

## PRODUCT INFORMATION

**All information is subject to change without notice. Please read bottom notes.****FEATURES**

- (1) "Transmitting type", High brightness, High contrast, Wide view angle
- (2) Digital 6 bit RGB input interface
- (3) LCD drive circuit is built in, but inverter for backlight is not built in
- (4) Mounting compatible with LTA065A041F
- (5) RoHS compliant

**TENTATIVE****RoHS compliant product****MECHANICAL SPECIFICATIONS**

Item	Specification
Module outer dimension (Typ.) <sup>*1</sup>	151.0 (W) x 115.5 (H) x 10.0 (D) mm
Number of dots	640 (W) x 3 (RGB) x 480 (H)
Color-filter-array	RGB vertical stripes
Pitch of dots	0.0685 (W) x 0.2055 (H)
Effective display area	131.52 (W) x 98.64 (H) mm
Gray scales	64
Front surface treatment	AG coat (with WV film)
Backlight	CCFL side light (L-type)
Consumption power <sup>*2</sup>	4.2 W
Weight (TYP.)	205 g

\*1: The lug (FPC, lump harness and connector) is not included.

\*2: The loss of inverter efficiency is not included.

**ENVIRONMENTAL CONDITIONS SPECIFICATION**

Item	Condition	Min.	Max.	Unit
Operating Temp.	Panel surface	-20	70	°C
Storage Temp.	Panel surface	-30	80	°C

\*3: This value guarantees only operation, but doesn't guarantee all the contents of Optical specification.  
Optical specification can be guaranteed at the condition that ambient temperature is 25°C.**OPTICAL SPECIFICATION (Ta=25°C)**

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Luminance	L	300	400	-	cd/m <sup>2</sup>	I <sub>FL</sub> =7.0mA(rms)
		240	340	-	cd/m <sup>2</sup>	I <sub>FL</sub> =6.0mA(rms)
Contrast Ratio	CR	100	250	-	-	
White color chromaticity	x <sub>W</sub>	0.270	0.310	0.350	-	
	y <sub>W</sub>	0.280	0.320	0.360	-	
Luminance uniformity	-	0.7	-	-	-	
Viewing Angle (CR≥10)	Upper	40	60	-	°	*4
	Lower	20	30	-	°	
	Left	45	60	-	°	
	Right	45	60	-	°	
Response Time	τ <sub>r</sub>	-	10	20	ms	
	τ <sub>d</sub>	-	15	30	ms	

\*4: The reversal direction is 12 o'clock.

\*The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by Toshiba Matsushita Display Technology Co., Ltd. or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Toshiba Matsushita Display Technology Co. Ltd. or others.

\*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display Technology Co., Ltd. before proceeding with the design of equipment incorporating this product.

**CONNECTOR PIN ASSIGNMENT FOR INTERFACE**

Signal interface (CN1)

Use Connector :FA5B040HP1F (40 pin-0.5 mm pitch/Gilded type) (JAE)

Pin	Symbol	Function	Comment
1	VDD	+3.3V Power Supply	
2	VDD	+3.3V Power Supply	
3	VDD	+3.3V Power Supply	
4	VDD	+3.3V Power Supply	
5	GND	Signal Ground	
6	GSX1	Display period compensation signal	It opens, when performing the usual operation.
7	GND	Signal Ground	
8	DOFF1	Non-display period compensation signal	It opens, when performing the usual operation.
9	GND	Signal Ground	
10	DE	Data Enable Signal	
11	GND	Signal Ground	
12	VS	Vertical Sync.	
13	GND	Signal Ground	
14	HS	Horizontal Sync.	
15	GND	Signal Ground	
16	B5	Blue Data	Blue picture display data
17	B4	Blue Data	
18	B3	Blue Data	
19	B2	Blue Data	
20	B1	Blue Data	
21	B0	Blue Data	
22	GND	Signal Ground	
23	G5	Green Data	Green picture display data
24	G4	Green Data	
25	G3	Green Data	
26	G2	Green Data	
27	G1	Green Data	
28	G0	Green Data	
29	GND	Signal Ground	
30	R5	Red Data	Red picture display data
31	R4	Red Data	
32	R3	Red Data	
33	R2	Red Data	
34	R1	Red Data	
35	R0	Red Data	
36	GND	Signal Ground	
37	GND	Signal Ground	
38	CLK	Dot Clock	
39	GND	Signal Ground	
40	GND	Signal Ground	

**ABSOLUTE MAXIMUM RATINGS**

Item	Symbol	Condition	Min.	Max.	Unit	Remarks
Logic voltage	VI	Ta=25°C	-0.3	4.5	V	
Supply voltage	VDD	Ta=25°C	-0.3	VDD+0.3	V	
Back light input voltage	VBL	Ta=25°C	-	3000	Vrms	
Operating temperature (at panel surface)	Top	-	-20	70	°C	
Operating humidity	Hop	-	-	90	%(RH)	
Storage temperature (at panel surface)	Tstg	-	-30	80	°C	
Storage humidity	Hstg	-	-	95	%(RH)	

## ELECTRICAL SPECIFICATION

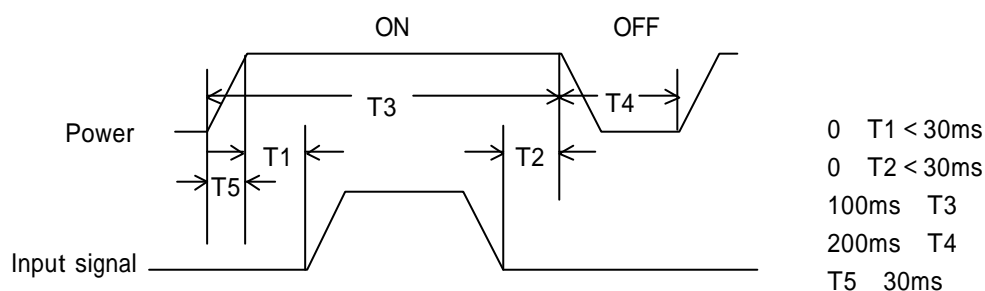
Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Power Voltage	input voltage	VDD	+3.15	+3.30	+3.45	V
	Current consumption	IDD	-	240	350	mArms *1
Input low voltage	VIL	0.0	-	0.3 x VDD	V	
Input high voltage	VIH	0.7 x VDD	-	VDD	V	
Allowable Ripple voltage	VRP	-	-	100	mVp-p	

\*1: Effective value (mArms) at VDD=3.3V

Typical value under 8-color-bar displaying condition.

Please consult, when there is inrush current exceeding 500mA at the time of a power supply injection.

## SEQUENCE FOR POWER-ON/OFF AND SIGNAL ON/OFF



\*2: The time regulations from T1 to T5 are defined as a changing point 10% of the amplitude of "Input signal" and "Power", and 90%.

\*3: In case handling

Make sure to turn off the power when you plug the cable to the input connector and pull the cable out from the connector.

## TIMING SPECIFICATION

Item		Symbol	Min.	Typ.	Max.	PAL Drive <sup>*1</sup>	Unit	Remarks
CLK Clock	frequency	Fck	-	25.175	-	25.175	MHz	
	Period	Clk	-	39.72	-	39.72	us	
	High Time	Tch	12	-	-	MIN : 12	ns	
	Low Time	Tcl	12	-	-	MIN : 12	ns	
DATA Data	Setup Time	Tds	5	-	-	MIN : 5	ns	
	Hold Time	Tdh	10	-	-	MIN : 10	ns	
DE Data Enable	Setup Time	Tes	5	-	-	MIN : 5	ns	
	Hold Time	Teh	10	-	-	MIN : 10	ns	
Hs Horizontal Sync.	Setup Time	Ths	5	-	-	MIN : 5	ns	
	Hold Time	Thh	10	-	-	MIN : 10	ns	
	Period	Th	700	800	832	800	clk	
	Pulse Width	Thp	4	96	-	96	clk	
	Front Porch	Thf	-	13	-	13	clk	
	Back Porch	Thb	7	51	-	51	clk	
Vs Vertical Sync.	Period	Tv	516	525	534	625	th	
			16.2	16.7	17.6	19.875	ms	
	Pulse Width	Tvp	1	2	-	2	th	
	Front Porch	Tvf	-	11	-	25	th	
Back Porch	Thb	4	32	-	38	th		
GSX1 Display period correction signal	Start Position	Thgs	-	-	-	738	clk	*2
	Pulse Width	Thgsw	-	-	-	990	clk	
DOFF1 Non-display period correction signal	Start Position	Thdo	-	-	-	800	clk	*2
	Pulse Width	Thdow	-	-	-	800	clk	

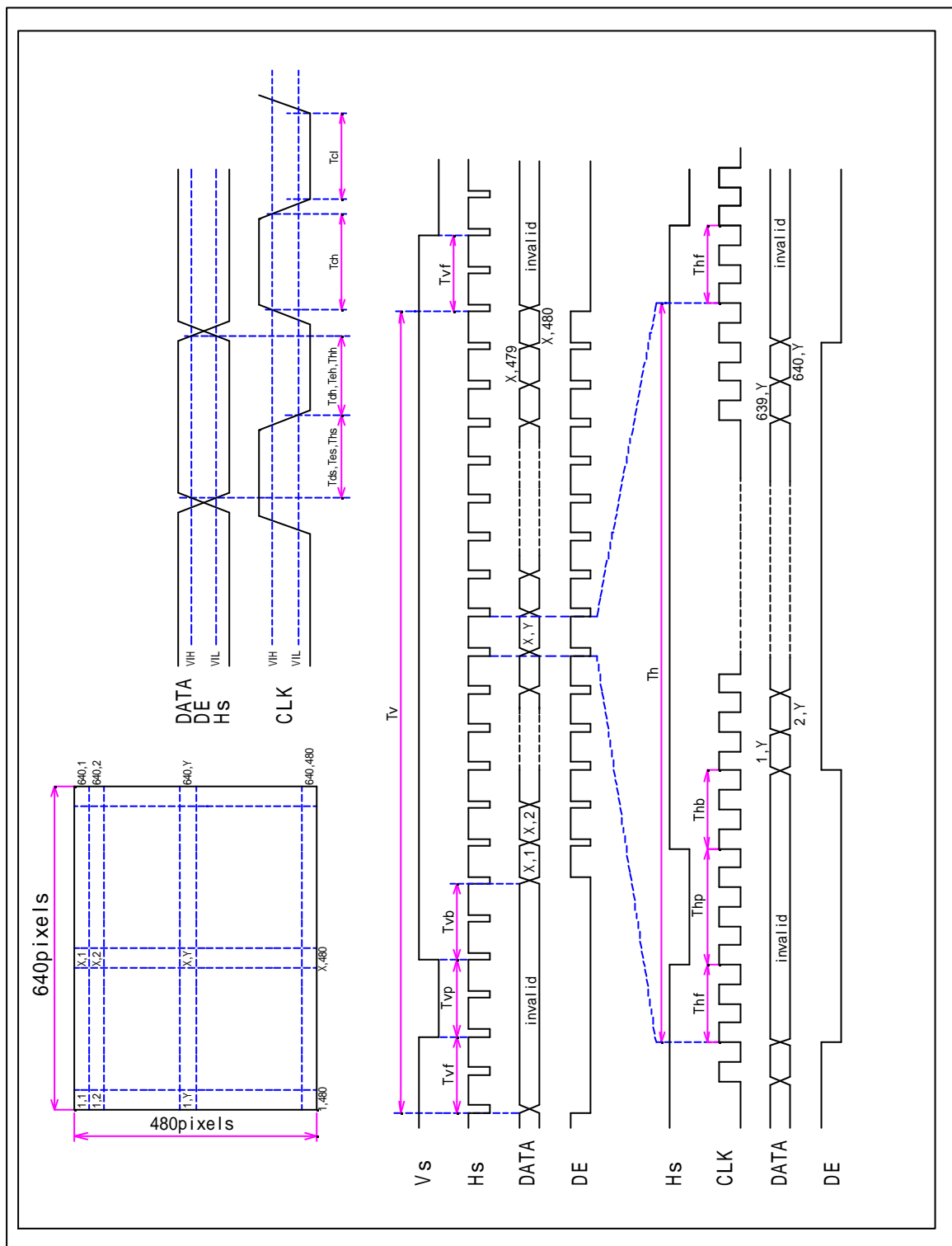
The timing of a clock signal is defined by the connector input terminal part.

\*1: PAL drive does not guarantee about the timing which does not follow above.

A flicker and quality of image may deteriorate a little by PAL drive. Please include in your set and check enough.

\*2: The start position of each correction signal is defined as the regulation from falling of DE signal before 1Hs of DE signal removed.

## TIMING CHART



\*1: DE Signal is defined as above timing concerning to the sync. signal of Vs and Hs. This LCD module is designed to be synchronized only by DE signal even when Vs and Hs are inputted. Therefore, make DE signal be low level by all means for the blanking period that effective data aren't inputted.

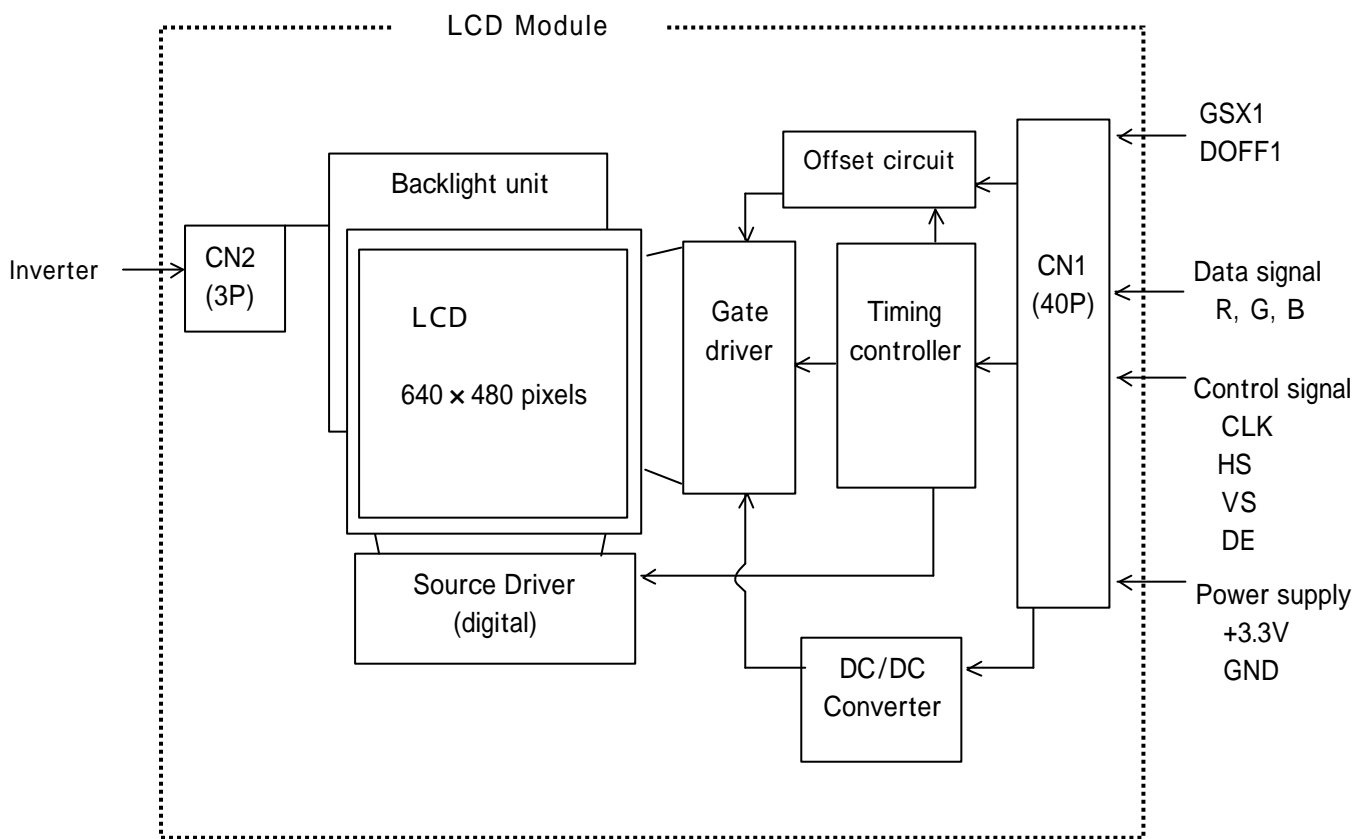


COLOR COMBINATION TABLE

	Display	R5 R4 R3 R2 R1 R0	G5 G4 G3 G2 G1 G0	B5 B4 B3 B2 B1 B0	Gray Scale Level
Basic Color	Black	L L L L L L	L L L L L L	L L L L L L	-
	Blue	L L L L L L	L L L L L L	H H H H H H	-
	Green	L L L L L L	H H H H H H	L L L L L L	-
	Light Blue	L L L L L L	H H H H H H	H H H H H H	-
	Red	H H H H H H	L L L L L L	L L L L L L	-
	Purple	H H H H H H	L L L L L L	H H H H H H	-
	Yellow	H H H H H H	H H H H H H	L L L L L L	-
	White	H H H H H H	H H H H H H	H H H H H H	-
Gray Scale of Red	Black	L L L L L L	L L L L L L	L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L H	L L L L L L	L L L L L L	L 1
		L L L L H L	L L L L L L	L L L L L L	L 2
		: :	: :	: :	L3...
		: :	: :	: :	L60
		H H H H L H	L L L L L L	L L L L L L	L61
	H H H H H L	L L L L L L	L L L L L L	L62	
	H H H H H H	L L L L L L	L L L L L L	Red L63	
Gray Scale of Green	Black	L L L L L L	L L L L L L	L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L	L L L L L H	L L L L L L	L 1
		L L L L L L	L L L L H L	L L L L L L	L 2
		: :	: :	: :	L3...
		: :	: :	: :	L60
		L L L L L L	H H H H L H	L L L L L L	L61
	L L L L L L	H H H H H L	L L L L L L	L62	
	L L L L L L	H H H H H H	L L L L L L	Green L63	
Gray Scale of Blue	Black	L L L L L L	L L L L L L	L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L L	L L L L L L	L L L L L H	L 1
		L L L L L L	L L L L L L	L L L L H L	L 2
		: :	: :	: :	L3...
		: :	: :	: :	L60
		L L L L L L	L L L L L L	H H H H L H	L61
	L L L L L L	L L L L L L	H H H H H L	L62	
	L L L L L L	L L L L L L	H H H H H H	Blue L63	
Gray Scale of White & Black	Black	L L L L L L	L L L L L L	L L L L L L	L 0
	Dark ↑ ↓ Light	L L L L L H	L L L L L H	L L L L L H	L 1
		L L L L H L	L L L L H L	L L L L H L	L 2
		: :	: :	: :	L3...
		: :	: :	: :	L60
		H H H H L H	H H H H L H	H H H H L H	L61
	H H H H H L	H H H H H L	H H H H H L	L62	
	H H H H H H	H H H H H H	H H H H H H	White L63	

\*1: This LCD module can display 262,144 colors because the each of R,G,B signals has 6bits information which represents 64 step brightness levels.

## BLOCK DAIGRAM





**BACKLIGHT**

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lamp current	$I_{FL}$	4.0	7.0	7.5	mArms	
Lamp voltage	VL	-	480	-	Vrms	
Lamp power consumption	PL	-	3.36	-	Wrms	
Possible lighting frequency	FL	30	-	80	kHz	
Starting voltage	VS	1700	-	-	Vrms	Ta=-10°C
Life time	-	30000	-	-	Hour	$I_{FL}=7mA$
		50000	-	-		$I_{FL}=6mA$

## Attention)

- \*1 Panel surface temperature should be kept less than contents of "Absolute Maximum Ratings".
- \*2 Inverter should be designed to be subject to the conditions below:
  - (1) Both the area and the peak under the positive and negative cycles of the waveform of the lamp current and lamp voltage should be symmetric.  
(The symmetric ratio should be larger than 90%)
  - (2) There should not be any spikes in the waveform.
  - (3) The waveform should be close to a sine wave whenever possible.
  - (4) Lamp current should not exceed the "MAX" value under the "Operating Temperature"(It is prohibited to exceed the "MAX" value even if it is operated in the non-guaranteed temperature). When lamp current exceed the maximum value for a long time, it may cause a smoking and ignition. Therefore, it is recommended that the inverter have the current limited circuit that is used as a protection circuit and/or the lamp current-controlled inverter.
  - (5) Please check the lamp current not to exceed the "MAX" value in the inverter open/short test.
  - (6) The "MIN" of "Lamp current " is the necessary value that must not be applied to the product for a stable working condition.  
Please pay attention to keep the "MIN" of "Lamp current" for a light dimmer.
- \*3 The lamp frequency should be selected as different as possible from display horizontal synchronous signal (Including harmonic frequency of this scanning frequency) to avoid "Beat "interference which may be observed on the screen as horizontal stripes like moving wave.  
This phenomenon is caused by interference between lamp (CCFL) lighting frequency and LCD horizontal synchronous signal.
- \*4 "Life time" is defined as a lamp maker's warranty value which applied to CCFL only.  
"Life time" is defined as the lamp brightness decrease to 50% original brightness at  $I_L=MAX$ ; continuous lighting,  $T_a=25^{\circ}C$ .
- \*5 Values of "Lamp Voltage", "Lamp power consumption" and "Starting voltage" are defined on condition of the LCD module derived by Toshiba Matsushita Display Technology Co., Ltd. standard inverter (Harison HIU-742A; 16.5pF).  
The "MIN" of "Starting voltage "means the minimum voltage to light normally in the LCD module.  
However this isn't the value that we can assure stability of starting lamp on condition that the module is installed in your set.  
It is careful that "Starting voltage" is changed by an increase of stray capacitance in your set, inverter method, value of ballast capacitor in your inverter and so on.  
Especially, the value of "Starting voltage" is higher in low temperature condition than in normal temperature condition, because impedance of CCFL is increased.  
So, please check your set in low temperature condition.

- \*6 Please do not bring the high voltage wire into contact with metallic frame and the GND lead wire, so as to ensure the safety and decrease the difference of brightness.
- \*7 Inverter output voltage should be stopped automatically and simultaneously when open-circuit or short-circuit happened between the inverter output and CCFL. (Please design the inverter that has shutdown function in case of no load for inverter output.) Continuous voltage output from the inverter under the open or short circuit may cause excessive leak current and overheat.

**However inverter output voltage is required to remain for on-condition at least 3 seconds, because CCFL needs 1 or 2 seconds as start-up time.**

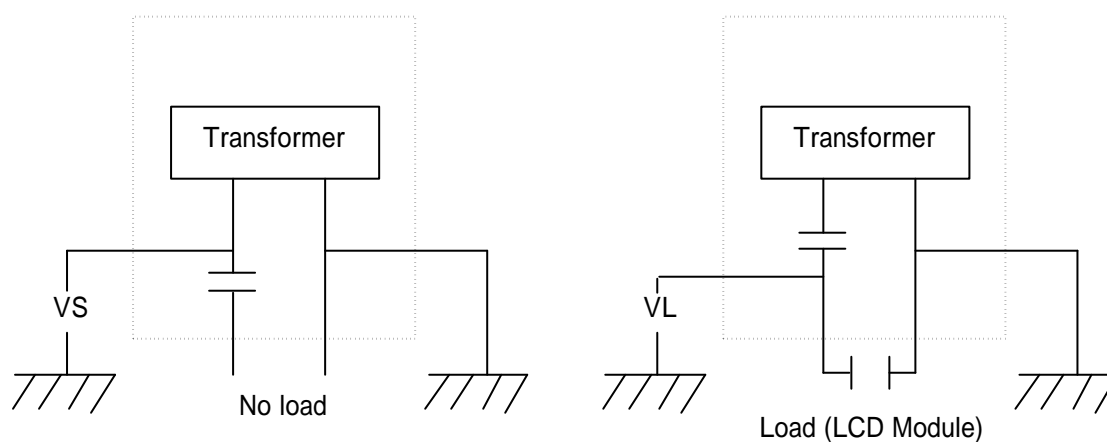
- \*8 "Starting Voltage" and "Lamp voltage" are defined as follows.

(1) Starting voltage

\*Use inverter: HIU-742A; 16.5pF

(2) Lamp voltage

\*Use inverter: HIU-742A; 16.5pF



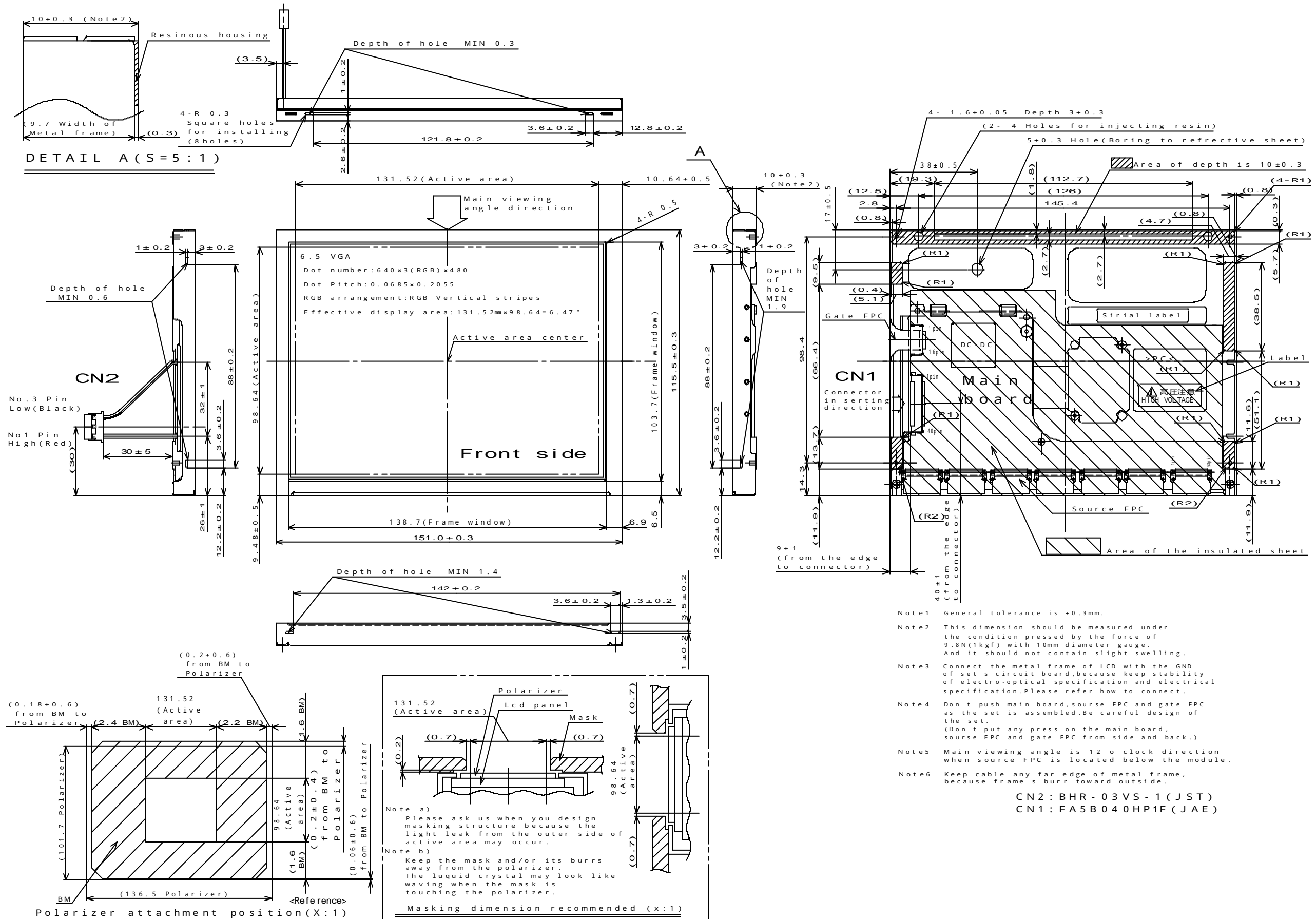
Lamp connector (CN2)

Connector: BHR-03VS-1 (JST Y J.S.T. Mfg. Co., Ltd.)

Mating connector: SM02 (8.0) B-BHS-1 / J.S.T. Mfg. Co., Ltd.

Pin No.	Symbol	Function	Remarks
1	H	CCFL Power supply (High Voltage)	Cable color: Red
2	NC	-	-
3	L	CCFL power supply (Ground)	Cable color: Black

DIMENSIONAL OUTLINE (REFERENCE)



**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 safety precautions detailed in Engineering Information No.EE-N001,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY LCD MODULES". Refer to individual specifications and TECHNICAL DATA sheets (hereinafter called "TD") for more detailed technical information.

**1) SPECIAL PURPOSES**

A) Toshiba Matsushita Display Technology'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 Toshiba Matsushita Display Technology'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 that exceed Toshiba's published specification limits.

C) In addition, since Toshiba Matsushita Display Technology's 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 (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-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.

Toshiba Matsushita Display Technology does not warrant the module, if customer disassembled or modified it.

**3) BREAKAGE OF LCD PANEL**

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT CONTACT 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 cloths, 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 in order to prevent electric shock, because high voltage is supplied to these parts 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 for each system design.

**7) RECOMMENDED OPERATION CONDITIONS**

The performance and quality of the LCD panel are warranted only when the LCD panel is used within "the recommended operation conditions". Toshiba Matsushita Display Technology Co., Ltd. never warrants the performance and quality of the LCD panel when you use the LCD panel over "the recommended operation conditions", although within "the absolute maximum rating".

To use the LCD panel over "the recommended operation conditions" may have bad influence on the characteristics and reliability of the LCD panel and may shorten the life of the LCD panel.

Therefore, when designing the whole set, not to be over "the recommended operation conditions", you should fully take care of supply voltage change, characteristic of connection parts, surge of input-and-output line, and surrounding temperature.

**8) DISPOSAL**

When dispose LCD module, obey to the applicable environmental regulations.