SPECIFICATION

FOR

TFT-LCD MODULE

CJM16C0101

JILIN CAIJING DIGITAL TECHNOLOGY
PANELS Co., Ltd

1999/9/30

Contents

1.Revision History

Date of Revision	Affected Pages	Reasons of Revision

2.Mechanical Characteristics Data

Physical Size	400mm×333mm×40.7mm(Typ.)
Screen Diagonal	40.9cm(16.1″)
Active Area	318.7mm(H)×255.0mm(V)
Pixel Format	1280(×3)×1024
Pixel Pitch	0.249(per one triad)×0.249mm
Pixel Arrangement	R,G,B in triad arrangement
Weight	3080 grams Max.
LCD Surface Treatment	Antiglare and Hard coat 3H
Backlight	Cold Cathode Fluorescent Lamp (CCFL) with inverter

3.Absolute Maximum Ratings

Electrical Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Conditions
Supply Voltage	VDD	-0.3 ～+7.0	V	
Supply Voltage	VBL	-0.3 ～+21.0	V	
Input Voltage	VIN	-0.3 ～+5.25	V	
Static Electricity				Operators should be grounded in handling the TFT LCD Module

Environmental Absolute Maximum Ratings

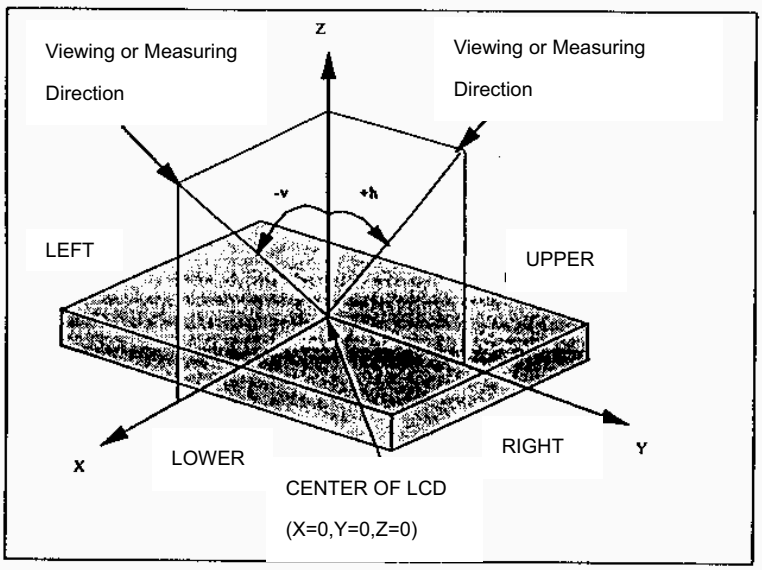
Rating	Symbol	Value	Unit	Condition
Storage Temperature	TST	-20 to+60	℃	At the glass surface
Operation Temperature	TOP	0 to+50	℃	At the glass surface
Operation Humidity		5 to 80	%RH	Max wet bulb temp.29 ℃ No condensation
Vibration		1.5	G	10V/200Hz,X,Y,Z(Note1)
Trapezoidal Shock		35	G	20msec,±X,Y,Z(Note1)
Corrosive Gas		Not Acceptable		

Note 1:At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

4.Optical Characteristics

Item	Conditions	Specification			Unit	Notes
		Min.	Typ.	Max.		
Viewing Angle	h=0° ,v=+20°	5				In the unit of Contrast Ratio K
	h=0° ,v=-20°	20				
	h=±40° ,v=0°	10				
	h=±20° ,v=0°	45				
Contrast	h=0,v=0	60	100			In the unit of Contrast Ratio K
Response Time	Both On/Off. From/To 10% luminance To/From 90% luminance level.		30	50	msec	Ambient Temperature 25℃. At Center of LCD. h=0,v=0
White Luminance	Gray Scale L=L255 h=0,v=0.		200		Cd/m^2	At Center of LCD
Luminance Uniformity	Adjacent Area	0.80				Ratio of (Ldark/Lbright) over a circular area of 10mm diameter placed any one of 81 points of the screen.
	Screen Total	0.60				Ratio of (Ldark/Lbright) for any two of 81 measuring points of the screen
Chromaticity	Red x		0.639			±0.030
	Red y		0.329			±0.030
	Green x		0.301			±0.030
	Green y		0.581			±0.030
	Blue x		0.137			±0.030
	Blue y		0.117			±0.030
White Balance	x		0.310			±0.030
	y		0.346			±0.030

Notes for the Optical Characteristics:

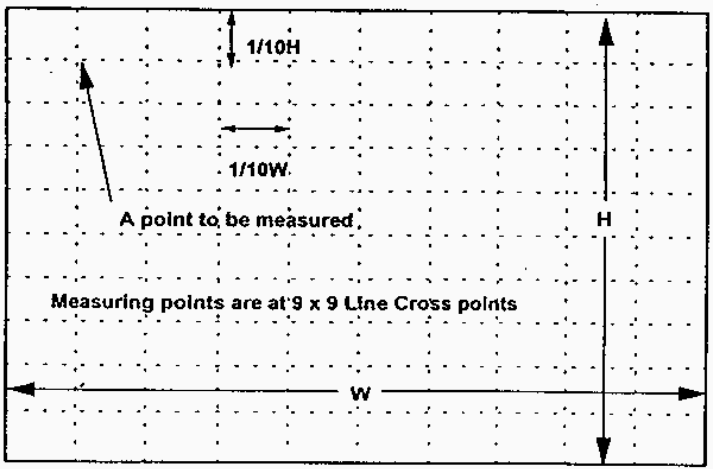


• Gray Scale Level is denoted by Lxx.(ex.L00 means all Pels are in the selected state) (Uniformity Measurement)

• 'Lbright' represents the Luminance of the point that is brighter than the other point to be compared.

• 'Ldark' represents the Luminance of the point that is darker than the other point to be compared.

• Measuring points are at the following.



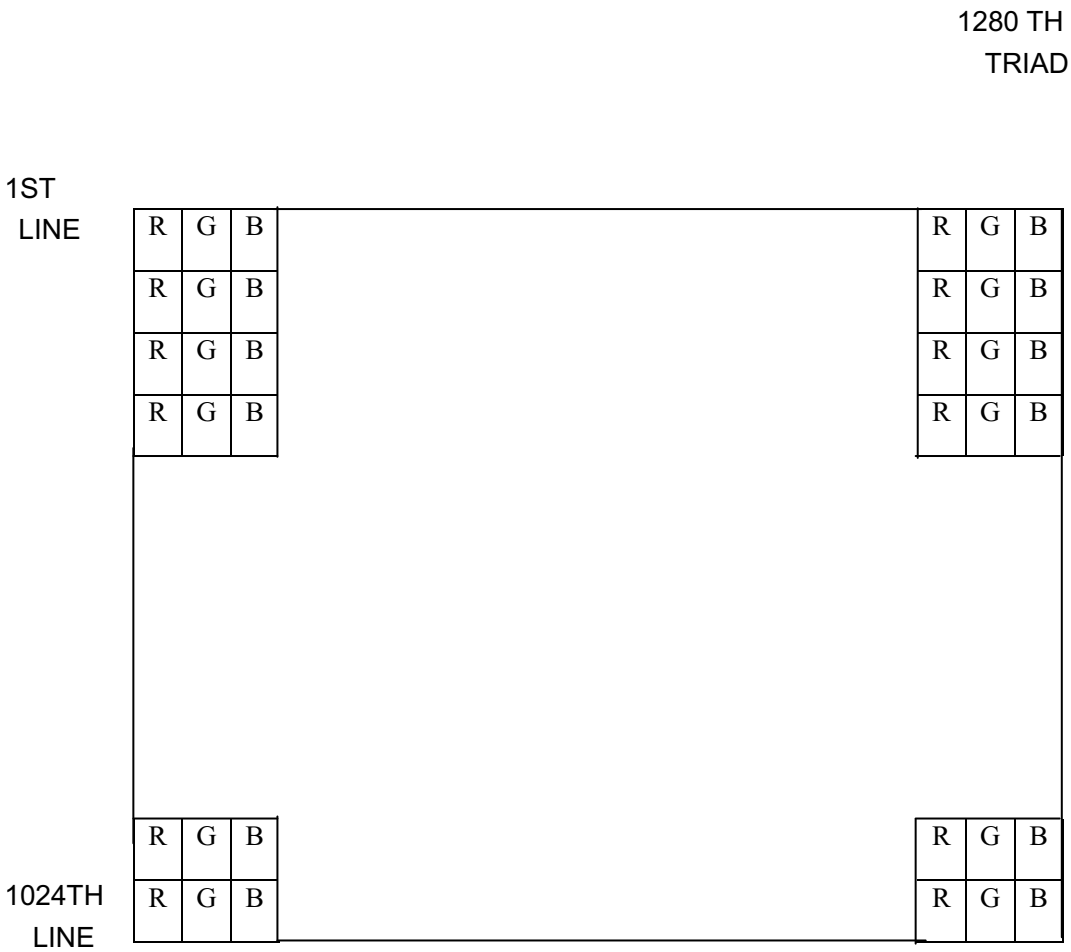
• Chromaticity and White Balance are defined as C.I.E. 1931 x,y coordinates at the center of LCD.
• The measurement Equipment are as shown below table.

Item	Measuring Equipment
Viewing Angle	Pritchard 1980A by Photo Research Corp.
Contrast	Pritchard 1980A by Photo Research Corp.
Response Time	LCD-5000 by Ohtsuka Elec
White Luminance	Pritchard 1980A by Photo Research Corp.
Luminance Uniformity	Pritchard 1980A by Photo Research Corp.
Chromaticity	LCD-5000 by Ohtsuka Elec
White Balance	LCD-5000 by Ohtsuka Elec

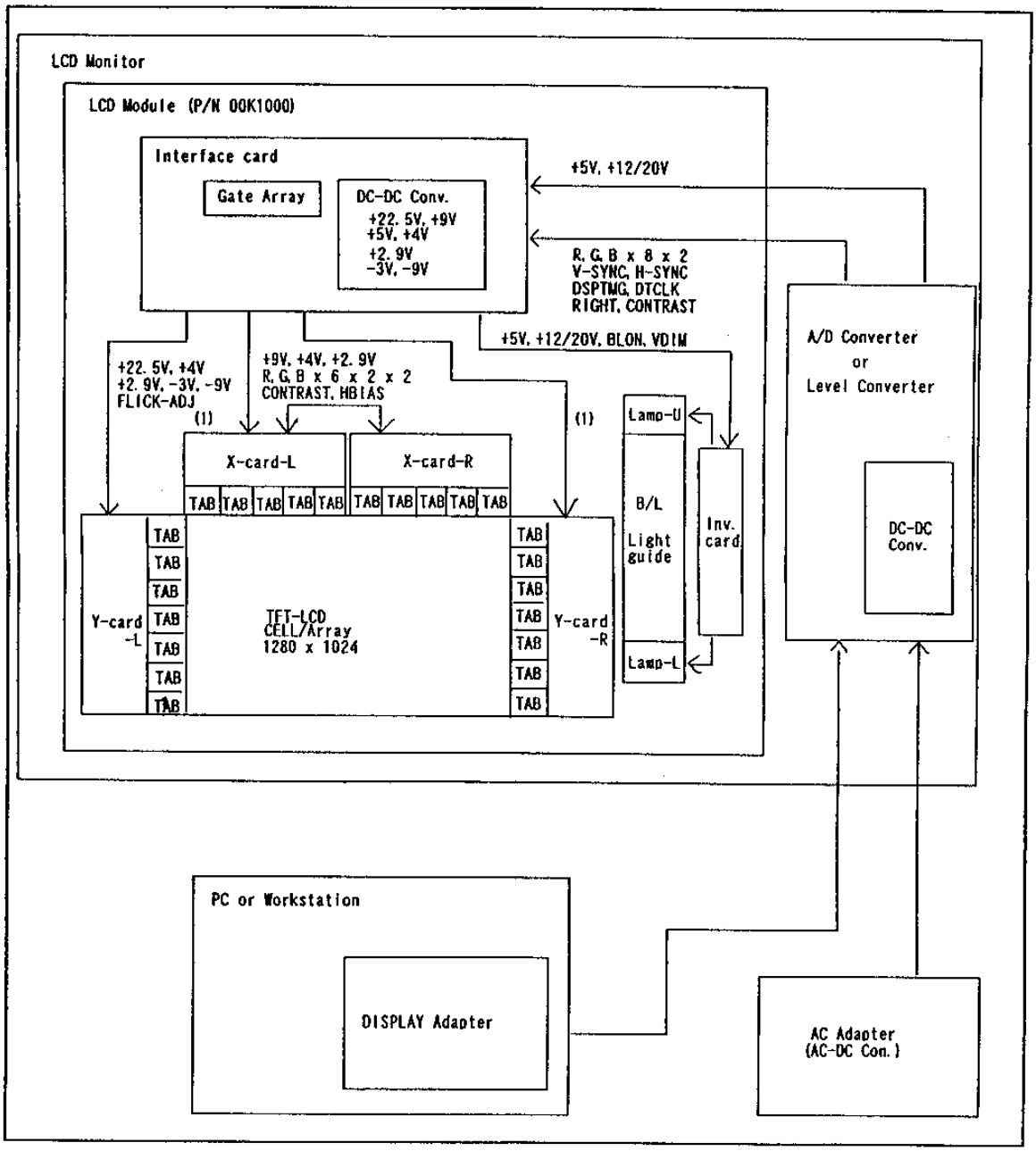
The measurement is to be done after 30 minutes of Power-on of Back Light.
• Unless otherwise specified, the ambient conditions are as following.

Ambient Temperature：25±2 (℃)
Ambient Humidity： 25-85 (%)
Atmospheric Pressure：86-106 (kPa)

5.Color Arrangement



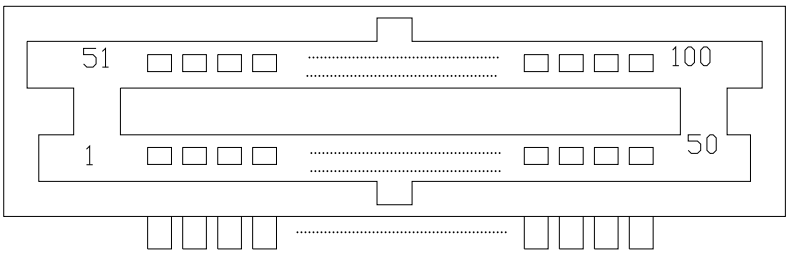
6.Block Diagram



7. Signal Interface

(1) Signal connector

J1: PhEC100R-R211 (BURNDY, mate with PHEC100P-R211)



Front View

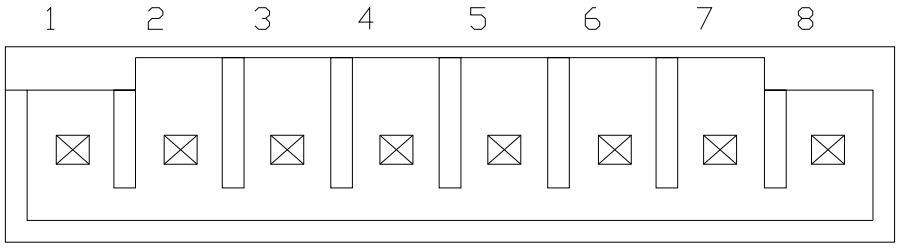
PIN#	Signal name	PIN#	Signal name	PIN#	Signal name	PIN#	Sign name
1	VSYNC	26	GND	51	GND	76	OG5
2	GND	27	OG6	52	DOTCLK	77	GND
3	HSYNC	28	GND	53	GND	78	OG7
4	GND	29	EB2	54	DISP TIMING	79	GND
5	ER2	30	EB0	55	GND	80	EB3
6	ER0	31	EB4	56	ER3	81	EB1
7	ER4	32	GND	57	ER1	82	EB5
8	GND	33	EB6	58	ER5	83	GND
9	ER6	34	GND	59	GND	84	EB7
10	GND	35	OB2	60	ER7	85	GND
11	OR2	36	OB0	61	GND	86	OB3
12	OR0	37	OB4	62	OR3	87	OB1
13	OR4	38	GND	63	OR1	88	OB5
14	GND	39	OB6	64	OR5	89	GND
15	OR6	40	GND	65	GND	90	OB7
16	GND	41	RESERVE	66	OR7	91	GND
17	EG2	42	GND	67	GND	92	RESERVE
18	EG0	43	RESERVE	68	EG3	93	GND
19	EG4	44	DPOL	69	EG1	94	PPOL
20	GND	45	N.C.	70	EG5	95	N.C.
21	EG6	46	BRIGHTNESS	71	GND	96	CONTRAST
22	GND	47	FRCEN	72	EG7	97	DTREN
23	OG2	48	RESERVE	73	GND	98	-BL-OFF
24	OG0	49	GND	74	OG3	99	GND
25	OG4	50	+5V	75	OG1	100	+5V

INTERFACE SIGNAL DESCRIPTION

SIGNAL NAME	DESCRIPTION
RE(7:0),RO(7:0)	Red data 7(MSB) to 0 (LSB)
GE(7:0),GO(7:0)	Green data 7(MSB) to 0 (LSB)
BE(7:0),BO(7:0)	Blue data 7(MSB) to 0 (LSB)
DOTCLK	Dot Clock Input-The falling edge should be used to sample the other LCD signal.
DISP TIMING	LCD Display Timing signal
VSYNC	Vertical Synchronization
HSYNC	Horizontal Synchronization
DPOL (Note.1)	Display Timing Signal Polarity Control-This signal controls the polarity of 'DISP TIMING'. The 'DISP TIMING' signal is high active when "DPOL' is high, low active when 'DPOL' is low. This signal is pulled-up internally by 10k ohm.
PPOL (Note.1)	Pixel Data Polarity Control-This signal is used to indicate the digital video data polarity. This signal is pulled-up internally by 10k ohm.
BRIGHTNESS	Shall be connected with variable volume (Max=0 ohm, Min=10kohm) Between this signal line and GND.
CONTRAST	Shall be connected with variable volume (Max=0 ohm, Min=10k ohm) between this signal line and GND.
FRCEN (Note.1)	Frame Rate Control Enable-When this signal is high, the Frame Rate Control function is enabled. This signal is pulled-up internally by 10k ohm.
DTREN (Note.1)	Dithering Enable-When this signal is high, the Dithering function is enabled. This signal is pulled-up internally by 10k ohm.
-BL-OFF (Note.1)	Back Light Off input-This signal is used to control the back light by external input. When this signal is low, back light is off(pre-heating)and DC/DC converter on the IF card is disabled. This signal is pulled-up internally by 10k ohm.
+5V	+5V output for test use.
GND	Signal GND.

(Note.1) If this signal is not used, the signal should be open.

(2) Power connector



Compatible with ITSX80

J10: S8B-PH-SM3(JST, mate with PHR-8)

PIN#	Signal name
8	+5V
7	+5V
6	GND
5	GND
4	+12/20V
3	+12/20V
2	AGND
1	AGND

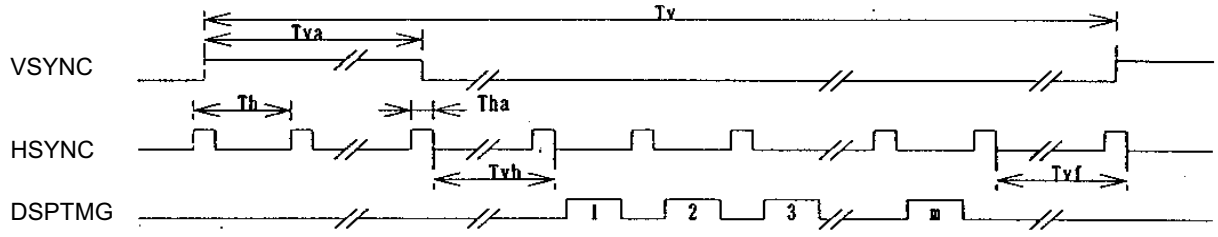
8. Color Code

BIT7 (MSB)	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0 (LSB)	Color code
ER7	ER6	ER5	ER4	ER3	ER2	ER1	ER0	Red of even column pixels.
OR7	OR6	OR5	OR4	OR3	OR2	OR1	OR0	Red of odd column pixels.
EG7	EG6	EG5	EG4	EG3	EG2	EG1	EG0	Green of even column pixels.
OG7	OG6	OG5	OG4	OG3	OG2	OG1	OG0	Green of odd column pixels.
EB7	EB6	EB5	EB4	EB3	EB2	EB1	EB0	Blue of even column pixels.
OB7	OB6	OB5	OB4	OB3	OB2	OB1	OB0	Blue of odd column pixels.
H	H	H	H	H	H	H	H	255(brightest)
H	H	H	H	H	H	H	L	254
H	H	H	H	H	H	L	H	253
H	H	H	H	H	H	L	L	253
L	L	L	L	L	L	H	H	3
L	L	L	L	L	L	H	L	2
L	L	L	L	L	L	L	H	1
L	L	L	L	L	L	L	L	0(darkest)

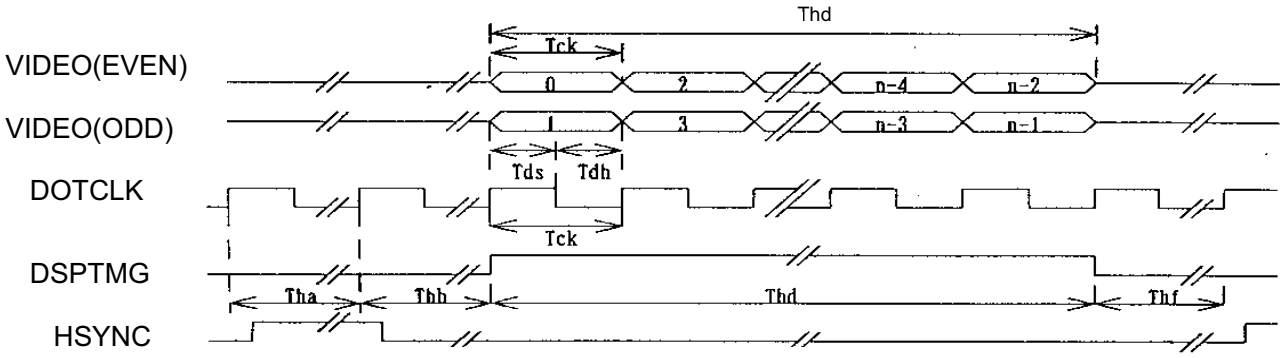
9.Signal Specification

R/G/B,DTCLK,DSPTMG,H/VSYNC signal specification				
Parameter	Condition	Min.	Max.	Unit
Vih	High level input voltage	2.0	VDD+0.3	V
Vil	Low level input voltage	0	0.8	V
Iih	High level input current	—	50	μA
Iil	Low level input current	—	-50	μA

10.Interface Timing



Vsync,Hsync and Display Timing



Video signal and Dot clock

-1280×1024/60Hz, Dot Clock 55.76 MHz

Signal	Item	Symbol	MIN.	TYP.	MAX.	Unit
DTCLK	Freq.	Fdck		55.76	57	MHz
DTCLK	Freq.	Tck	17.5	17.9		ns
DTCLKWH	Clock high width	Twch	4			ns
DTCLKWL	Clock low width	Twcl	4			ns
+V-Sync	Frame Rate	1/Tv	56.25	60	61	Hz
+V-Sync	Cycle	Tv	16.39	16.67	17.78	ms
+V-Sync	Cycle	Tv	1020	1056		lines
+V-Sync	active level	Tva	15.78	47.3		µs
+V-Sync	active level	Tva	1	3		lines
+V-Sync	V-back porch	Tvb	7	26	63	lines
+V-Sync	V-front porch	Tvf	1	3		lines
+DSPTMG	V-Line	m		1024		lines
+H-Sync	Scan Rate	1/Th		63.36		KHz
+H-Sync	Cycle	Th		15.78		µsec
+H-Sync	Cycle	Th	820	880		Tck
+H-Sync	active level	Tha		1.79		µsec
+H-Sync	active level	Tha	10	100		Tck
+H-Sync	Back porch	Thb	8	127		Tck
+H-Sync	Front porch	Thf	8	13		Tck
+DSPTMG	Display	Thd		11.48		µsec
+VIDEO	V-ODD/EVEN	n		640		Tck
+VIDEO	Data setup	Tds	3			ns
+VIDEO	Data hold	Tdh	5			ns

-1280×1024/60Hz,Dot Clock 50MHz

Signal	Item	Symbol	MIN.	TYP.	MAX.	Unit
DTCLK	Freq.	Fdck		50		MHz
DTCLK	Freq.	Tck		20		ns
DTCLKWH	Clock high width	Twch	4			ns
DTCLKWL	Clock low width	Twcl	4			ns
+V-Sync	Frame Rate	1/Tv		57.74		Hz
+V-Sync	Cycle	Tv		17.32		ms
+V-Sync	Cycle	Tv		1056		lines
+V-Sync	active level	Tva		49.6		μs
+V-Sync	active level	Tva		3		lines
+V-Sync	V-back porch	Tvb		26		lines
+V-Sync	V-front porch	Tvf		3		lines
+DSPTMG	V-Line	m		1024		lines
+H-Sync	Scan Rate	1/Th		60.98		KHz
+H-Sync	Cycle	Th		16.4		μsec
+H-Sync	Cycle	Th		820		Tck
+H-Sync	active level	Tha		2		μsec
+H-Sync	active level	Tha		100		Tck
+H-Sync	Back porch	Thb		67		Tck
+H-Sync	Front porch	Thf		13		Tck
+DSPTMG	Display	Thd		12.8		μsec
+VIDEO	V-ODD/EVEN	N		640		Tck
+VIDEO	Data setup	Tds	3			ns
+VIDEO	Data hold	Tdh	5			ns

11.Power Requirement

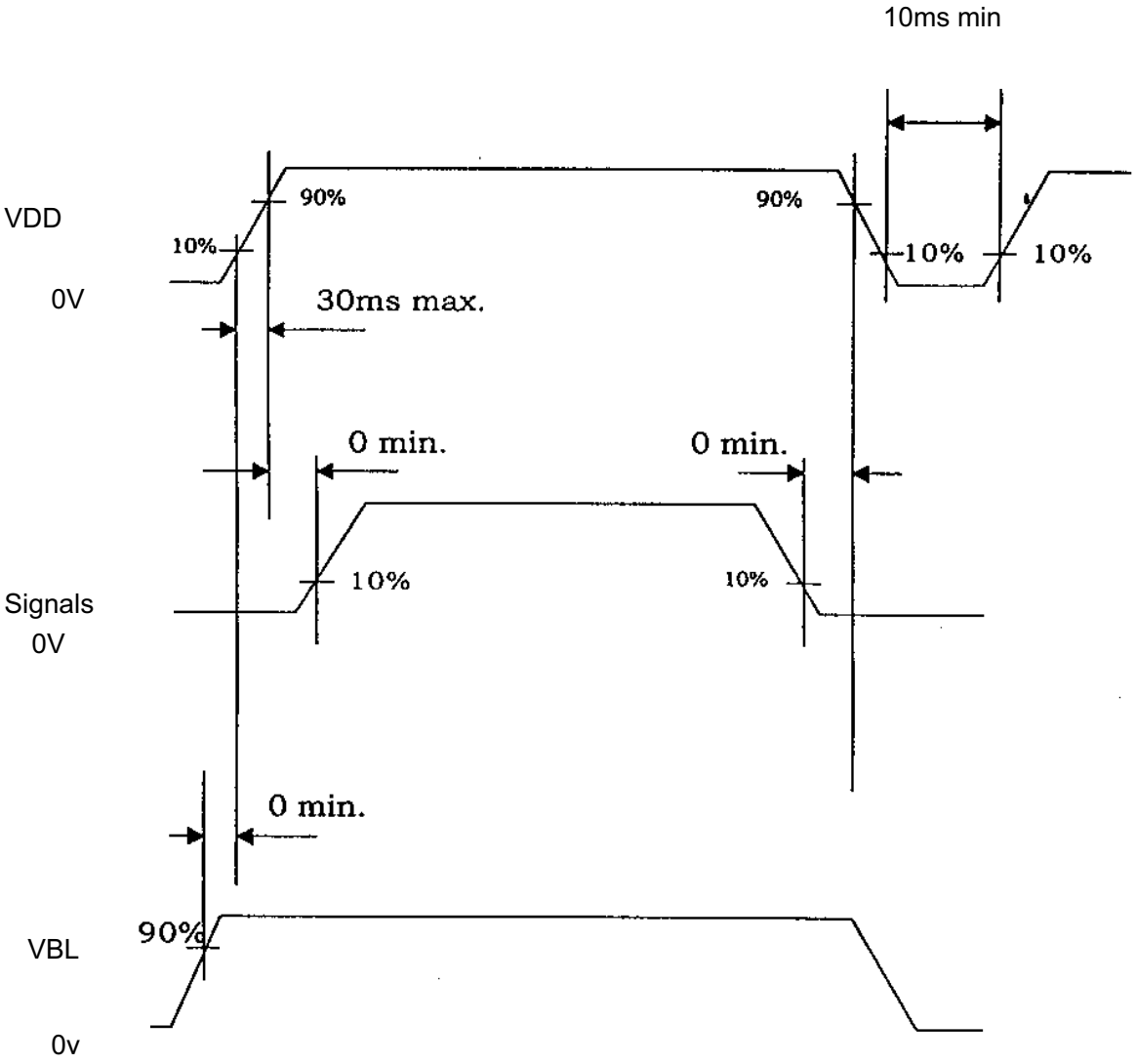
SYMBOL	PARAMETER	Min.	Typ.	Max.	Unit	CONDITION
VDD	Logic/LCD Drive Voltage	4.75	+5.0	5.25	V	
IDD	Logic Control Current			0.6	A	
VBL	Backlight Voltage	10.8	12.0/20.0	21	V	
IBL	Backlight Current			2.5 1.5	A	12V 20V
PDD+PBL	Total Power		30	33	W	
VDDrp, VBLrp	Allowable Logic/LCD Drive Ripple Voltage			100	mVp-p	
VDDns, VBLns	Allowable Logic/LCD Drive Ripple Noise			150	mVp-p	

Note:1.This requirements shall be met with 'All black pattern'.

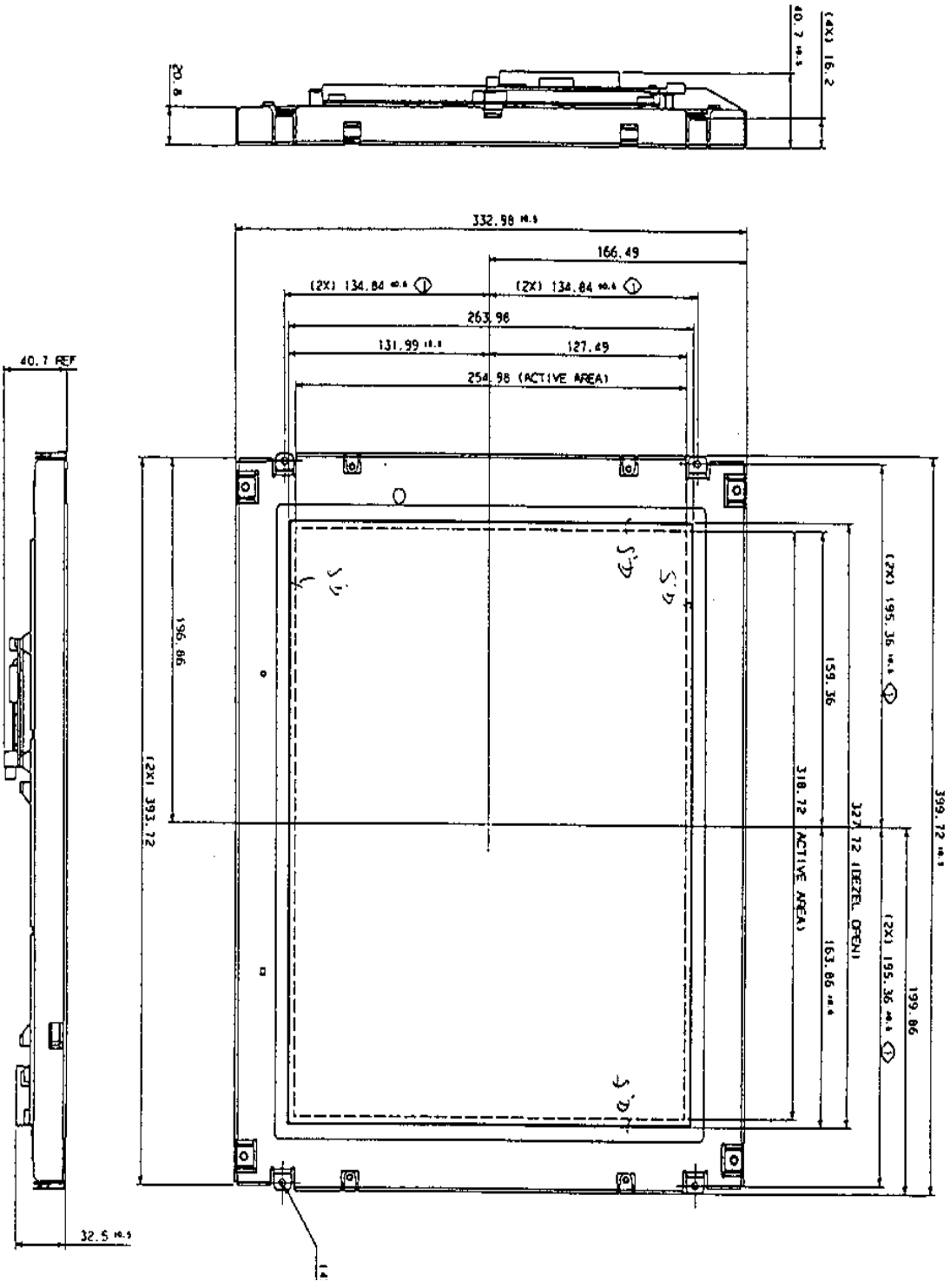
2.Maximum current does not include noise nor ripple current.

3.Voltage variation includes the ripple voltage.

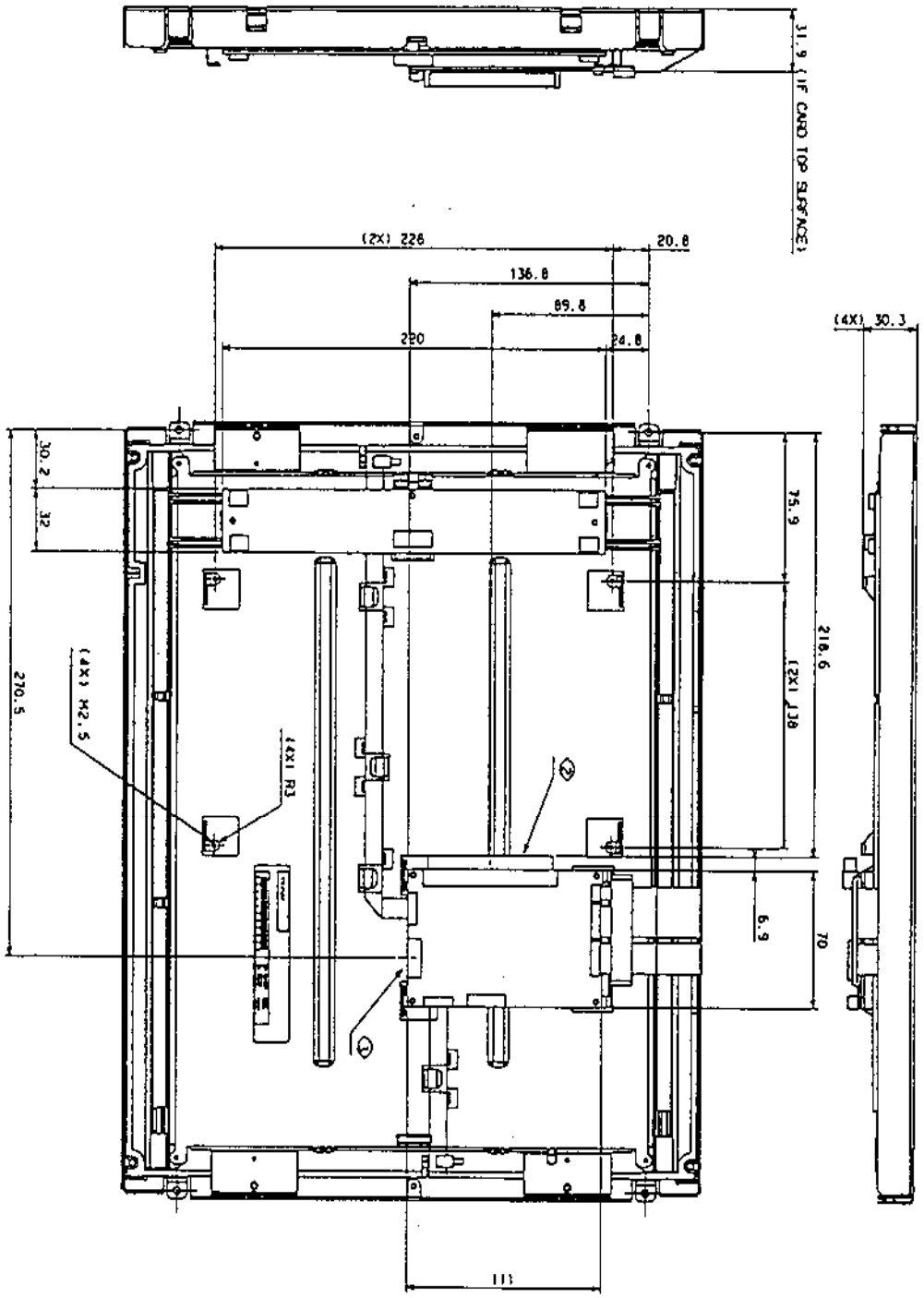
12.Power ON/OFF sequence



13.Outline Dimension



Front view



Rear view

14. NOTE

14.1 FOR SAFETY

LCD module is generally designed with precise parts to achieve light weighted thin mechanical dimensions.

In using our Modules, make certain that you fully understand and put into practice the warnings and safely precautions detailed in engineering information.

Refer to individual specifications and technical data for more detailed technical information.

1. SPECIAL PURPOSES
   - A) JCT'S Standard LCD Modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.
   - B) Since JCT'S Standard LCD Modules have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to abnormally high levels of vibration or shock which exceed JCT Corp. published specification limits.
   - C) In addition, since JCT Standard LCD Modules have not been designed for use in applications where performance failures could be life-threatening or catastrophic, they must never be installed in aircraft navigation control systems 、critical industrial process control systems(e.g. those involved in the production of nuclear energy) or in critical medical device or patient lift-support systems.
2. DISASSEMBLING OR MODIFICATION

   DO NOT DISASSEMBLE OR MODIFY the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.

   JCT Corp. doses not warrant the module, if customer disassembled or modified it.
3. BREAKAGE OF LCD PANEL

   DO NOT INGEST liquid crystal material, DO NOT INHALE the material with skin, if LCD panel is broken and liquid crystal material spills out.

   If liquid crystal material comes into mouth or eyes, rinse mouth or eyes out with water immediately.

   If this material contact with skin or cloth, wash it off immediately with alcohol and rinse thoroughly with water.
4. GLASS OF LCD PANEL

   BE CAREFUL WITH CHIPS OF GLASS THAT MAY CAUSE INJURING FINGERS OR SKIN, when the glass is broken.
5. ELECTRIC SHOCK

   DISCONNECT POWER SUPPLY before handling LCD module.

   DO NOT TOUCH the parts inside LCD module and the fluorescent lamp's connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from the inverter unit while power supply is turned on.
6. ABSOLUTE MAXIMUM RATINGS AND POWER PROTECTION CIRCUIT

   DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc, otherwise LCD module may be damaged.

   Employ protection circuit for power supply, whenever the specification or TD specifies it.

   Suitable protection circuit should be applied each system design.
7. DISPOSAL

   When dispose LCD module, obey to the applicable environmental regulations

14.2 For Designing the System

(1) LCD module should be assembled to the system by using all mounting holes specified in this specification and with the specified screws.

(2) DO NOT GIVE high voltage to “Low Voltage” side of the FL.
For example, DO NOT USE a flowing inverter which gives high voltage to “Low Voltage” side. That’s because it has a possibility to burn or smoke around the FL.

(3) Make sure to connect correctly high-voltage wire and low-voltage wire between FL tube and inverter unit.

(4) Input FL starting voltage (V_{SFL}) should not be less than one second.
If it were less than one second, it may cause unstable operation of FL.
Please adjust inverter circuit parameters, such as capacitor, resistor, to assure the display quality is maintained.
There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency).

(5) In case of severe environmental condition like outdoor usage, a proper transparent protective cover (lens) over LCD module is recommended to apply in order to prevent scratches, and invasion of dust, water, etc., from the system’s window onto LCD module.
Ultra-violet ray cut filter is recommended to apply onto LCD module for outdoor operation. Strong ultra-violet ray may cause damage the panel.

(6) Design the system not to display same pattern for a long time in order to prevent image sticking on the panel. Note that incorrect sequence of power supplies and input signals may cause the sticking on the panels, too.

14.3 For Installation in Assembly

(1) The C-MOS LSI used in LCD module is very sensitive to ESD (Electro-static Discharge).
Ambient humidity of working area is recommended to be higher than 50%RH.
Person handling LCD modules should be ground with wrist band. Tools like soldering iron and screw driver, and working benches should be grounded.
The grounding should be done through a resister of 0.5-1 Mohms in order to prevent spark of ESD.

(2) Reduce dust level in working area. Especially the level of metal particle should be decreased. Use finger stalls or soft and dust-free gloves in order to keep clean appearance of LCD module when handle for incoming inspection and assembly

(3) When remove protection film from LCD panel, peer off the film slowly (more than three second from the edge of the panel to minimize ESD, using a soft-pointed tweezers covered by Teflon or adherent tape.

(4) When LCD panel becomes dirty, wipe of the panel surface softly with absorbent cotton or another soft cloth.
If necessary, breathe upon the panel surface and then wipe off immediately and softly again.
If the dirt can not be wiped off, absorbent cotton wetted a little with normal-hexane or petroleum benzene can be used for wiping the panel.
Be careful not to spill this solvent into the inside of LCD module. Driver ICs and PCB area used inside LCD module may be damaged by the solvent.

(5) AVOID THE DEWING OF WATER CONDENSATION
Wipe off a spot or spots of water of mist and chemicals of mist on LCD panel softly with absorbent cotton or another cloth as soon as possible if happened, otherwise discoloration or stain may be caused. If water invade into LCD module may cause its damages.

(6) Do not expose LCD module to the gas (which is not normally contained in the atmosphere),it may cause mis-operation or defects.

(7) DO NOT APPLY MECHANICAL FORCES.
Do not bend or twist LCD module even momentary when LCD module is installed an enclosure of the system. Bending or twisting LCD module may cause its damages.
Make sure to design the enclosure that bending/twisting forces are not applied to LCD module when it is installed in the system.
Refrain from strong mechanical shock like dropping form the working bench or knocking against hard object.
These may cause glass of the panel crack, damage of FL or other mis-operation.

(8) Refrain from excessive force like pushing the surface of LCD panel. This may cause damage of the panel or electrical parts on PCB.

(9) Do not put heavy object such as tools, books, etc., and do not pile up LCD modules.
Be careful not to touch surface of the polarizer laminated to the panel with any hard and sharp object. The polarizer is so soft that it can easily scratched, even the protect film covers it.

(10) When inserting or disconnecting the connectors to LCD module, be sure not to apply force against PCB, nor connecting cables, otherwise internal connection of PCB and TAB drivers may be damaged.
Do not fasten screws while putting cables like those for interface or FL between LCD module and the enclosure.
Make sure to insert the module FL connector to the inverter connector in correct position.
If incorrect, this may cause smoke or burn or electrical parts by high voltage of FL circuit.

(11) Be careful not to pull the FL cables of the backlight in order to avoid mechanical damage in FL lamp and soldering area.
Be careful not to pull or not to hurt the FPC (Flexible Printed Circuit) cables.

(12) Power supplies should always be turned off in assembling process.
Do not connect or disconnect the power cables and connectors with power applied to LCD module. This may cause damage of module circuit.
The signal should be applied after power is turned on. And the signal should be removed before power supplies are turned off.

14.4 For Transportation and storage

(1) Do not store LCD module in high temperature, especially in high humidity for a long time (approximately more than one month).
It is recommended to store LCD module where the temperature is in the range of 0 to 35 degrees Celsius and the relative humidity is lower than 70%.

(2) Store LCD module without exposure to direct sunlight or fluorescent lamps in order to prevent the module from strong ultra violet ray.

(3) Avoid condensation of water on LCD module; otherwise it may cause mis-operation or defects. Keep away LCD module from such ambient.

(4) In case of transportation of storage after opening the original packing. LCD module is recommended to be repacked into original packaging with the same method, especially with the same kind of desiccant.

CAUTION:

1. **JCT is not responsible for any undesirable result caused by the abnormal operating by users.**
2. **For improvement, JCT reserves the right to change or alter any or all specification or design this product and the content of the specification without any prior notice.**
3. **No part of the product and the specification may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means. Otherwise, this will be considered as a copyright infringement.**