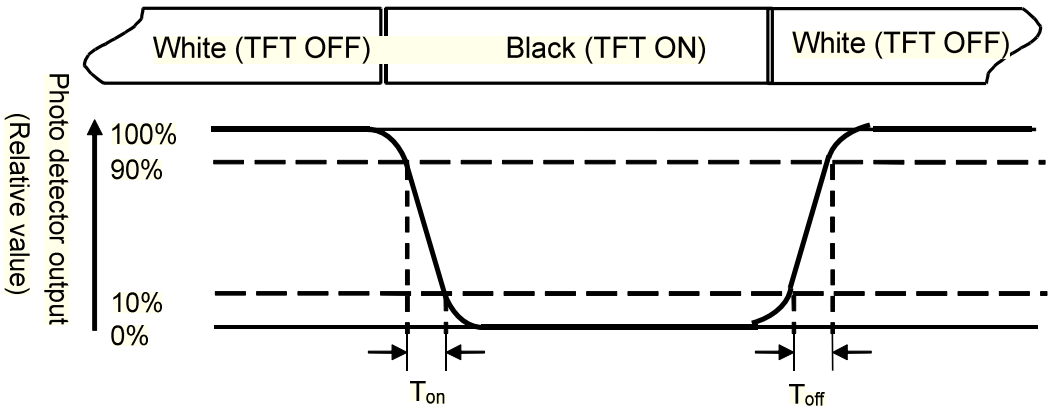


Fig. 4 Definition of response time

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

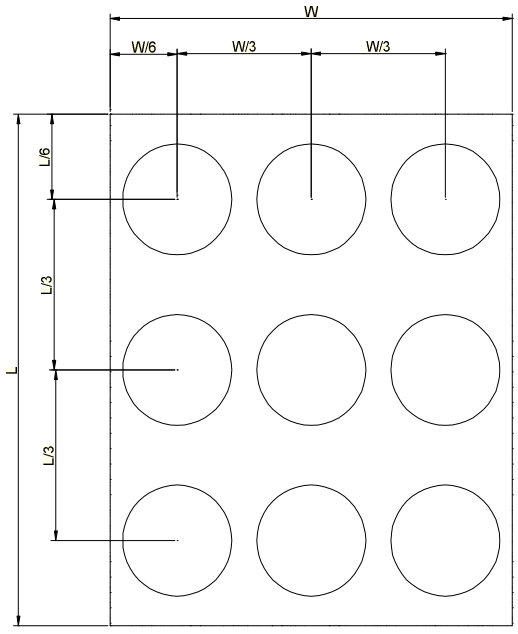


Fig. 5 Definition of luminance uniformity

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

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

8. RELIABILITY TESTS

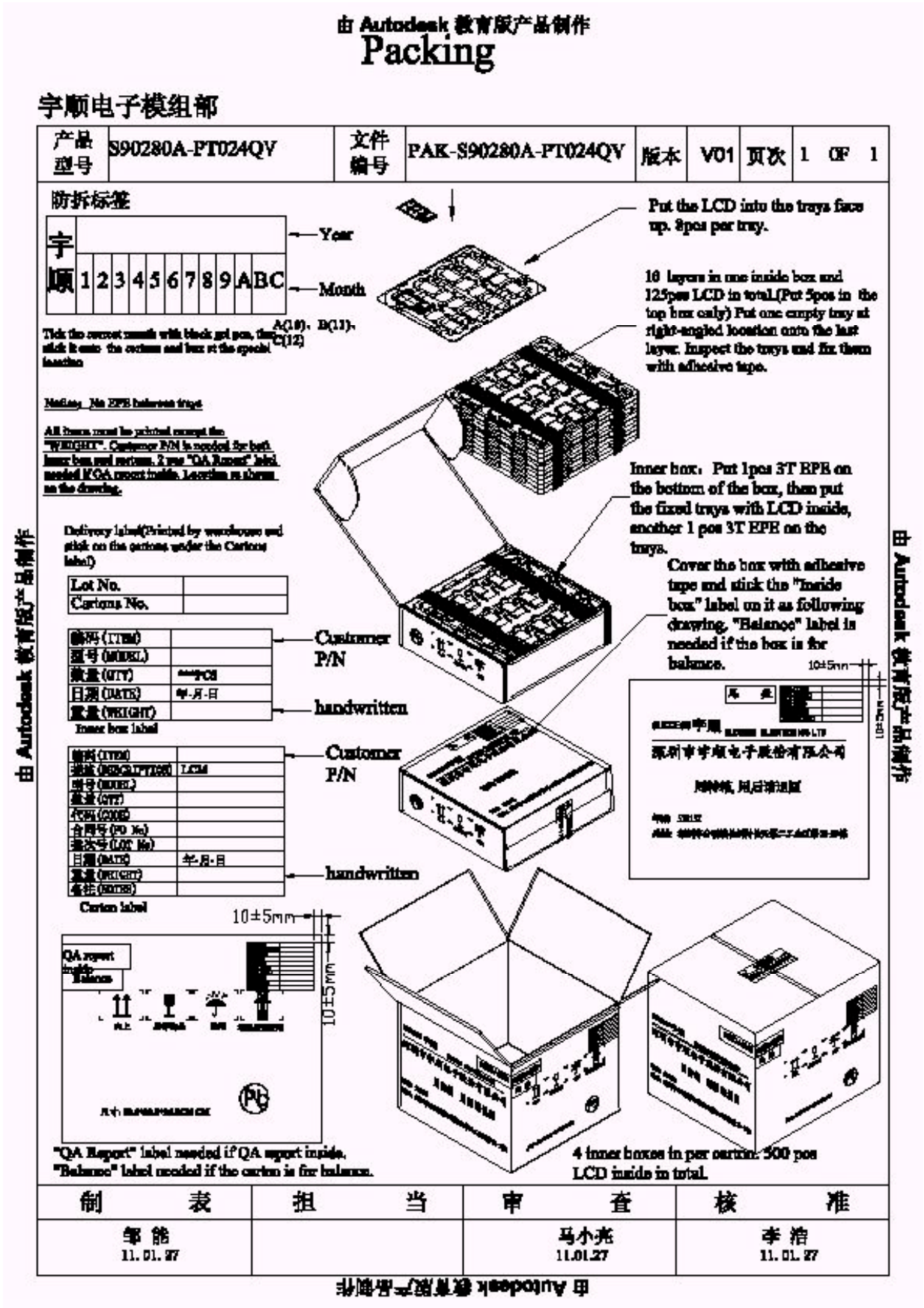
ITEM	CONDITION	CRITERION
Operating Temperature Test	High Temperature: +70 ºC±3℃, 72 hrs	No defects in display and operational functions
	Low Temperature: -20 ºC±3℃, 72 hrs	
Storage Temperature Test	High Temperature: +80 ºC±3℃, 120 hrs	No defects in display and operational functions
	Low Temperature: -30 ºC±3℃, 120 hrs	
Humidity Endurance Test	60 ºC±3℃, 90%±3%RH, 72 hrs	No defects in display and operational functions
Thermal Shock Test	-30 ºC (30mins)～ +80 ºC (30mins) 10 cycles	No defects in display and operational functions
Vibration Resistance Test	Operating Time: thirty minutes exposure for each direction (X,Y,Z) Sweep Frequency:10~55Hz (1 min) Amplitude: 1.5mm	No defects in display and operational functions
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	No defects in display and operational functions
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)	No defects in display and operational functions
Package Drop Test	Height :72cm(Weight≦10kg); 60cm(Weight≧10kg) 1 corner, 3 edges, 6 surfaces	No defects in display and operational functions
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	No defects in display and operational functions

NOTE:

1) The samples must be free from defect before test, must be restored at room condition at least for 2 hours after reliability test before any inspection.

2) Before test the function of TP, the sample must be placed in room temperature for 24hrs after RA test.

9. PACKAGE DRAWING



10. PRECAUTIONS

10.1. HANDLING

10.1.1. Polarizer Cleaning, Petroleum ether (or N-hexane) is recommended for cleaning the front/rear polarizers and reflectors, acetone, toluene and ethanol are not allowed to avoid damaging the surface.

10.1.2. Body grounding, must wear Anti-ESD wrist strap while pick up LCDs.

10.1.3. FPC Soldering, less than 300℃/3S, solder must be grounding on grounding bench.

10.1.4. If use electric Screwdriver to do assembly, screwdriver must be grounding.

10.2. STORAGE

10.2.1. Keep in a sealed polyethylene bag.

10.2.2. Keep in a dark place.

10.2.3. Keep in temperature between 0°C and 35°C.

NOT allowed at 70°C for more than 160 Hours, or at -20°C for more than 48 Hrs.

10.3. SAFETY

If liquid crystal leak out of a damaged glass cell, **DO NOT** put it in your mouth or touch eyes, if the liquid crystal touch your skin or clothes, please wash it off immediately using soap and water.

11. LIMITED WARRANTY

Unless otherwise agreed between SUCCESS and customer, SUCCESS will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with SUCCESS LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects over specs must be returned to SUCCESS within 30 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of SUCCESS limited to repair and/or replacement on the terms set forth above. SUCCESS shall not be responsible for any subsequent or consequential events.

11.1. RETURNING LCM UNDER WARRANTY – TERMS AND CONDITIONS

11.1.1. No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

11.1.2. Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.