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MODEL NAME: OSD0280TA1T2	PAGE: 1 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
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# **2.8" 262K TFT LCD PANEL WITH TOUCH PANEL SPECIFICATION**

**MODEL NAME: OSD0280TA1T2**

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MODEL NAME: OSD0280TA1T2	PAGE: 3 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

## Table of Contents

1	GENERAL DESCRIPTION	4
2	ABSOLUTE MAXIMUM RATINGS	6
3	AC CHARACTERISTICS	9
4	DC CHARACTERISTICS	12
5	OPTICAL CHARACTERISTICS	14
6	OUTLINE DIMENSION	17
7	INTERFACE PIN CONNECTION	18
8	BLOCK DIAGRAM	19
9	PACKING FORM	20
10	DESIGNATION OF LOT MARK	21
11	RELIABILITY	23
12	PRECAUTIONS	24

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MODEL NAME: OSD0280TA1T2	PAGE: 4 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

# 1 GENERAL DESCRIPTION

## 1.1 Description

OSD0280TA1T2 is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that used amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, a back-light unit, and a touch panel. The resolution of 2.8" contains 240 x 320 pixels and can display up to 262K colors. The LCD module is designed and manufactured specifically for use in cellular phone.

## 1.2 Features

LCD Type	:	Transmissive color active matrix LCD panel TN (Twisted Nematic) mode
Drive IC	:	Himax 8312-A or compatible IC
Built-in Drive Power	:	Low power consumption
System Interface	:	80 System Interface 16-bit bus
Internal RAM Capacity	:	1,328,400 bytes max.
Color Mode	:	262,144 colors
Outline Dimensions	:	52.9 (W) × 71.7 (H) × 4.2 (D) mm
Active Area	:	43.2 (W) × 57.6 (H) mm
Pixel Size	:	0.18 (W) × 0.16 (H) mm
Viewing Direction	:	12 O' Clock
Weight	:	T.B.D.

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MODEL NAME: OSD0280TA1T2	PAGE: 5 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

### 1.3 Touch Panel

- Type : Resistance , Analog, 4-Wires Type Touch Panel
- Input Method : Polyacetal Pen or Finger
- Activation Force : 10gf ~ 80gf
- Hardness of Surface : 3H

### 1.4 Environmental impact substances controlled for containing in products

The environmental impact substances we control are classified into 2 types as described below.

a. Prohibited substances:

LOI, in principle, does not produce any products containing or contaminated by substances of this type.

- ◆ Cadmium (Cd) < 100 ppm
- ◆ Mercury (Hg) < 1000 ppm
- ◆ Hexavalent-Chromium (Cr <sup>+6</sup>) < 1000 ppm
- ◆ Polybrominated biphenylethers (PBDE) < 1000 ppm
- ◆ Polybrominated biphenyls (PBB) < 1000 ppm

b. Prohibited substances:

Desired not to be contained in or contaminate our products as far as possible and abolished by a targeted date. LOI moderately produces products containing substances of this type.

- ◆ Lead (Pb) < 1000 ppm
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MODEL NAME: OSD0280TA1T2	PAGE: 6 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

## 2 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical absolute maximum ratings

Item	Symbol	Value	Unit	Note
Power Supply Voltage (1)	Vcc, IOVcc	-0.3 to +4.6	V	(1),(2)
Power Supply Voltage (2)	Vci-VSSA	-0.3 to +4.6	V	(1),(2)
Power Supply Voltage (3)	VLCD-VSSA	-0.3 to +6.0	V	(1),(3)
Power Supply Voltage (4)	VSSA ~ VCL	-0.3 to +4.6	V	(4)
Power Supply Voltage (5)	VLCD ~ VCL	-0.3 to +9.0	V	(5)
Power Supply Voltage (6)	VGH ~ VSSA	-0.3 to +18.5	V	(6)
Power Supply Voltage (7)	VSSA ~ VGL	0.0 to -16.5	V	(7)
Input Voltage	Vt	-0.3 ~ Vcc+0.3	V	-

Note:

- (1) Vcc, VSSD must be maintained.
- (2) To make sure IOVCC  $\geq$  VSSD
- (3) To make sure Vci  $\geq$  VSSA
- (4) To make sure VLCD  $\geq$  VSSA
- (5) To make sure VLCD  $\geq$  VCL
- (6) To make sure VGH  $\geq$  VSSA
- (7) To make sure VSSA  $\geq$  VGL ; VGH + |VGL| < 32V

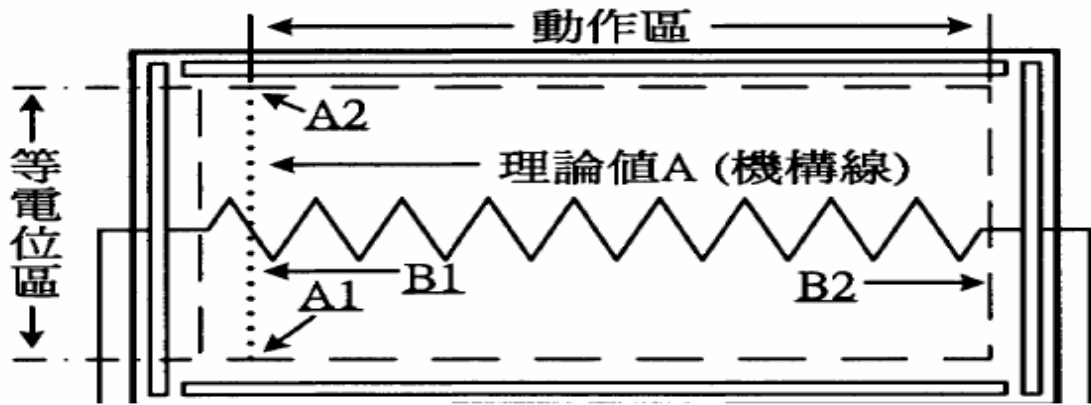
### 2.2 Electrical characteristics of touch panel

Description		Specification	Remark
Operating Voltage		DC 5V	
Circuit Resistance	X-axis	200 $\Omega$ ~ 650 $\Omega$	At connector
	y-axis	250 $\Omega$ ~ 500 $\Omega$	At connector
Insulation Resistance		$\geq$ 20M $\Omega$	At DC 25V
Chattering Time		$\leq$ 10ms	Test Condition: Voltage:3V, Frequency: 5Hz
Linearity		$\leq$ 1.5%	Material of Pen: Poly-acetal resin End shape:R0.8mm Pitch: 10mm Test Force:180gf (1)

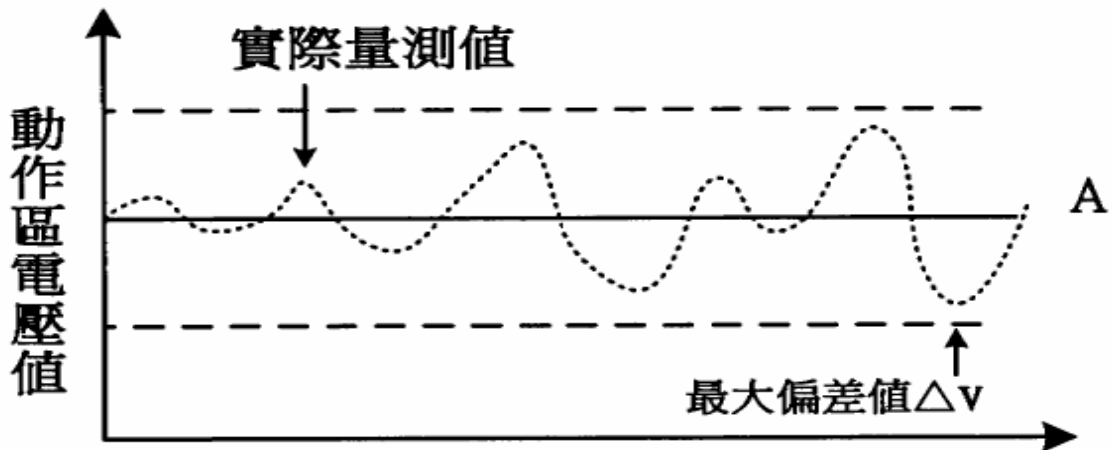
MODEL NAME: OSD0280TA1T2	PAGE: 7 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
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Note:

(1) Measurement condition of Linearity

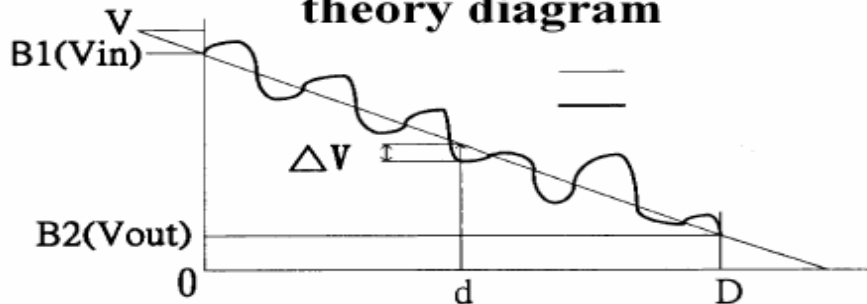


### 線性度計算方式



量測距離A1~A2

### Linearity measurement theory diagram



$$\text{Linearity errors (\%)} = \frac{|\Delta V|}{V_{in} - V_{out}}$$

$$\text{Max. Linearity errors (\%)} = \frac{|\Delta V_{max}|}{V_{in} - V_{out}}$$



MODEL NAME: OSD0280TA1T2	PAGE: 8 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

### 2.3 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	unit	Note
Storage Temperature	T <sub>STG</sub>	(-30)	(70)	°C	(1)
Operating Temperature (Ambient Temperature)	T <sub>OPR</sub>	(-20)	(60)	°C	(1),(2)

Note:

(1) 90 % RH Max. ( 40 °C  $\geq$  Ta )

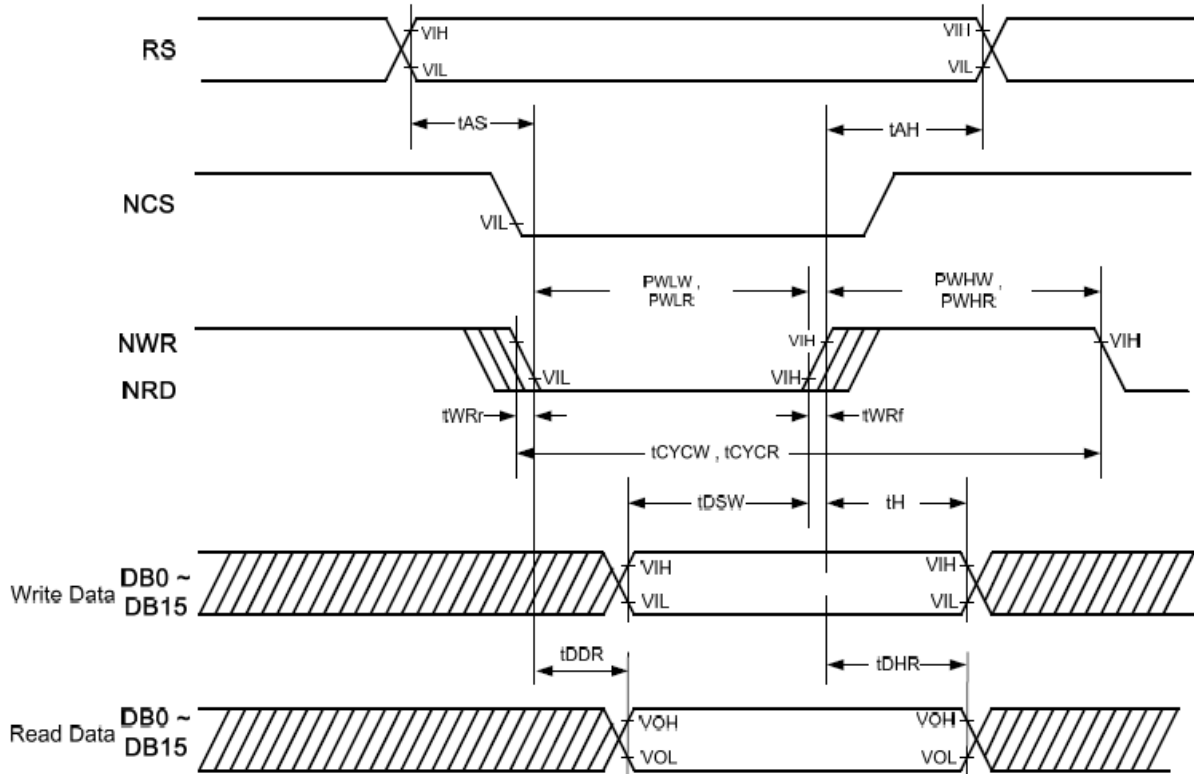
(2) In Case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one.



MODEL NAME: OSD0280TA1T2	PAGE: 9 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	------------------	--------------------------------	-----------------

### 3 AC CHARACTERISTICS

#### 3.1 80-system bus interface timing characteristics



##### (1) Normal write mode

(IOVCC=1.65~2.4V, VCC=2.4~3.3V)

Item		Symbol	Unit	Min.	Typ.	Max.
Bus cycle time	Write	$t_{CYCW}$	ns	200	-	-
	Read	$t_{CYCR}$	ns	300	-	-
Write low-level pulse width		$PW_{LW}$	ns	40	-	-
Read low-level pulse width		$PW_{LR}$	ns	150	-	-
Write high-level pulse width		$PW_{HW}$	ns	70	-	-
Read high-level pulse width		$PW_{HR}$	ns	150	-	-
Write / Read rise / fall time		$t_{WRr}, t_{WRf}$	ns	-	-	25
RS Setup time	RS to NCS, NWR	$t_{AS}$	ns	5	-	-

MODEL NAME: OSD0280TA1T2	PAGE: 10 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

Item		Symbol	Unit	Min.	Typ.	Max.
RS Hole time	NCS, NWR to RS	$t_{AH}$	ns	5	-	-
Write data set up time		$t_{DSW}$	ns	20	-	-
Write data hold time		$t_H$	ns	15	-	-
Read data delay time		$t_{DDR}$	ns	-	-	100
Read data hold time		$t_{DHR}$	ns	5	-	-

(2) High-speed write mode (HWM=1)

(IOVCC=1.65~2.4V, VCC=2.4~3.3V)

Item		Symbol	Unit	Min.	Typ.	Max.
Bus cycle time	Write	$t_{CYCW}$	ns	125	-	-
	Read	$t_{CYCR}$	ns	300	-	-
Write low-level pulse width		$PW_{LW}$	ns	40	-	-
Read low-level pulse width		$PW_{LR}$	ns	150	-	-
Write high-level pulse width		$PW_{HW}$	ns	70	-	-
Read high-level pulse width		$PW_{HR}$	ns	150	-	-
Write / Read rise / fall time		$t_{WRr}, t_{WRf}$	ns	-	-	25
RS Setup time	RS to NCS, NWR	$t_{AS}$	ns	5	-	-
RS Hole time	NCS, NWR to RS	$t_{AH}$	ns	5	-	-
Write data set up time		$t_{DSW}$	ns	20	-	-
Write data hold time		$t_H$	ns	15	-	-
Read data delay time		$t_{DDR}$	ns	-	-	100
Read data hold time		$t_{DHR}$	ns	5	-	-

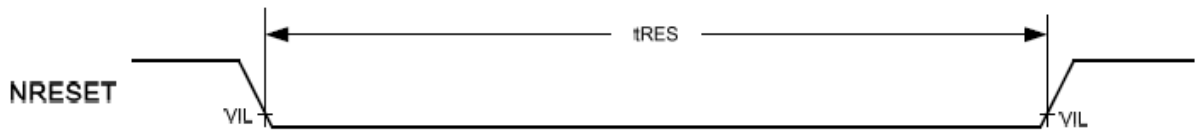
MODEL NAME: OSD0280TA1T2	PAGE: 11 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

### 3.2 Clock characteristics

(VCC=2.2~3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conduction
External clock frequency	$f_{cp}$	MHz	-	1.2	-	VCC=2.4~3.3V
External clock duty ratio	Duty	%	45	50	55	VCC=2.4~3.3V
External clock rise time	$T_{rcp}$	$\mu s$	-	-	0.2	VCC=2.4~3.3V
External clock fall time	$T_{fcp}$	$\mu s$	-	-	0.2	VCC=2.4~3.3V
R-C oscillation clock	$f_{osc}$	MHz	-	1.2	-	Rf=100K ohm, Vcc=2.8V

### 3.3 Reset timing characteristics



(VCC=2.4~3.3V, IOVCC=1.65~3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low level width	$t_{RES}$	ms	1	-	-
Reset rise time	$t_{rRES}$	ns	-	-	10

MODEL NAME: OSD0280TA1T2	PAGE: 12 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 4 DC CHARACTERISTICS

### 4.1 DC characteristics

(IOVcc=1.8~3.3V, Vcc=2.4~3.3V, Ta=-40~85°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Input high voltage	V <sub>IH</sub>	IOVcc=1.65~3.3V	0.8xIOVcc	-	IOVcc	V
Input low voltage	V <sub>IL</sub>	IOVcc=1.65~3.3V	-0.3	-	0.2xIOVcc	V
Output high voltage (1) (DB0~17 Pins)	V <sub>OH1</sub>	I <sub>OH</sub> = -0.1 mA	0.8xIOVcc	-	-	V
Output low voltage (DB0~17 Pins)	V <sub>OL1</sub>	IOVcc=1.65~3.3V I <sub>OL</sub> = 0.1 mA	-	-	0.2xIOVCC	V
I/O leakage current	I <sub>Li</sub>	V <sub>in</sub> = 0~Vcc	-1	-	1	μ A
Current consumption during standby mode (Vcc-VSSD)+(IOVcc-V SSD)	I <sub>ST(Vcc)</sub>	Vcc=Vci=2.8V Ta=25°C	-	5	10	μ A
Current consumption during standby mode (Vci-VSSD)	I <sub>ST(Vci)</sub>		-	0.5	1	μ A
Output voltage deviation	-	-	-	5	-	mV
Dispersion of the Average Output Voltage	V	-	-	-	35	mV

MODEL NAME: OSD0280TA1T2	PAGE: 13 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

#### 4.2 DC characteristics of the LED back-light

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
LED current	$I_L$		-	15	20	mA	(1)
Forward voltage	$V_f$		9.0	10.2	11.4	V	(2)
Power consumption	P		135	153	171	mW	

Note: (1) Four LEDs are in serial type.

(2) The reference value obtained by calculation ( $V_f \times I_L$ ),  $I_L=15\text{mA}$

MODEL NAME: OSD0280TA1T2	PAGE: 14 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 5 OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

Measuring equipment: BM-5A, BM-7

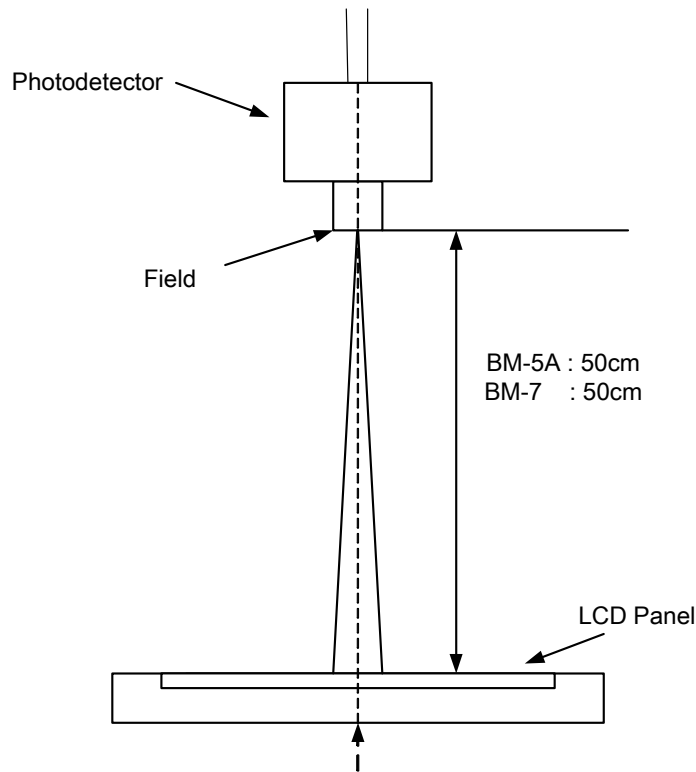
(Ta = 25 +/- 2°C, Vcc = Vci = 2.8V)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Hor.	ΘR	C/R ≥ 10	-	(45)	-	Degree	(1)(6) BM-5A
		ΘL		-	(45)	-		
	Ver.	ΦH	B/L On	-	(35)	-		
		ΦL		-	(15)	-		
Contrast Ratio (Center Point)		C/R		(150)	(200)	-	-	(1)(2) BM-5A
Brightness		B		(140)	(160)	-	cd/m <sup>2</sup>	(1)(3) BM-5A
Response Time	Rising: Tr	Tr+f	Note (1) Θ = 0 Φ = 0	(25)	(35)	(50)	msec	(1)(4) BM-7
	Falling: Tf							
Chromaticity Coordinate	White	Wx	Viewing Angle B/L On I <sub>L</sub> = 20 mA	(0.245)	(0.295)	(0.345)	-	(1)(5) BM-5A
		Wy		(0.261)	(0.311)	(0.361)		
	Red	Rx		(0.584)	(0.634)	(0.684)		
		Ry		(0.296)	(0.346)	(0.396)		
	Green	Gx		(0.283)	(0.333)	(0.383)		
		Gy		(0.535)	(0.585)	(0.635)		
	Blue	Bx		(0.091)	(0.141)	(0.191)		
		By		(0.038)	(0.088)	(0.138)		

Note: (1) Test Equipment Setup

After stabilizing and leaving the module alone at a given temperature for 30 min, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room 30 min after lighting the back-light. This should be measured in the center of screen with a viewing cone of 1° by photodetector.

MODEL NAME: OSD0280TA1T2	PAGE: 15 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------



(2) Definition of Contrast Ratio (C/R): Ratio of gray max (Gmax) & gray min (Gmin) at the center point:

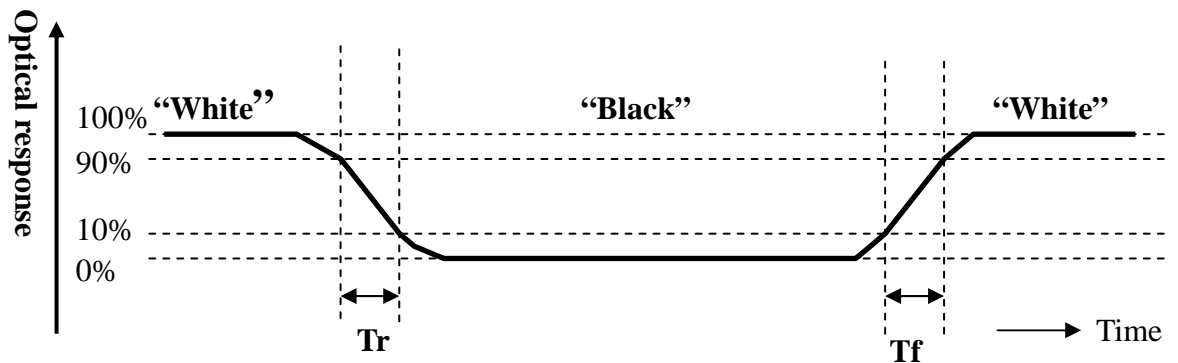
$$CR = \frac{G_{max}}{G_{min}}$$

\* Gmax: Luminance with all pixels white

Gmin: Luminance with all pixels black

(3) Definite of Luminance of White: Luminance of white at the center point

(4) Definition of Response time: Sum of Tr, Tf

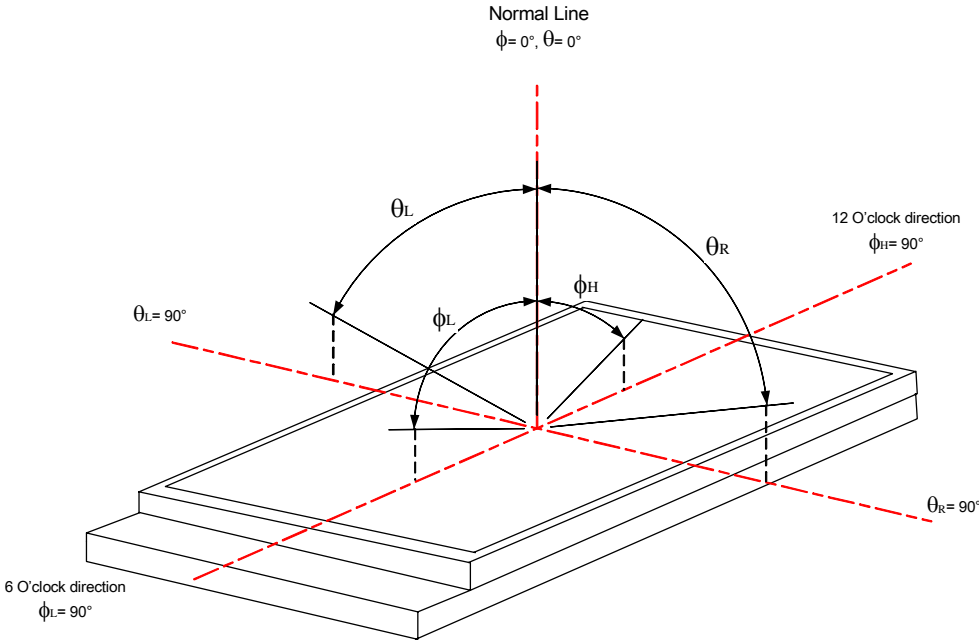


MODEL NAME: OSD0280TA1T2	PAGE: 16 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

(5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.

(6) Definition of Viewing Angle: Viewing angle range (  $CR \geq 10$  )





MODEL NAME: OSD0280TA1T2	PAGE: 18 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

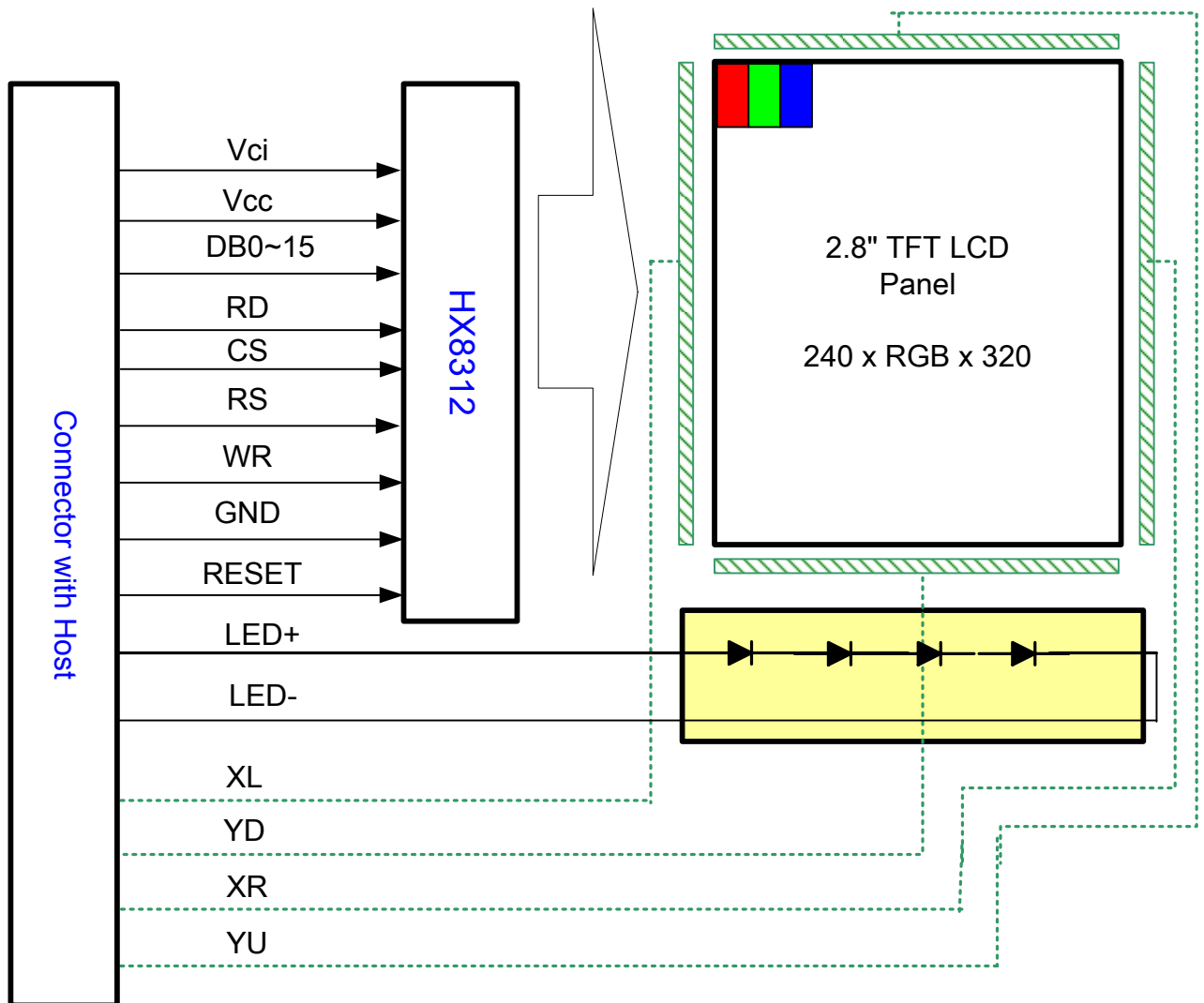
## 7 INTERFACE PIN CONNECTION

Pin No.	Symbol	Pin No.	Symbol
1	GND	28	VCI
2	NC	29	NC
3	RESET	30	XL
4~19	DB15~DB0	31	YD
20	NC	32	XR
21	RD	33	YU
22	WR	34	NC
23	RS	35	LED+
24	CS	36	LED-
25~26	NC	37	NC
27	VCC	38~39	GND

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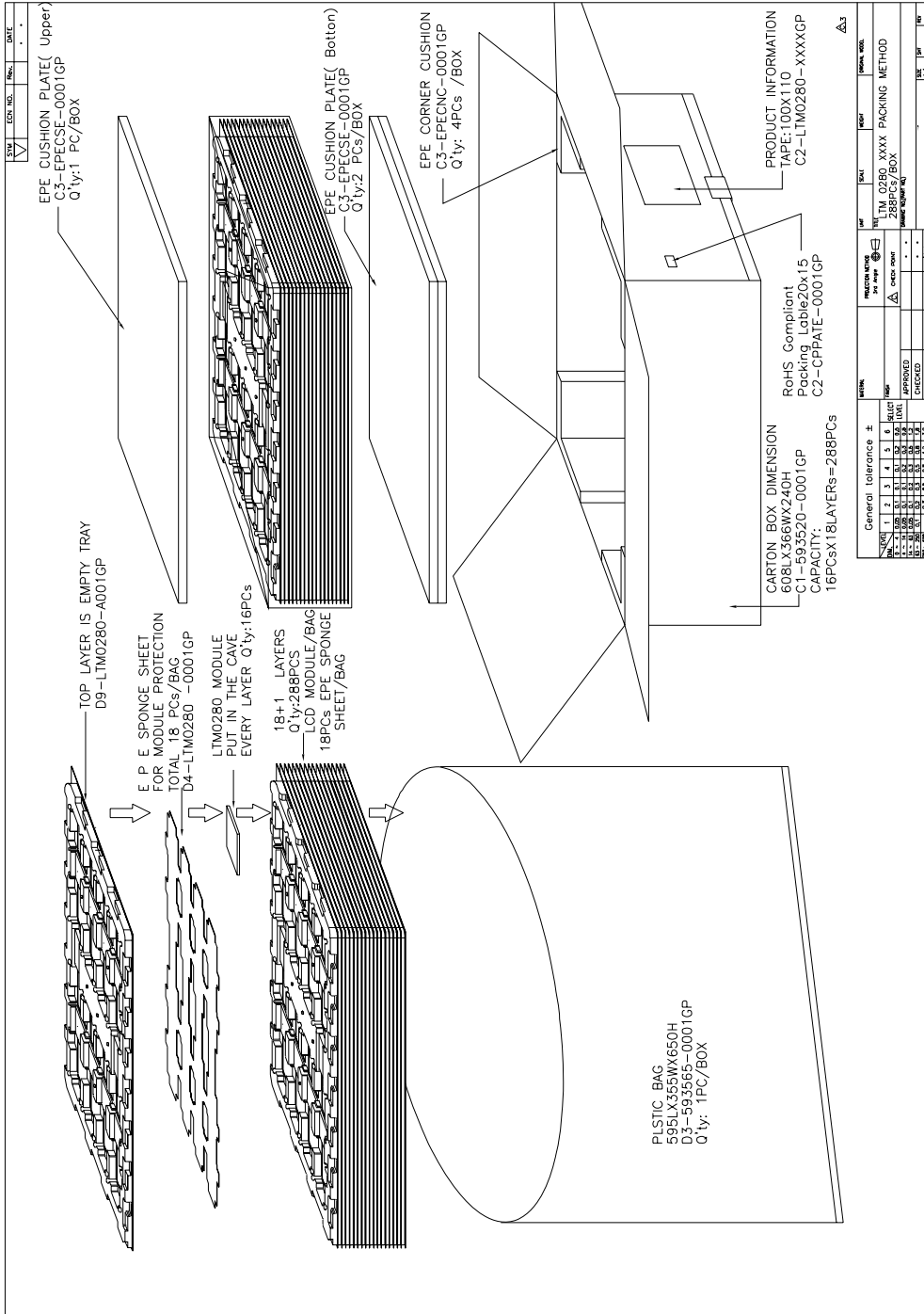
MODEL NAME: OSD0280TA1T2	PAGE: 19 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 8. BLOCK DIAGRAM



MODEL NAME: OSD0280TA1T2	PAGE: 20 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

# 9 PACKING FORM



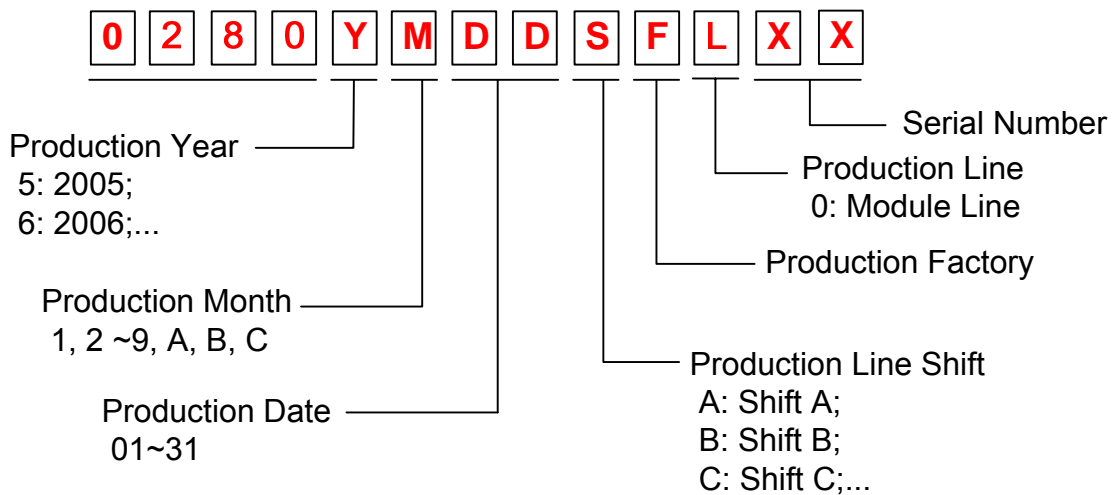
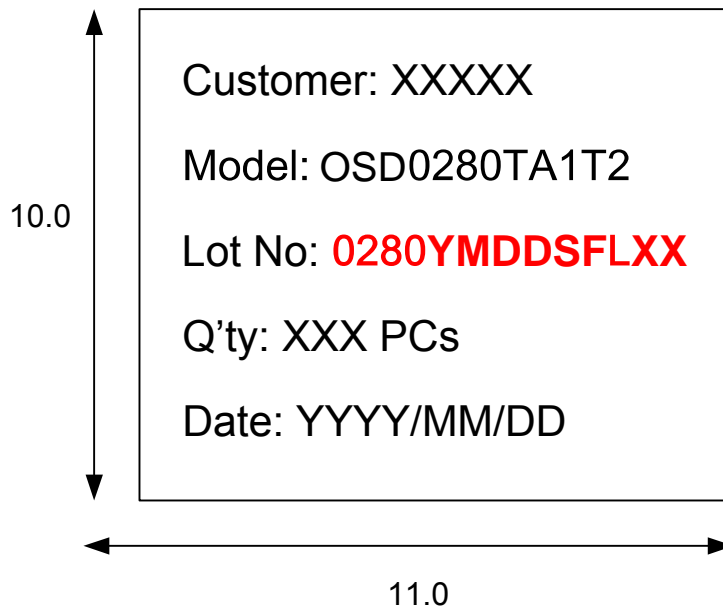


MODEL NAME: OSD0280TA1T2	PAGE: 21 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 10 DESIGNATION OF LOT MARK

### 10.1 Lot Mark on Packing Label

Lot Number on Outer  
Carton Box

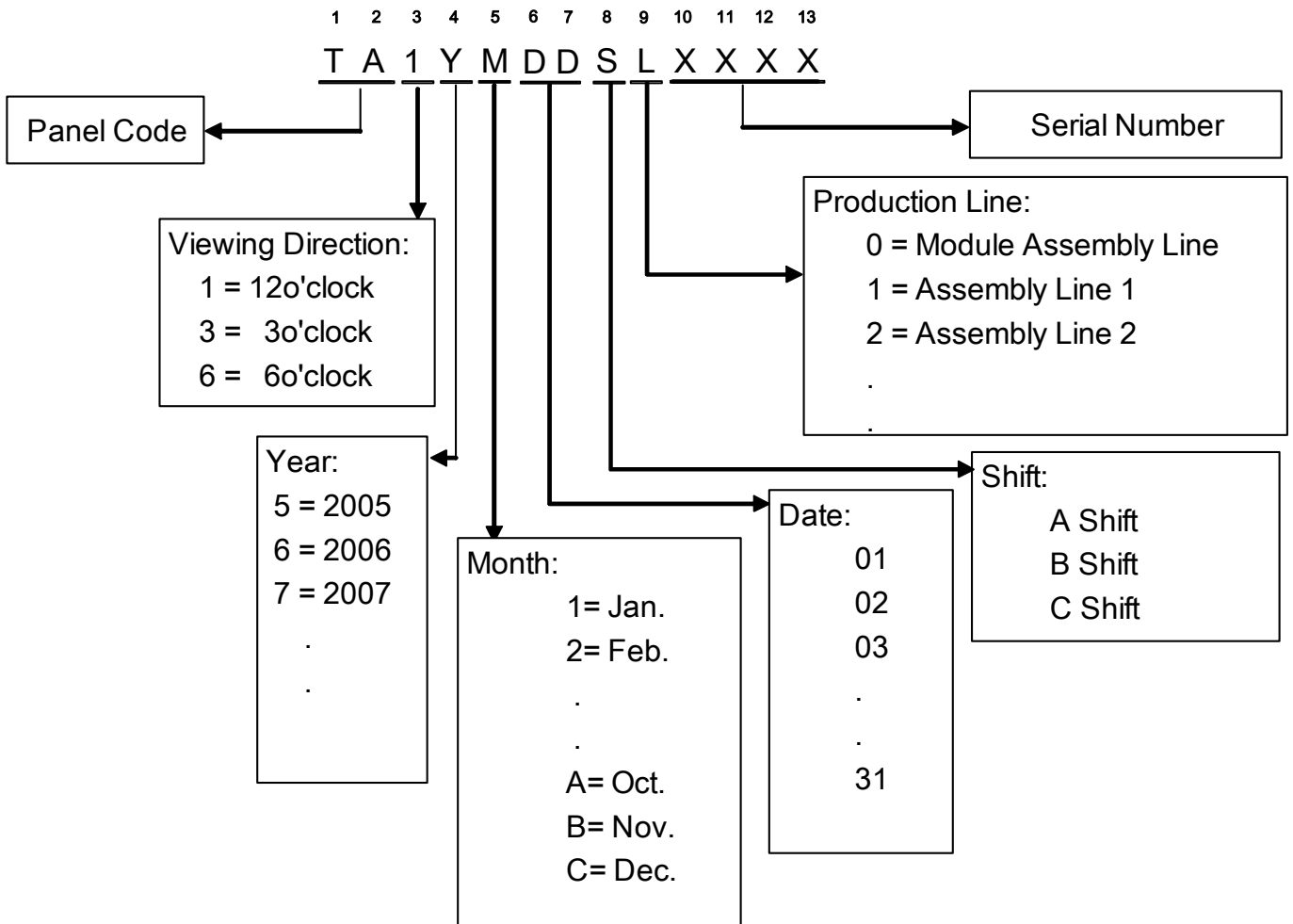




MODEL NAME: OSD0280TA1T2	PAGE: 22 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

### 10.2 Production Lot Mark of LCD Panel

The production lot of module is specified on the back of panel. The lot mark is consisted of 13-digit number.



MODEL NAME: OSD0280TA1T2	PAGE: 23 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 11 RELIABILITY

No.	Test Items	Test Conditions
1	High Temperature Storage Test	Ta=70°C, 120 Hrs
2	Low Temperature Storage Test	Ta=-30°C, 120Hrs
3	High Temperature and High Humidity Operating Test	Ta=40°C, 90%RH, 120Hrs (No condensation of dew)
4	High Temperature Operating Test	Ta=60°C, 120Hrs
5	Low Temperature Operating Test	Ta=-20°C, 120Hrs
6	Heat Shock Test	Ta=-30°C (0.5H) ~ 70°C (0.5H) / 32 cycles
7	Electro Static Discharge Test	+200V, 200pF (0Ω), 1 time for each terminal

- Note: (1) Evaluation should be tested after storage at room temperature for 24 hours.
- (2) There should be no change that might affect the practical display function when the display quality test is conducted under normal operating conditions.
- (3) Judgment:
- a. In the standard condition, there shall be no practical problems that may affect the display function.
  - b. No serious image quality degradation.
-



MODEL NAME: OSD0280TA1T2	PAGE: 24 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

## 12 PRECAUTIONS

### 12.1 Handling

- (1) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.
  - (2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
  - (3) Note that the polarizer is very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.
  - (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
  - (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
  - (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
  - (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
  - (8) Protect the module from static; it may cause damage to the CMOS Gate Array IC.
  - (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
  - (10) Do not disassemble the module.
-



MODEL NAME: OSD0280TA1T2	PAGE: 25 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.

## 12.2 Storage

- (1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35oC and relative humidity of less than 70%.
- (2) Do not store the TFT-LCD module in direct sunlight.
- (3) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

## 12.3 Operation

- (1) Do not connect; disconnect the module in the “Power on” condition.
- (2) Power supply should always be turned on/off by the chapter 8 TFT-LCD Driver IC Operation Algorithms.

## 12.4 Precautions in use of touch panel

- (1) Do not give excessive strain to the product.
  - (2) To prevent giving distortion to the film of the product and peeling off of the film from the product, do not fix the film and a set case or a shock absorbing material adhered to a set case by adhesion.
  - (3) Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying excessive load. Never use any mechanical pencils, ball point pens and hard fingertips whose tip is hard for input, otherwise malfunctions may result.
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MODEL NAME: OSD0280TA1T2	PAGE: 26 OF 26	DOC. NO.: T9-OSD0280TA-1T20	VERSION: A.2
-----------------------------	-------------------	--------------------------------	-----------------

- (4) The input position may be fluctuated a little through long-time use. It is desirable to provide a zero-adjustment function by using a circuit and software.
- (5) Operation at the out of Active Area is out of our guarantee. It causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

## 12.5 Others

- (1) The Liquid crystal is deteriorated by ultra violet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.
  - (2) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
  - (3) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.
  - (4) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image” Sticks” to the screen.
  - (5) His panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.
-