

ENGINEERING SPECIFICATIONS

TFT COLOR LCD MODULE

TM070WA-22L03

- 18cm (7 inch) diagonal
- Resolution (480xR·G·Bx234 dots)
- With CFL backlight unit
- Nonglare surface type

(TENTATIVE)

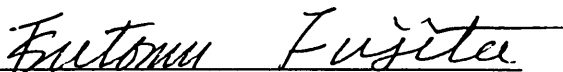
Nov.6.2000

Tottori SANYO Electric Co., Ltd.
Electronic Device Business Headquarters
LCD Division

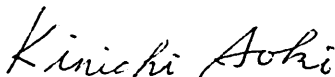
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3. This product is designed and manufactured only for general AV instruments usage.
It is not suitable for the purpose or equipment that required extremely high reliability
or safety. Ex: Aerospace instrument, control equipment for nuclear power or life-support.
4. Please use this product correctly according to operating conditions and precautions for use
stated in this document.
Please install safety proof in your designing to avoid human accident,
fire accident and social damage which may be resulted from malfunction of this product.
5. Radiation proof design is not applied on this product.
6. Tottori SANYO will not be liable for any damages or disadvantages caused by our product
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7. Separate inspection standard spec is applied for cosmetic criteria.
8. Should you have questions on this product, please kindly contact our sales section.

■ MECHANICAL CHARACTERISTICS

ITEM	SPECIFICATION	UNIT
Module size	167.0(W)×102.0(H)×17.0typ.(T)	mm
Resolution	480×R・G・B(W)×234(H)	pixel
Screen size	7" (RGB Stripe)	
Dot pitch	0.107(W)×0.372(H)	mm
Pixel pitch	0.321(W)×0.372(H)	mm
Active viewing area	154.1(W)×87.05(H)	mm
Bezel opening area	158.1(W)×91.1(H)	mm
Weight	320 TYP.	g

Ta=25°C

■ ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	MIN	MAX	UNIT	NOTE
Power supply voltage	+12V	-	-0.5	13.0	V	Used for inverter as well
Analogue RGB input	VR,VB,VG	-	-0.3	2.0	V	
Input signals	V _I	-	-0.3	5.0	V	
Output signals	V _O	-	-0.3	5.0	V	
		-	-	-		
Ambient temperature	T _{ST}	Storage	-10	75	°C	Note 1),2)
	T _{OP}	Operation	0	65		
Humidity	-	Ta≤60°C	-	90	%RH	not beyond 240H Note 3)

Note 1) Care should be taken so that the LCD module may not be subjected to the temperature beyond this specification.

Note 2) Ambient temperature shows temperature on LCD surface. Module temperature is apt to increase while it's driving due to CFL heat etc. Please design carefully not to exceed +85 degree C on every surface of LCD that should come to contact with any other equipment. Temperature for operation is one which only assures LCD operation. Contrast, response time, or other LCD quality is regulated under condition of Ta=+25 degree C.

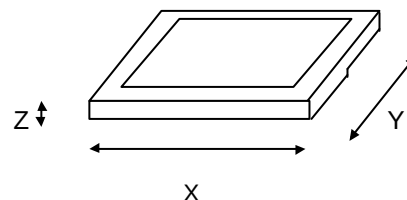
Note 3) Please be advised that dew condensation level should be less than maximum wet bulb temperature 58 degree C. Dew condensation may induce leak current, and also influence LCD performance.

■ MECHANICAL ENVIRONMENT

ITEM	SYMBOL	CONDITIONS	MIN	MAX	UNIT	NOTE
Vibration	-	Storage	-	(2.9)	G	Note 1)
Shock	-	Storage	-	(100)	G	XYZ 6ms/direction

Note 1) Frequency : 8 ~ 33.3 Hz, Displacement : 1.3mm, Sweep : 33.3 ~ 400Hz
 Vibration frequency : 33.3 ~ 400Hz
 Sweep time : 15 min./1 sweep
 total test time : X,Y-2Hr Z-4Hr

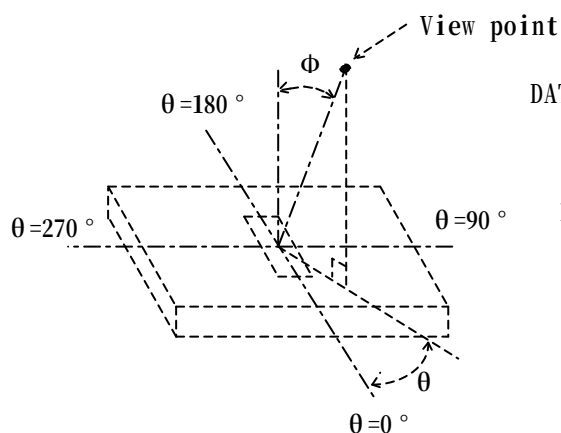
X = Longer side
 Y = Shorter side
 Z = Height



■ OPTICAL CHARACTERISTICS (1)

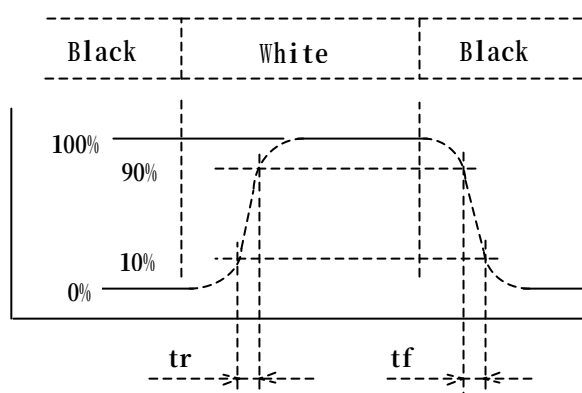
Ta=25°C, fv=60Hz

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Viewing angle range	ϕ	$K \geq 5$	$\theta = 0^\circ$	65	-	-	deg. Note 1),4),5)
			$\theta = 90^\circ$	65	-	-	
			$\theta = 180^\circ$	40	-	-	
			$\theta = 270^\circ$	65	-	-	
Contrast ratio	K	At optimized viewing angle	100	-	-	-	Note 2),4)
Response time	Rise	$\theta = 0^\circ, \phi = 0^\circ$	-	30	-	ms.	Note 3),4)
	Fall		-	20	-		
Color of CIE Coordinate	White	$\theta = 0^\circ, \phi = 0^\circ$	-	0.305	-		Note 4)
	y		-	0.313	-		



Note 1) ϕ and θ are defined as above figure.

DATA



Note 3) Response time

Note 2) Contrast ratio "K" is defined below formula.

$$K = \frac{\text{Brightness at ON (White)}}{\text{Brightness at OFF (Black)}}$$

Note 4) Measurement condition

① VIN=12.0V, VB,VR,VG = 0.7Vo-p

② Follow brightness measurement condition in next item.

Note 5)

$\theta = 0^\circ$ (Down)

$\theta = 90^\circ$ (Right)

$\theta = 180^\circ$ (Up)

$\theta = 270^\circ$ (Left)

■ OPTICAL CHARACTERISTICS (2)

Ta=25°C

ITEM	SYM	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Brightness	B		-	360	—	cd/m ²	

Note) The brightness shall be the following point.

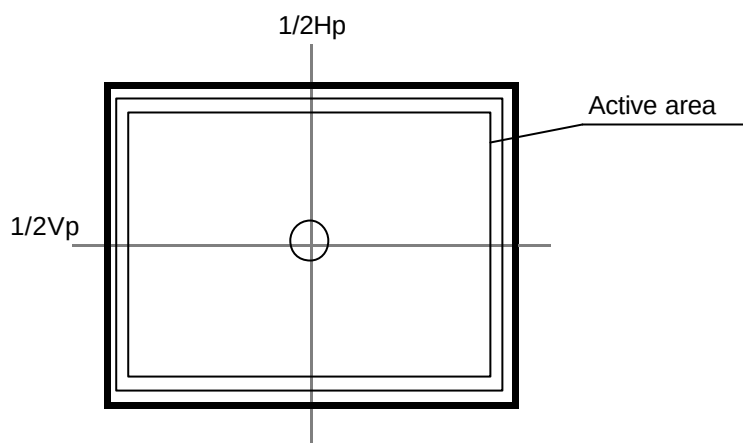


Fig.1 Measurement point

Vp :Total Number of Vertical pixel

Hp :Total Number of horizontal pixel

Measurement equipment : BM-7(TOPCON Corp.)

Measurement condition

- ① Ambient temperature : 25 ±2°C
- ② LCD : All pixels are WHITE
- ③ Measure after 30 minutes of CFL warm up.
- ④ VIN = 12V, VB,VR,VG = 0.7Vo-p

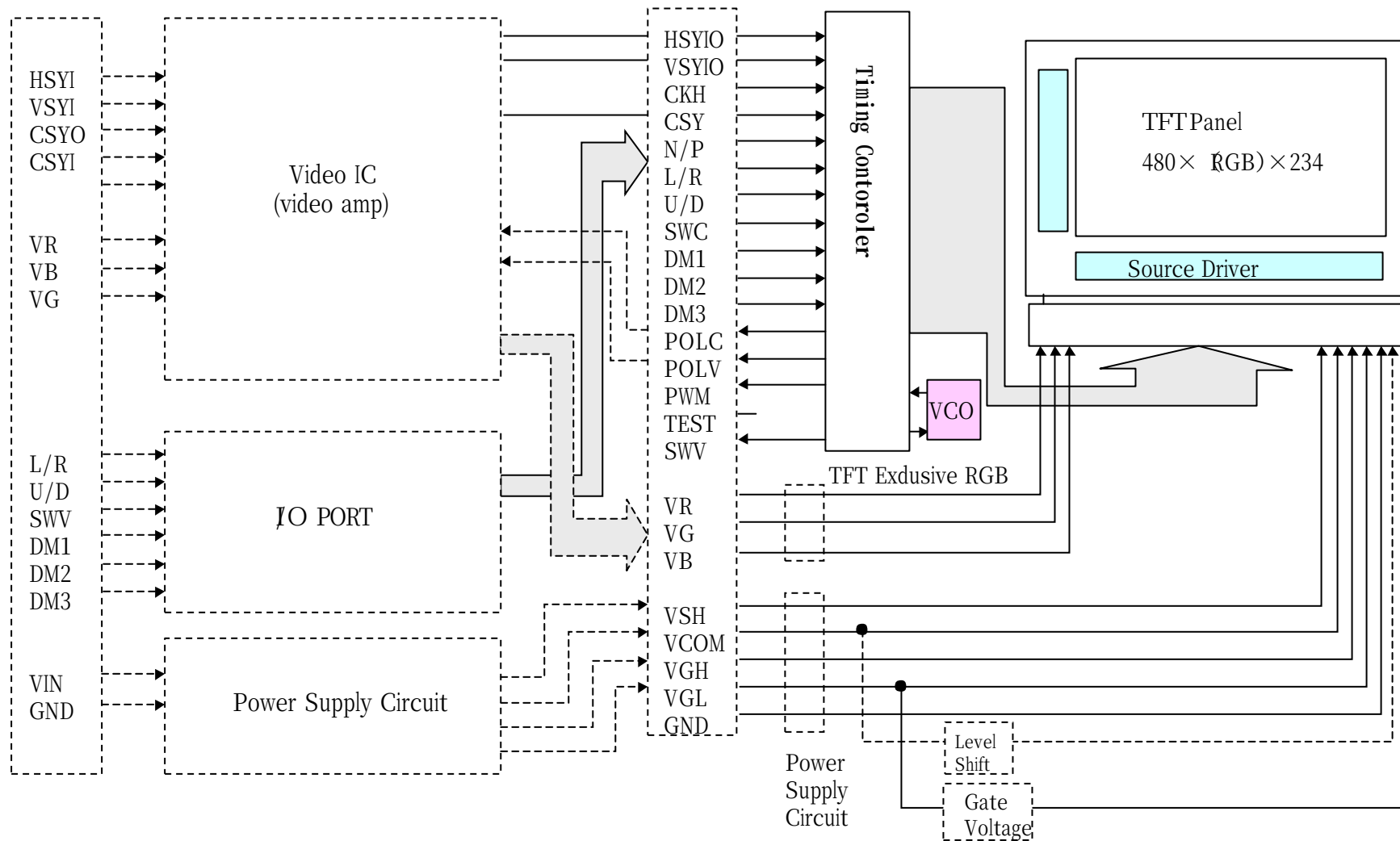
■ BACKLIGHT CHARACTERISTICS (REFERENCE ONLY)

Ta=25°C

ITEM	SYM.	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Lamp voltage	VL		—	740	—	Vrms	at IL=4.5mArms
Lamp current	IL		3.0	—	4.5	mArms	(Recommended value)
Operating frequency	fL		45	55	65	KHz	(Recommended value)
Start up voltage	Vs1		—	—	1750	Vrms	at Ta= 25°C
Start up voltage	Vs2		—	—	1800	Vrms	at Ta=-30°C
Lamp life	toL		10000	—	—	Hours	at IL=4.5mArms, Note 1)
Backlight power supply	WL		—	4.5	—	W	at IL=4.5mArms

Note 1) CFL Lamp life indicates time from initial Lamp brightness to half of original brightness.

■ Block Diagram

IF BLOCK
24PIN

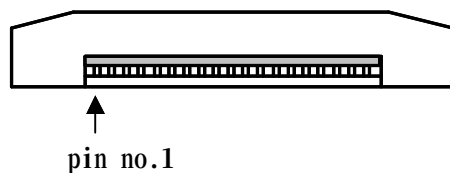
INTERFACE PIN CONNECTION

PIN NO.	SYMBOL	I/O	FUNCTION
1	HSYI	I	Input Horizontal Sync Signal (low active)
2	CSYO	O	Output Composite Sync Signal (*2)
3	CSYI	I	Input Composite Sync Signal (*2)
4	VIN	I	Power Supply (+12V)
5	VIN	I	Power Supply (+12V)
6	VR	I	Color Video Signal (Red)
7	VB	I	Color Video Signal (Blue)
8	VG	I	Color Video Signal (Green)
9	GND	I	GND (Signal)
10	GND	I	GND (Signal)
11	GND	I	GND (Backlight Inverter)
12	GND	I	GND (Backlight Inverter)
13	GND	-	GND (Backlight Inverter)
14	VSYI	I	Input Vertical Sync Signal (low active)
15	L/R	I	Selection for horizontal scanning direction (*1)
16	U/D	I	Selection for vertical scanning direction (*1)
17	GND_1	I	GND (*3)
18	GND_1	I	GND (*3)
19	GND_1	I	GND (*3)
20	SW-B	O	Selection for Power supply
21	DM1	I	Selection for display mode (*2)
22	DM2	I	Selection for display mode (*1)
23	DM3	I	Selection for display mode (*2)
24	GND_1	I	GND (*3)

<Connector Specification>

I/F CN:52559-2492 Molex

Suitable matching fpc : 0.5×24pin W=12.5mm t=0.3mm



<Connection in standard specification>

(wide screen when upper half is white)

Note 1) It is normal to connect 15, 16, 22 pin with 20 pin connector.

Note 2) 2, 3, 21, 23 terminal shall be connected to ground in 10KΩ.

Note 3) 17, 18, 19, 24 terminal shall be connected to ground.

ELECTRICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	Conditions	MIN	TYP	MAX	UNIT	NOTE
Power Supply Voltage	VIN		11.7	12.0	12.3	V	
Horizontal Sync Signal Rising time	frequency	HSYI	15.13	15.73	16.33	kHz	
	pulse width	HSYI	4.2	4.7	5.2	μs	
	H-L	HSYI	—	—	0.5	μs	
Vertical sync Signal	frequency	VSYI	f H/290	f H/262	f H/245	Hz	
	pulse width	VSYI	2H	3H	5H	μs	
Input Video Signals	VB			0.7o-p		V	Note 1)
	VR			0.7o-p		V	
	VG			0.7o-p		V	
Input Signals	VIH	High level	3.5	—	—	V	Note 2)
	VIL	Low level	—	—	1.5	V	
Input Signals Voltage	VIH	High level	2.5	—	—	V	Note 3)
	VIL	Low level	—	—	2.1	V	
	V+—V-	Hysteresis	0.4	—	—	V	
Power Supply for selection	SW-B		—	5	—	V	Note 4)
			—	—	—	V	
Power Supply current	IIN	VIN=12.0V	—	500		mA	Note 5)
Power Supply	WS		—	6		W	

Note 1) Symmetric terminal name : VR, VG, VB (Internal 75Ω termination)

Note 2) Symmetric terminal name : L/R, V/D, DM2 (CMOS Schmitt INPUT)

Note 3) Symmetric terminal name : HSYI, VSYI (CMOS OUTPUT)

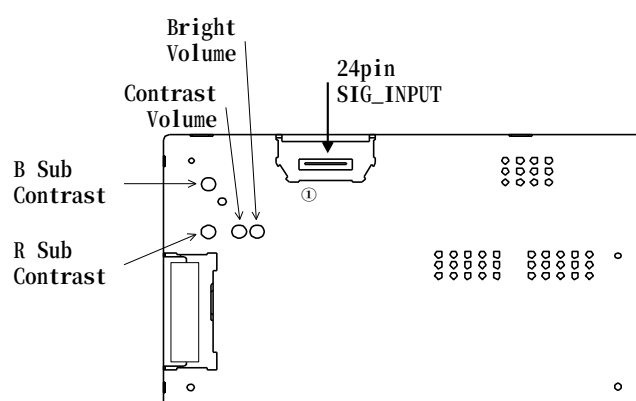
Note 4) Symmetric terminal name : SW-B (for L/R, V/D, DM2 connection)

Note 5) Under the following condition :

Display pattern : ALLBLACK FULL MODE

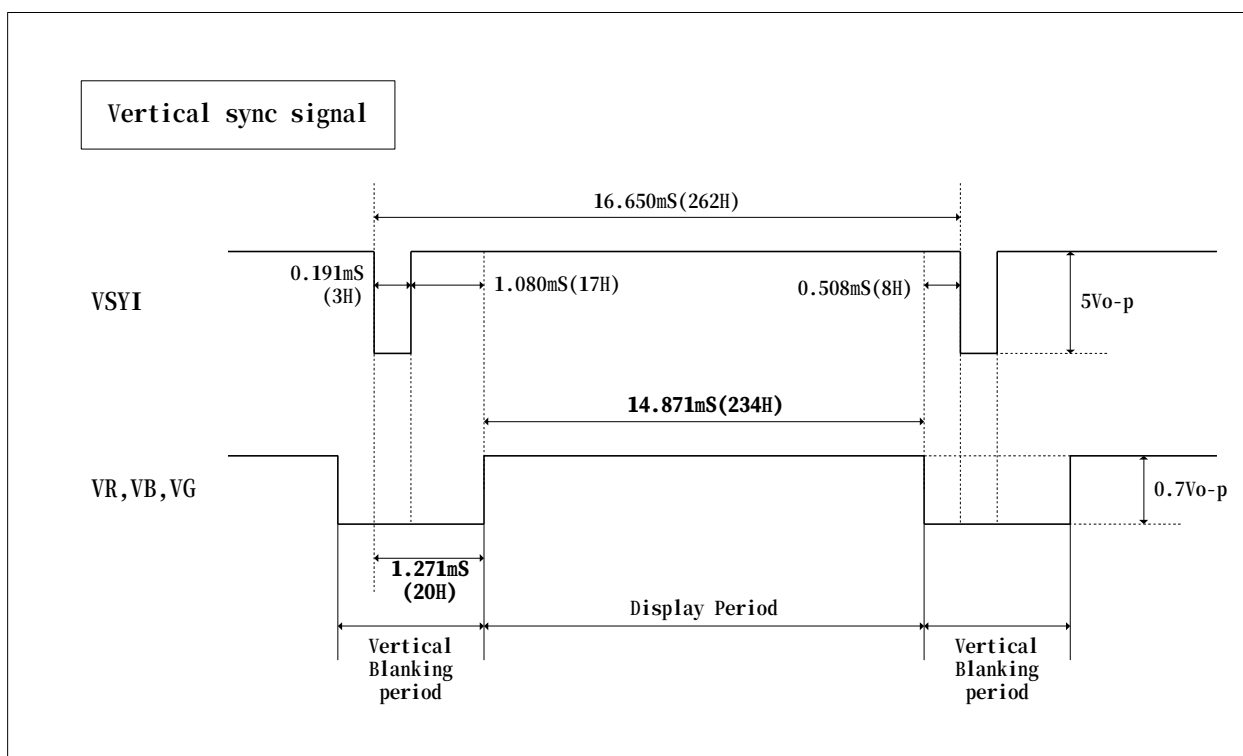
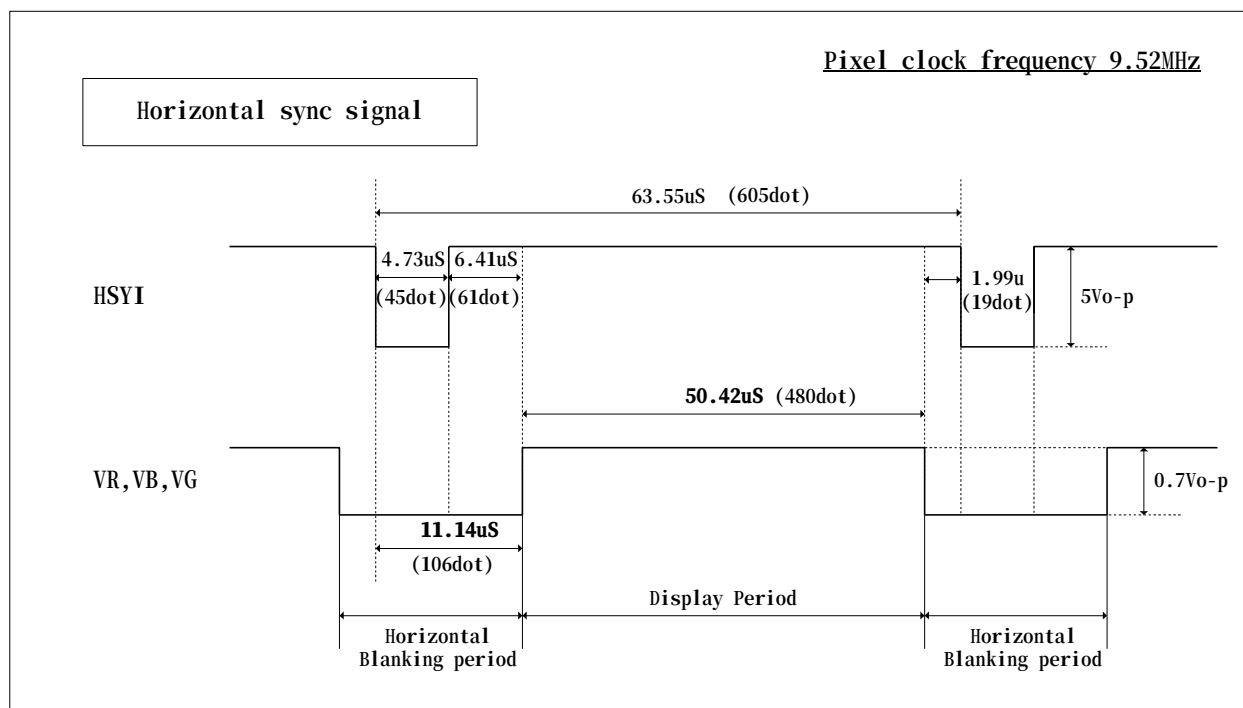
(fv : 60Hz, VIN = +12V, VR/VG/VB = 0.7o-Pv)

Volume adjust



Note) Designated screw driver is strongly requested for adjustment of VR.

Input signal timing (Horizontal / Vertical)



Note 1) All are in standard value. Minor adjustments with in electrical characteristic are possible.

Note 2) Above timings are recommendable value calculated from dot clocks, which shall not be considered as fixed value.

■ PRECAUTIONS (INSTRUCTIONS FOR SAFE AND PROPER USE)

1. Instructions for safety

- (1) Please do not disassemble or modify LCD module to avoid the possibility of electric shock, damage of electronic components, scratch at display surface or invasion of foreign particles. In addition, such activity may result in fire accident due to burning of electronic component.
LCD module disassembled or modified by customer is out of warranty.
- (2) Please be careful in handling of LCD module with broken glass.
When the display glass breaks, please pay attention not to injure your fingers. The display surface has the plastic film attached, which prevents dispersion of glass pieces, however, touching broken edge will injure your fingers. Also CFL (Cold Cathode Fluorescent Lamp) is made of glass, therefore please pay attention in the same way.
- (3) Please do not touch the fluid flown out of broken display glass.
Should it stick to hand or clothes, wipe off with soap or alcohol immediately and then wash it with water. Should the fluid get in eyes, wash eyes immediately with washing lotion for more 15 minutes and then consult the doctor.
- (4) CFL contains mercury inside. Please follow regulations or rules by local autonomy at its disposal.
- (5) Before handling LCD module, please switch off the power supply.

2. Instructions for designing

- (1) Mounting of LCD
Designing of mounting parts should be adequate so that LCD module is not putted stresses (ex. Warp orortion), to achieve good display quality.
- (2) Heat radiation
Required CFL generates heat at lighting and causes temperature rise inside system. Therefore, designing to radiate heat like radiation slits at cabinet is recommended to meet the specified operating temperature range for LCD module.
- (3) Noise on power line
Spike noise contained in power line causes abnormal operation of driving circuit and abnormal display. To avoid it, spike noise should be suppressed below VDD +/- 200mVp-p. (In any case, absolute maximum rating should be kept.)
- (4) Absolute maximum rating
Absolute maximum rating specified in this specification has to be kept in any occasion. It shows the maximum that shall not be exceeded.
Exceeding it may cause burning or non-recoverable break of electronic components in circuit. Please make system design so that absolute maximum rating is not exceeding even if ambient temperature, input signal and components are varied.
- (5) Protection cover and cut-off filter for ultraviolet rays
When LCD module is used under severe condition like outdoor, it is recommended to use transparent protection cover over display surface to avoid scratches and invasion of dust and water. In addition, when LCD module is exposed to direct sun light for long time, use of cut-off filter for ultraviolet rays is also recommended. Please be careful not to get condensation.

3.Instructions for use and handling

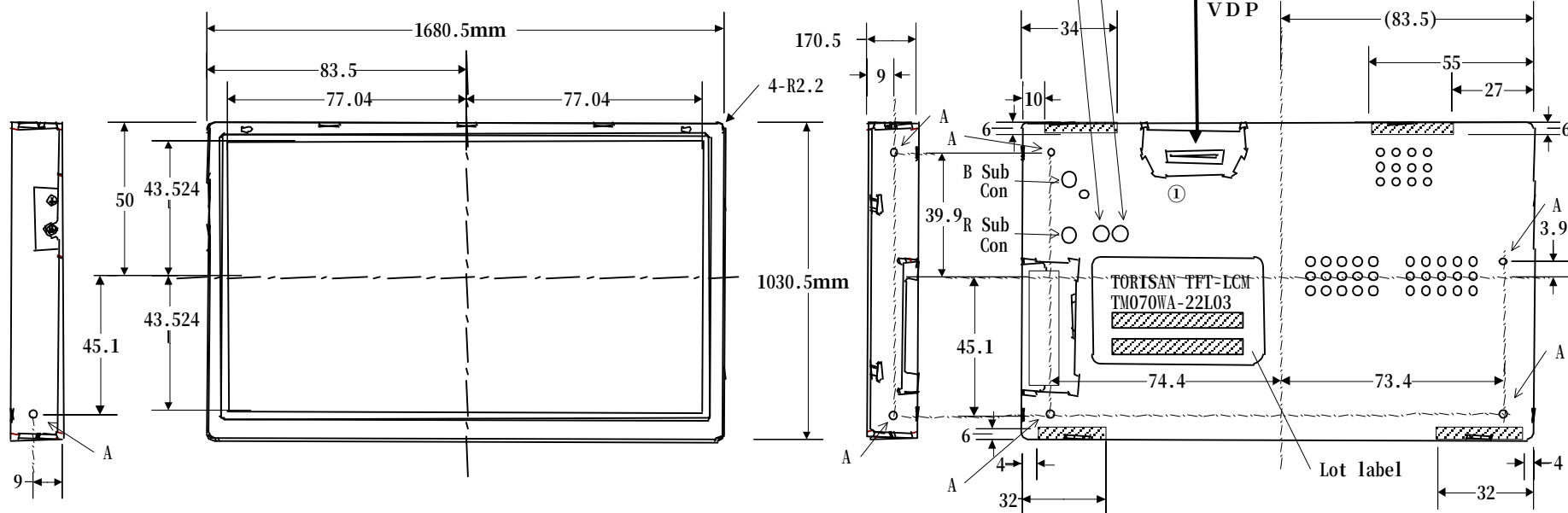
- (1) C-MOS LSI and semiconductors are easily damaged by static discharge. LCD module should be handled on conductive mat by person grounded with wrist strap etc. to avoid getting static electricity. Please be careful not to generate static electricity during operation.
- (2) Protection against dust and stain
LCD module should be handled in circumstance as clean as possible.
It is recommended to wear fingerstalls or ductless and soft gloves in advance to avoid getting dust or stain on display surface.
- (3) Protection film for display surface
It is recommended to remove protection film at nearly final process of assembling to avoid getting scratch or dust. Please be requested, when removing protection film, to pick up the edge of the film carefully by pincette. Which edges are obtuse and coated with PTFE or stick the glue tape at the edge to remove slowly with more than 3 seconds. Removal hasty shall be avoided to prevent static electricity which may cause damage on semiconductor or electric devices in LCD module.
- (4) Contamination of display surface
When display surface of LCD module is contaminated, please wipe the surface softly with cotton swab or clean cloth. If it is not enough, please take it away with by sticky tape or wipe the surface with cotton swab or clean cloth containing benzine. In this case, please be careful so that benzine dose not get in inside of LCD module, because it may be damaged.
- (5) Water drop on LCD surface
Please do not leave LCD module with water drop. When the Display surface gets water drop, please wipe it off with cotton swab or soft cloth immediately, otherwise display surface will be deteriorated.
If water gets in inside of LCD module, circuit may be damaged.
- (6) Please make sure that LCD module is not warped pr twisted at installation into system. Even temporary warp or twist may be the cause of failure.
- (7) Please be careful not to apply strong mechanical stress like drop or shock to LCD module. Such stress may cause break of display grass and CFL or may be the cause of failure.
- (8) Pressure to display surface
Please be careful not to apply strong pressure to display surface. Such pressure may cause scratches at surface or may be the cause of failure.
- (9) Protection against scratch
Please be careful not to hit, press or rub the display surface with hard material like tools. In addition, do not put heavy or hard material on display surface, and do not stack LCD modules. Polarizer at front surface can be easily scratched.
- (10) Plugging in of connector
Please be careful not to apply strong stress to connector part of LCD module at plugging in or out, because strong stress may damage the inside connection. At plugging in connector, place LCD module on the flat surface and hold the backside connector on LCD module. Keep the back of the connector onto the plain surface when inserting it. Please make sure that connector is properly plugged in. In addition, please be careful not to put the connecting cable between cabinet of system and LCD module at installing LCD module into system

- (11) About outer VR for adjustment
Outer VR for adjustment shall not be rotated unless necessary. If needed, please use screw driver for adjustment which TOTTORI SANYO recommends
- (12) Switching off before plugging in connector
Please make sure that power is switched off before plugging in connector.
If power is on at plugging in nor out, circuit of LCD module may be damaged.
When LCD is switched on for test or inspection, please make sure that power supply and signals of driving system meet the specified power sequence.
- (13) Response speed (optical response) of LCD display is dependent on temperature. Under low temperature, response speed is slower.
Also brightness and chromaticity change slightly depending on temperature.
- (14) Slow light-up of CFL under low temperature
Under low temperature, start-up of CFL gets difficult (The time from switch-on to stable lighting becomes longer.)
As characteristic of CFL, operation under low temperature makes the life time shorter. To avoid this, it is recommended to operate under normal temperature.
- (15) Condensation
Please be careful not to get condensation.
LCD module may get condensation on its display surface and inside in the circumstance where temperature changes much in short time.
Condensation can cause deterioration or failure.
- (16) Remaining of image
Displaying the same pattern for long time may cause remaining of image even after changing the pattern. This is not failure but will disappear with time.

4.Instructions for storage and transportation

- (1) Storage
Please store LCD module in the place where is free from direct sunlight ambient and low humid condention so as not to cause condensation.
Since sudden temperature change may cause condensation, please store in circumstance of stable temperature.
- (2) Stacking number
Since excessive weight causes deformation and damage of carton box, please stack only up to the number stated on carton box for storage and transportation.
- (3) Handling
Since LCD module consists of grass and precise electronic components, it will be damaged by excessive shock and drop. Therefore please handle the carton box carefully to minimize shock at loading, reloading and transportation.

The first floor plan shows a large rectangular hall with a central area containing a grid of 12 small circles arranged in 3 rows and 4 columns. To the left of this grid is a small rectangular area, and to the right is a larger rectangular area. The entire hall is enclosed by a thick black line representing the walls. There are small rectangular protrusions on the left and right walls, possibly representing doors or windows.



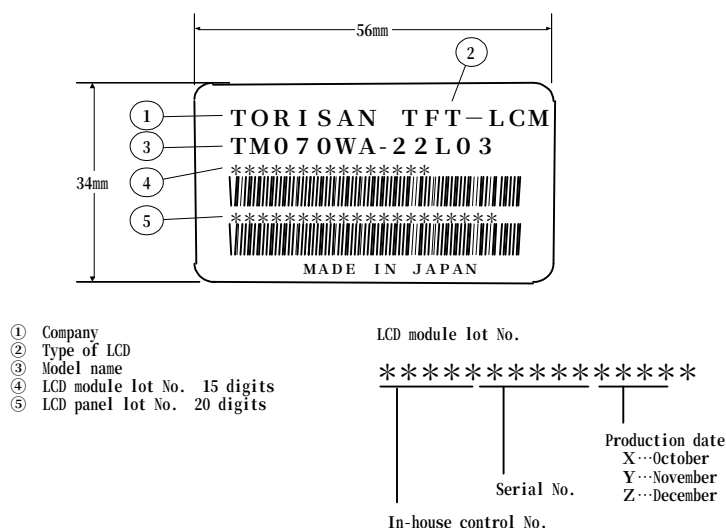
Outer dimensions	168×103×17mm
Viewing area	154.08×87.048mm

 Hooking point

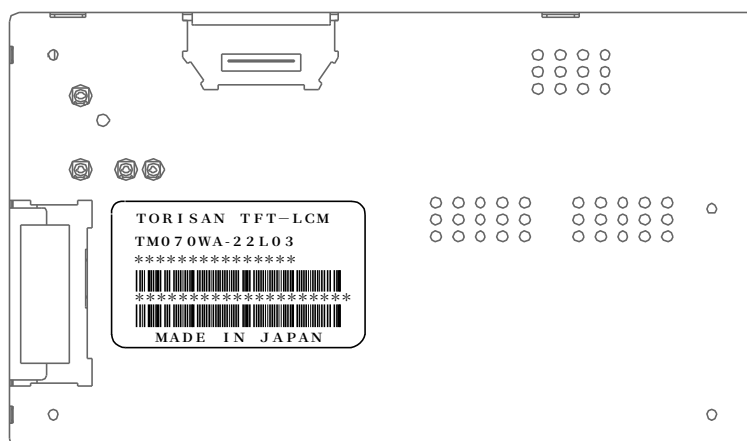
A : M2.3(7 off)

Label

Label specification



Label location



Bromic incombustible material

『Tottori Sanyo's products do not include bromic incombustible materials which produce dioxin.』

CFC(Chlorofluoro carbon = Freon)

『CFC and its substitutes.
Assembly process, edulcorating process and raw materials are free from CFC (= Chlorofluoro carbon = Freon) and its substitutes.』