Chunghwa Picture Tubes, Ltd.
Technical Specification

To	:	
Date	:	

CPT TFT-LCD

CLAA 150XP 04

ACCEPTED BY:

APPROVED BY	CHECKED BY	PREPARED BY
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1. OVERVIEW

CLAA150XP04 is 15.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and backlight. By applying 8 bit digital data (6 bit+Hi-FRC),1024×768, 16.7M-color images are displayed on the 15.0" diagonal screen. Input power voltage is 3.3V for LCD driving. Converter for backlight is not included in this module. General specifications are summarized in the following table:

ITEM	SPECIFICATION
Display Area(mm)	304.1(H)x228.1(V) (15.0-inch diagonal)
Number of Pixels	1024(H)x768(V)
Pixel Pitch(mm)	0.297 (H)x0.297 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white, TN
Number of Colors	16.7M (6 Bit+Hi-FRC)
Brightness(cd/m^2)	400 cd/m^2(Typ.)(Center point, 50 mA)
Viewing Angle	160 /140(Typ.)
Surface Treatment	Anti-glare
Power consumption(W)	7.11 W Without Converter(Typ.)
Module Size(mm)	326.5 (W)x253.5 (H)x11.0(D)(Typ.)
Module Weight(g)	1000g(Typ.)
Backlight Unit	LED(White-LED)

2. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Supply Voltage for LCD	VCC	0	6	V	
LED Forward voltage	VF	3.0	3.4	V	1). 2)
LED Forward current	IF	--	150	mA	
Operation Temperature	Top	0	60	℃	3). 4). 5). 7)
Storage Temperature	Tstg	-20	65	℃	3). 4). 5). 7)

[Note]

1).Product life-time relate to LED, please operate production follow statement at page 8"(2)back light".

2).When LED current over the definition of operating current ,product life-time will decay rapidly or operate unusual.

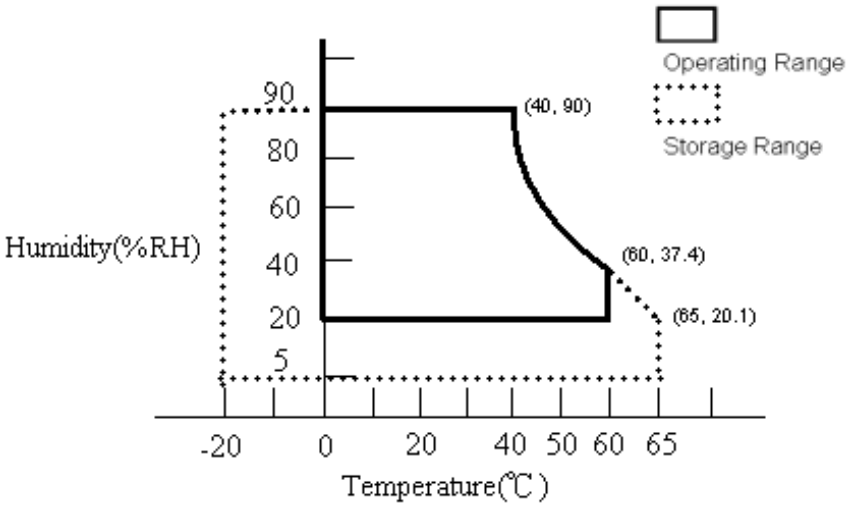
3)The relative temperature and humidity range are as below sketch, 90%RHMax.(Ta≦40℃).

4).The maximum wet bulb temperature ≦39℃(Ta＞40℃) and without dewing.

5).If you use the product in an environment which over the definition of temperature and humidity too long to effect the result of eye-etching.

6) Test Condition: IEC 1000-4-2 VESDt: Contact discharge to input connector; $VESD_C$: Contact discharge to module

7). If you operate the product in normal temperature range, the center surface of panel should be under 60℃.



3. ELECTRICAL CHARACTERISTICS

(1).TFT-LCD

Ta=25℃

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	Remark
Power Supply Voltage for LCD		Vcc	3.0	3.3	3.6	V	*1)
Power Supply Current for LCD		Icc	-	700	800	mA	*2)
Permissive Input Ripple Voltage		VRP	-	-	100	mVp-p	Vin=+3.3V
Differential impedance		Zm	70	100	110	Ω	
Logic input voltage LVDS:IN+，IN-	Common Mode Voltag	VCM	1.125	1.25	1.375	V	
	Differential Input Voltage	|VID|	250	350	450	mV	
	Threshold Voltage(High)	VTH	-	-	100	mV	*3)
	Threshold Voltage(Low)	VTL	-100	-	-	mV	
LCD Inrush Current		Inrush			2	A	*4)
Power consumption		P		2.31	2.64	W	*2)

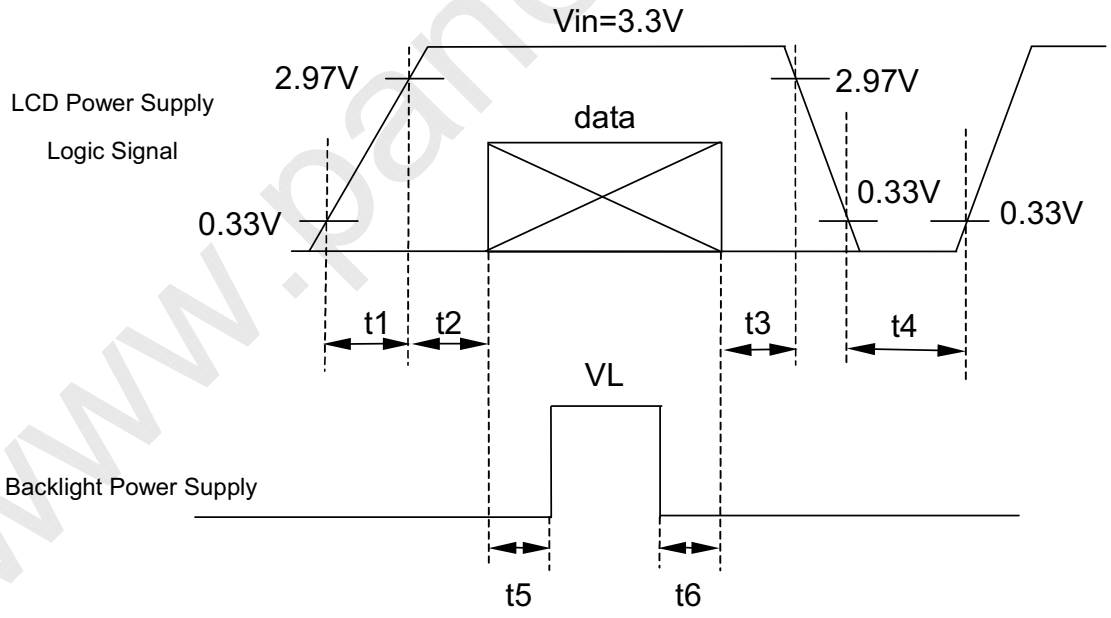
[Note]

1).VCC-turn-on conditions:

0.5ms≦t1≦10ms　　500ms≦t4

0≦t2≦50ms　　200ms≦t5

0≦t3≦50ms　　200ms≦t6

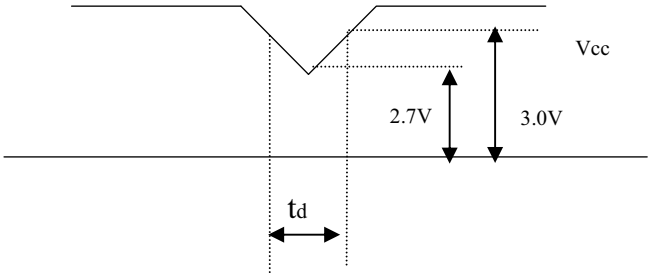


Data: RGB DATA, DCLK, DENA

VCC-dip conditions:

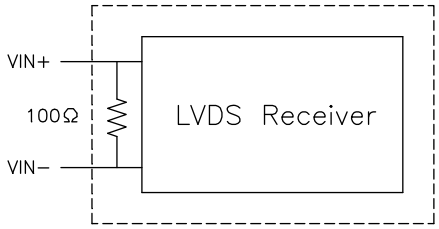
(1) When 2.7V≦Vcc (min) <3.0V: td≦10 ms, module works well.

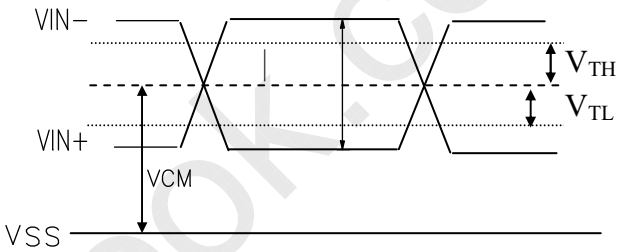
(2) When VCC <3.0 V, it works abnormal that must reset power. VCC -dip conditions should also follow the VCC-turn-on conditions.



2).Typical current situation: 64 gray scale level,1024 line mode, VCC=3.3V, Fh=64Khz,Fv=60Hz, f_{CLK}=65 MHz.

3).LVDS Signal definition:

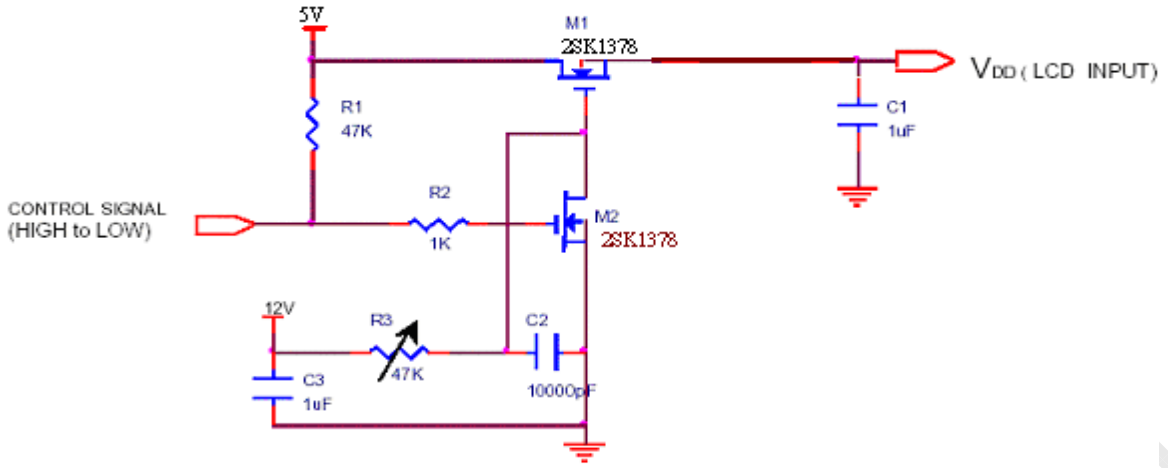


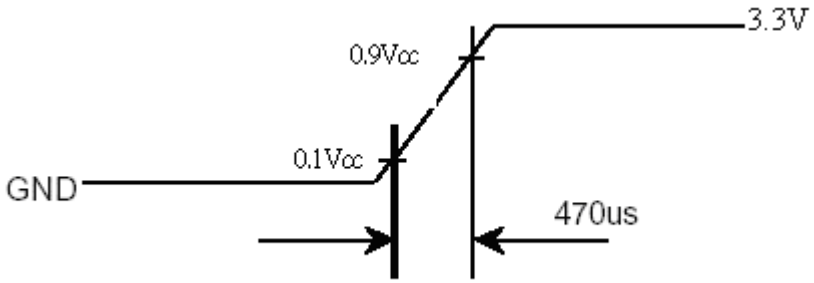


VIN+：Positive differential DATA & CLK Input

VIN-： Negative differential DATA & CLK Input

4).Irush Measurement Condition





(2).Backlight

1. Electrical specification

1-1 single LED

Ta=25℃(Ta: ambient temperature)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Forward Voltage	VF	3.0	3.2	3.5	V	IF=50mA
Forward Current	IF	-	50	60	mA	1)
Power consumption	W		160		mW	I_F =50mA

1-2 150XP04 LED light bar 6Pin Connector (ENTERY 3703K-F06N-13R) Pin Assignment

Pin	Name	Description
1	Vout	Current Feedback 50 mA
2	Vout	Current Feedback 50 mA
3	Vin	Vin 32V, Total 30pcs LED
4	Vin	Vin 32V, Total 30pcs LED
5	Vout	Current Feedback 50 mA
6	--	--

2. life time

ITEM	min	typ	max	UNIT	REMARK
LIFE TIME	--	50000	--	hrs	2)，3)，4)，5)

[Note]

1).If dimming function is required, it is strongly recommended to adopt pulse width modulation (PWM).If not, linear decrease of the driving current will affect the optical characteristics

2).Parameter guideline for LED driving is under stable conditions at 25℃ (Room Temperature) and IF=50mA

3). Definition of the lamp life time: Luminance (L) under 50% of specification.

4). When the ambient temperature Ta overstep 25℃, it will serious damage life time.

5). When the LED operation current IF overstep 50mA, it will serious damage life time.

4. INTERFACE PIN CONNECTION

(1) CN1 (Data Signal and Power Supply)
Outlet connector: MSB240420 (STM) or equivalent
Plug connector: DF14-20S-1.25C (Hirose) or equivalent

PIN #	SYMBOL	FUNCTION
1	VCC	+3.3V Power Supply
2	VCC	+3.3V Power Supply
3	GND	GND
4	GND	GND
5	RXIN0-	Negative LVDS Differential Data Input
6	RXIN0+	Positive LVDS Differential Data Input
7	GND	GND
8	RXIN1-	Negative LVDS Differential Data Input
9	RXIN1+	Positive LVDS Differential Data Input
10	GND	GND
11	RXIN2-	Negative LVDS Differential Data Input
12	RXIN2+	Positive LVDS Differential Data Input
13	GND	GND
14	RXCLK	Negative LVDS Differential Clock Input
15	RXCLK	Positive LVDS Differential Clock Input
16	GND	GND
17	RXIN3-	Negative LVDS Differential Data Input
18	RXIN3+	Positive LVDS Differential Data Input
19	GND	GND
20	NC	Reserved

1) Please keep the NC Pin and don't connect it to GND or other signals.

2) GND Pin must connect to the ground, don't let it be a vacant pin.

5. INTERFACE TIMING

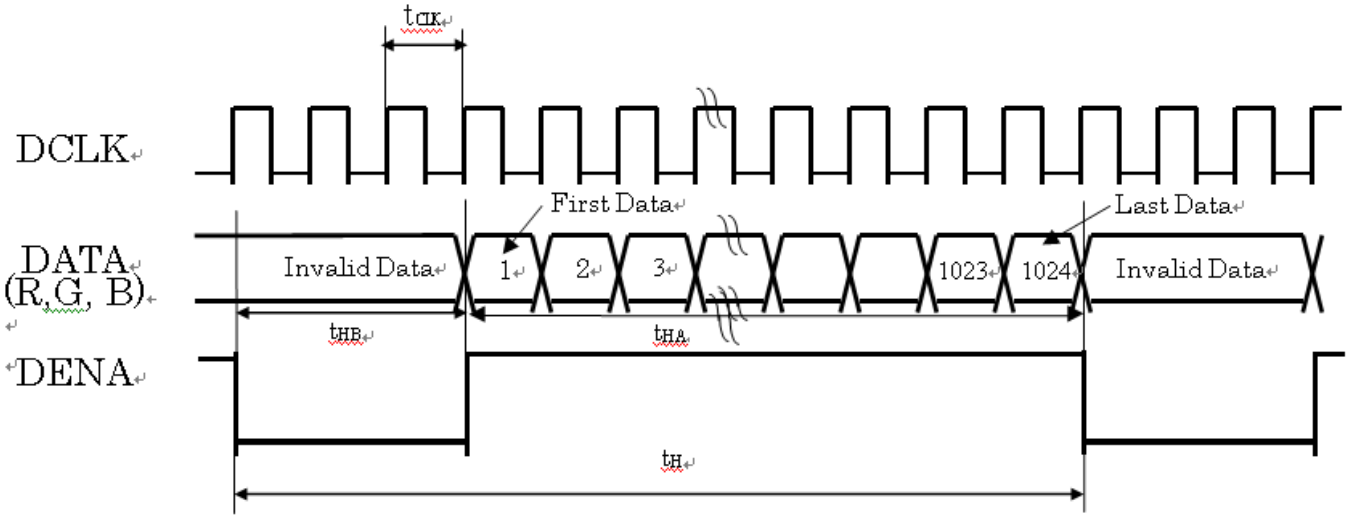
(1) Timing Specifications

ITEM			SYMBOL	MIN.	TYP.	MAX.	UNIT
LCD	DCLK	Frequency	f_{CLK}	50	65	80	MHz

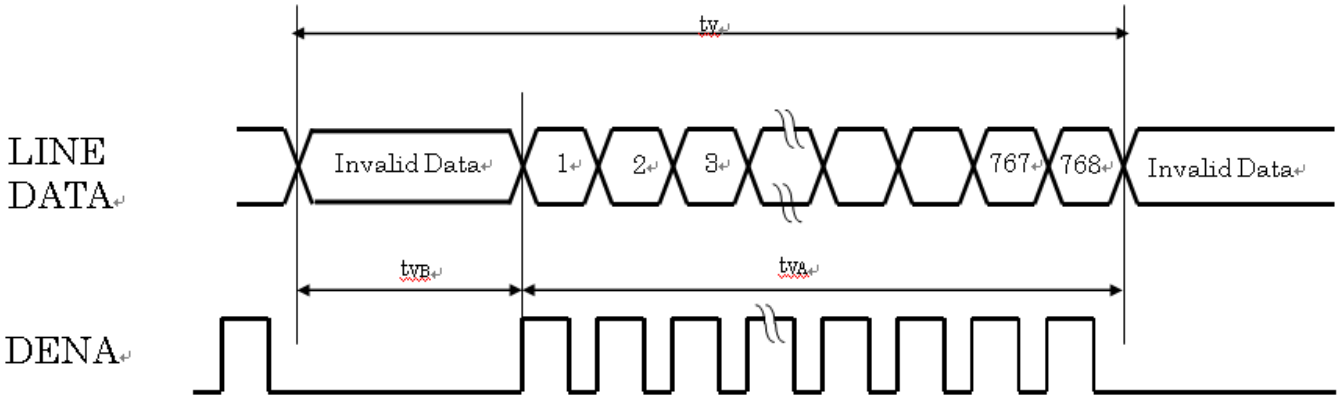
			Cycle	t_{CLK}	12.5	15.3	20	ns
	DENA	Horizontal	Vertical line rate	f_H	43.48	48.36	58.39	kHz
			Horizontal total time	t_H	1150	1344	1370	t_{CLK}
			Horiaontal effective time	t_{HA}	--	1024	--	t_{CLK}
			Horizontal blank time	t_{HB}	126	320	346	t_{CLK}
		Vertical	Vertical frame Rate	Fr	55	60	75	Hz
			Vertical total time	t_V	794	806	860	t_H
			Vertical effective time	t_{VA}	--	768	--	t_H
			Vertical blank time	t_{VB}	26	38	92	t_H

(2) Timing Chart

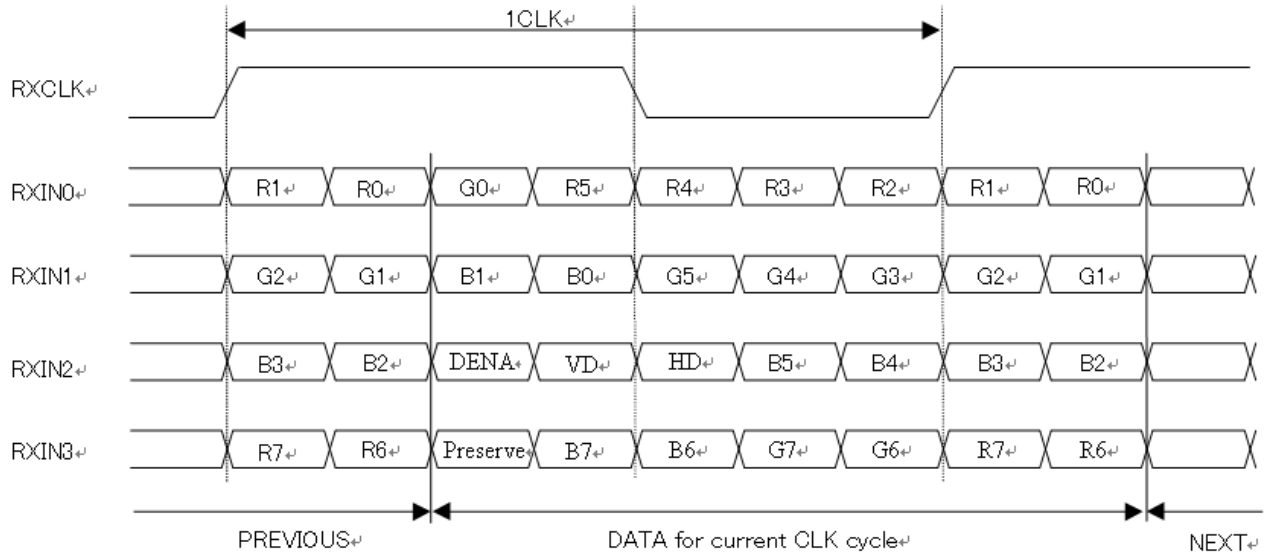
a. Horizontal Timing



b. Vertical Timing



(3) LVDS DATA：Timing Chart



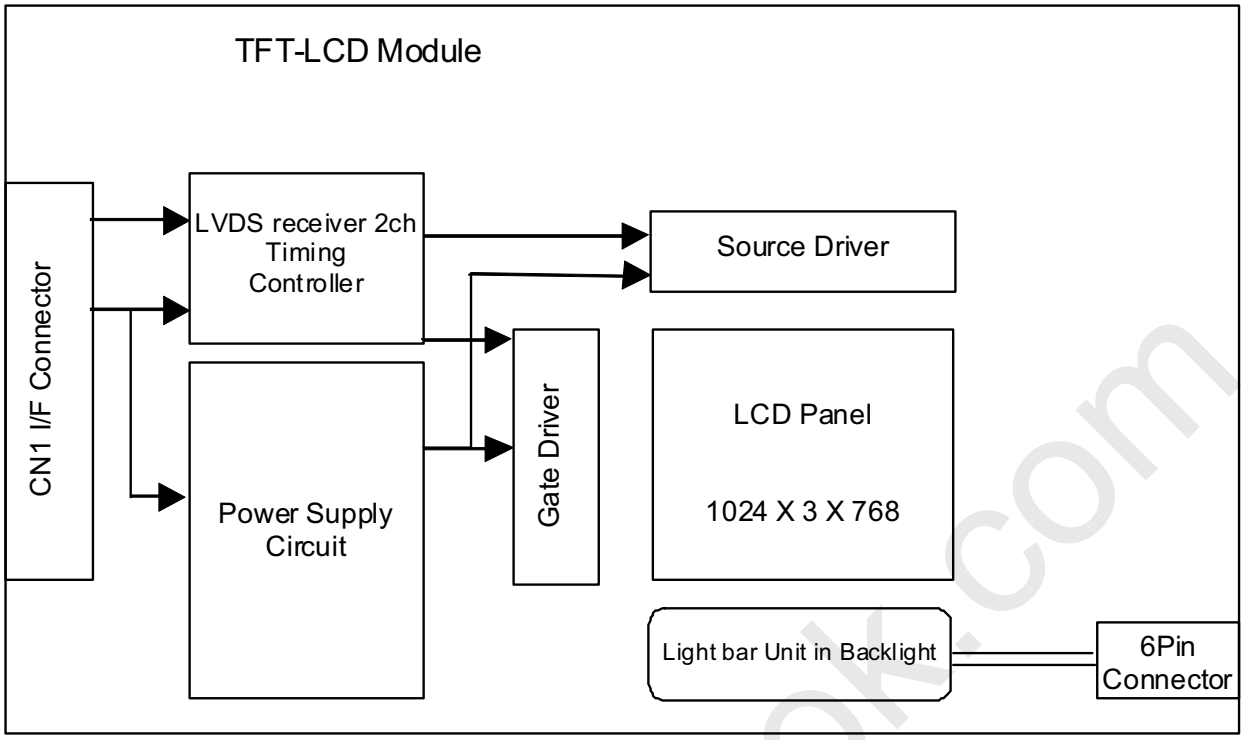
(4) Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note]

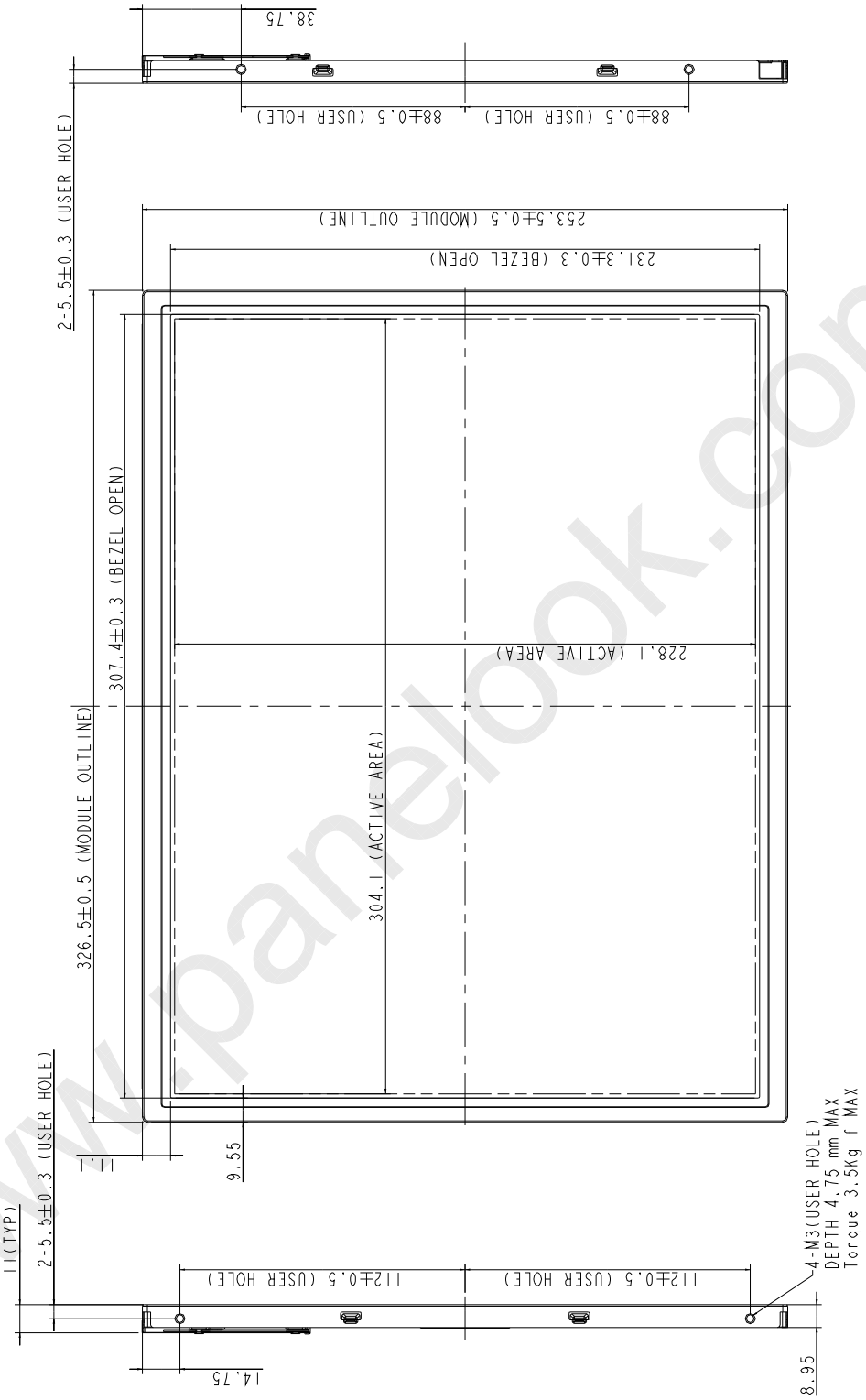
1) Definition of gray scale:
   Color (n): n indicates gray scale level; higher n means brighter level.
2) Data: 1-High, 0-Low.
3) This assignment is applied to both odd and even data.

6. BLOCK DIAGRAM

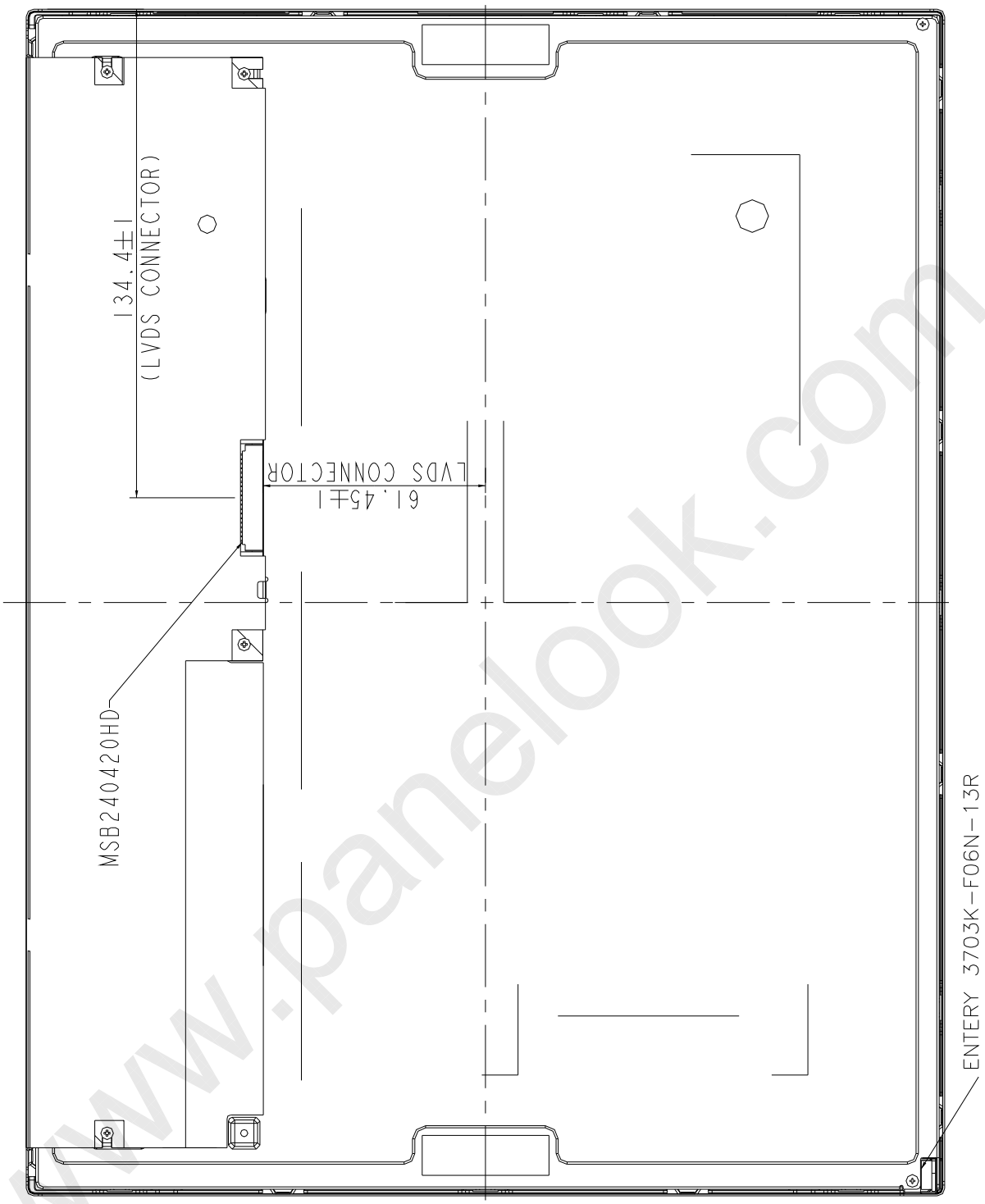


7. MECHANICAL SPECIFICATION

(1) Front side (Tolerance is ±0.5mm unless noted) Unit: mm



(2) Rear side (Tolerance is ±0.5mm unless noted) Unit: mm



8. OPTICAL CHARACTERISTICS

Ta=25℃，VCC=3.3

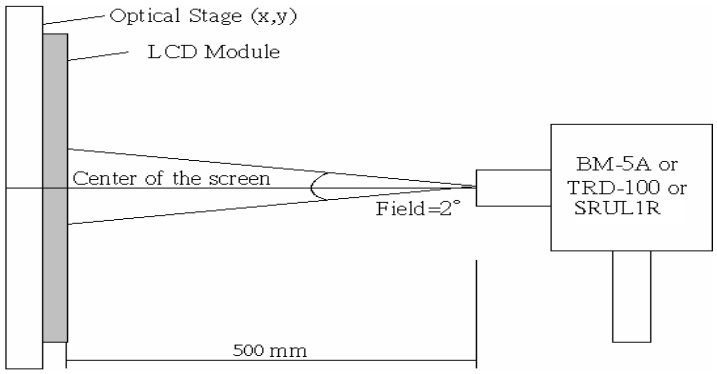
ITEM		SYMBOL	CONDITION	min	typ	max	UNIT	REMARK
Contrast Ratio		CR	θ=ψ= 0°	400	600	--	--	*1) 2)
Luminance(CEN)		L	θ=ψ= 0°, IL.6.5mA	200	350	--	cd/m^2	*1) 3)
9P Uniformity		ΔL	θ=ψ= 0°	75	--	--	%	*1) 3)
Response Time		Tr	θ=ψ= 0°	--	2	5	ms	*5)
		Tf	θ=ψ= 0°	--	6	10		
Crosstalk		CT	θ=ψ= 0°	0	--	1	%	*6)
Viewing Angle	Horizontal	ψ	CR≧10	140	160	--	Deg.	*4)
	Vertical	θ		120	140	--	Deg.	
Color Coordinates	White	X Y	θ=ψ= 0°	0.263 0.279	0.313 0.329	0.363 0.379	Color Coordinates	*3)
	Red	X Y		(0.578) (0.299)	(0.628) (0.349)	(0.674) (0.399)		
	Green	X Y		(0.308) (0.536)	(0.358) (0.586)	(0.408) (0.636)		
	Blue	X Y		(0.100) (0.015)	(0.150) (0.065)	(0.200) (0.115)		
Gamut		CG	θ=ψ= 0°		60		--	--
Gamma		γ	VESA	2.0	2.2	2.4	--	*7)

[Note]

Definition of these measurement items is as follows:

1) Setup of Measurement Equipment

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.



2).Definition of Contrast Ratio:

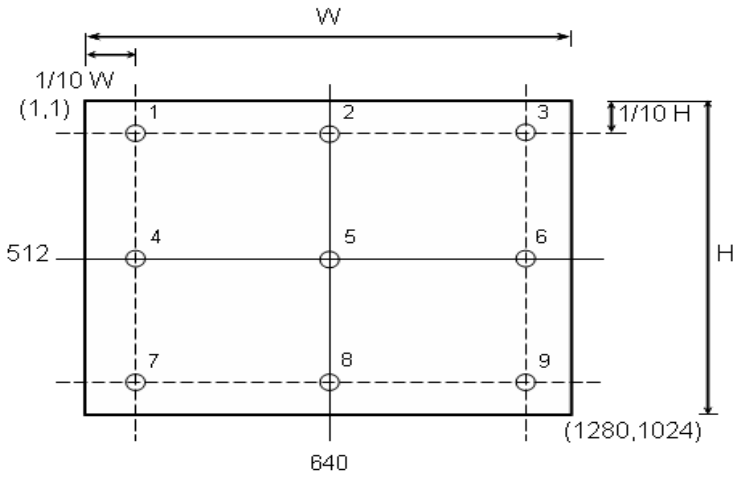
CR=ON (White) Luminance/OFF (Black) Luminance

3).Definition of Luminance and Luminance uniformity:

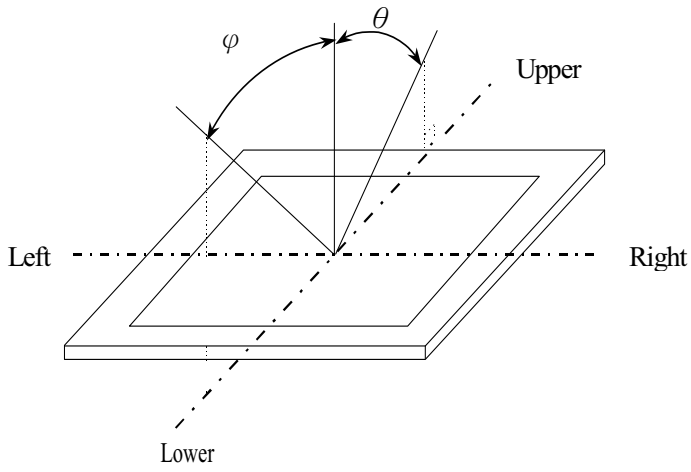
Center Luminance: measuring the luminance of the point no. 5

Average Luminance: measuring average luminance of points no.1-no.9

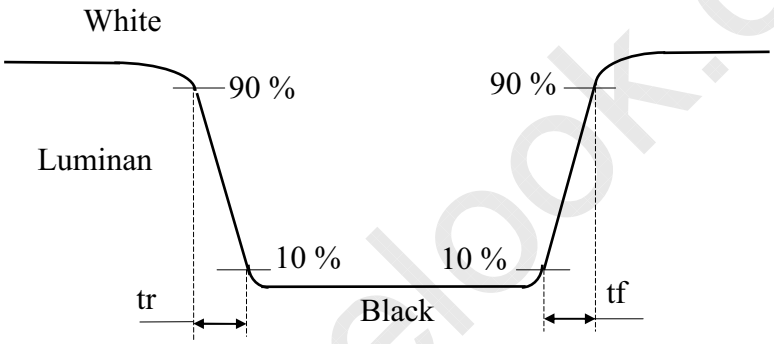
Uniformity: ΔL= [L (Min)/L (Max)] ×100 %



4).Definition of Viewing Angle (θ,ψ):



5) Definition of Response Time:

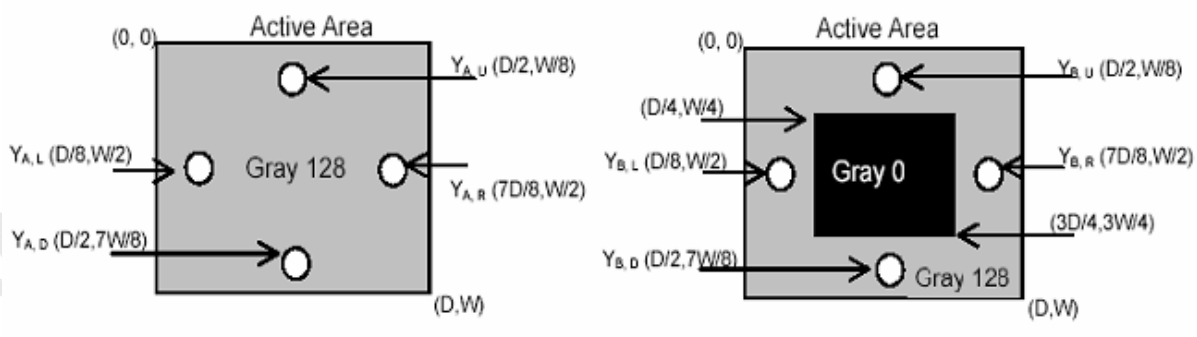


6) Definition of crosstalk:

$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

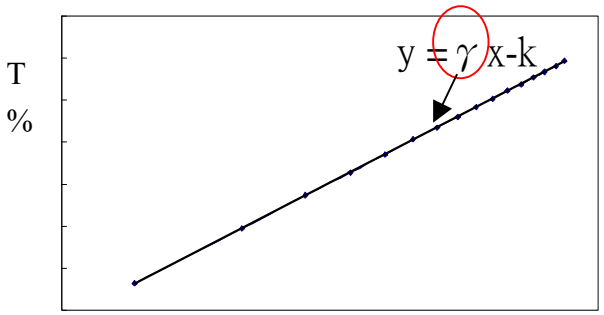
Y_A : The luminance of measured position at pattern A

Y_B : The luminance of measured position at pattern B with Gray level 0



Pattern A Pattern B

7) Definition of Gamma (γ), follow VESA standard sampling every 16 gray level (0,16,32,…..224,240,255)



9. RELIABILITY TEST CONDITIONS

(1) Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temperature High Humidity Operation	50℃; 90%RH; 300hrs (No condensation)
High Temperature High Humidity Storage	65℃; 90%RH; 48hrs (No condensation)
ON/OFF Test	5 sec On / 5 sec Off @ 0℃/50 min ~50℃ /50 min、10000 cycles
High Temperature Operation	60℃; 300hrs
High Temperature Storage	65℃; 300hrs
Low Temperature Operation	0℃; 300hrs
Low Temperature Storage	-20℃; 300hrs
Thermal Shock	Between -20℃(60min) ~ 60℃(60min); 100 Cycles

(2) Shock & Vibration

ITEMS	CONDITIONS
SHOCK (NON-OPERATION)1	Shock level:(150G) Waveform: half sinusoidal wave, 2ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
SHOCK (NON-OPERATION)2	Shock level:(50G) Waveform: half sinusoidal wave, 11ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
VIBRATION (NON-OPERATION)1	Vibration level: (1.5G) zero to peak Waveform: sinusoidal Frequency range: 10to 300 Hz Frequency sweep rate: Random Duration: one sweep from 10 to 300Hz in each of three mutually perpendicular axis(each x,y,z axis: 30 min, total 1.5 hours)
VIBRATION (NON-OPERATION)2	Vibration level: (1.0G) zero to peak Waveform: sinusoidal Frequency range: 5to 500 Hz Frequency sweep rate: 0.5 octave/min Duration: one sweep from 5 to 500Hz in each of three mutually perpendicular axis(each x,y,z axis: 60 min, total 3 hours)

(3) ESD

POSITION	CONDITION(MDL turn off)
Connector	1. 200 pF，0 Ω，±250 V 2. contact mode for each pin
Module	1. 150 pF，330 Ω，±15K V (Air mode)，±8K V (Contact mode)

	2. Air mode, test 25 times for each test point 3. Contact mode, 25 times for each test point

(4) Judgment standard

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

10. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

Please pay attention to the followings in handling- TFT-LCD products;

(1) ASSEMBLY PRECAUTION

1) Please use the mounting hole on the module side in installing and do not beading or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.
2) Please design display housing in accordance with the following guide lines.
   a) Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
   b) Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. Approximately 1.0 mm of the clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
   c) When some parts, such as, FPC cable and ferrite plate, are installed underneath the LCD module, still sufficient clearance is required, such as 0.5mm. This clearance is, especially, to be reconsidered when the additional parts are implemented for EMI countermeasure.
   d) Design the inverter location and connector position carefully so as not to give stress to lamp cable, or not to interface the LCD module by the lamp cable.
   e) Keep sufficient clearance between LCD module and the others parts, such as inverter and speaker so as not to interface the LCD module. Approximately 1.0mm of the clearance in the design is recommended.
3) Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)
4) Please do not press any parts on the rear side such as source TCP, gate TCP, control circuit board and FPCs during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
5) Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
6) Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
7) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
8) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
9) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

(2) OPERATING PRECAUTIONS

1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification.
3) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.
4) A condensation might happen on the surface and inside of LCD module in case of sudden charge of ambient temperature.
5) Please pay attention to displaying the same pattern for very long time. Image might stick on LCD. If then, time going on can make LCD work well.
6) Please obey the same caution descriptions as ones that need to pay attention to ordinary electronic parts.

(3) PRECAUTFONSWITHELECTROSTATICS

1) This LCD module use CMOS-IC on circuit board and TFT-LCD panel, and so it is easy to be affected by electrostatics. Please be careful with electrostatics by the way of your body connecting to the ground and so on.
2) Please remove protection film very slowly on the surface of LCD module to prevent from electrostatics occurrence.

(4) STORAGE PRECAUTIONS

1) When you store LCDs for a long time, it is recommended to keep the temperature between 0℃ ~40℃ without the exposure of sunlight and to keep the humidity less than 90%RH.
2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60℃ 90%RH.
3) Please do not leave the LCDs in the environment of low temperature; below -20℃.

(5) SAFETY PRECAUTIONS

1) When you waste LCDS, it is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
2) If any liquid leaks out of a damaged-glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

(6) OTHERS

1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays.
2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
3) For the. Packaging box, please pay attention to the followings:
   a) Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
   b) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not

turn over.

c) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

d) Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)