

LQ038Q5DR01 LCD Module

Product Specification

February 2010

QVGA module featuring very wide temperature range and very wide temperature tolerance, along with improved shock and vibration resistance. Brightness is 450 nits with contrast of 100:1.

Full Specifications Listing

PREPARED BY : DATE	SHARP	SPEC No. LD-22113
APPROVED BY : DATE		FILE No.
		ISSUE : Feb. 3. 2010
	MOBILE LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION	PAGE : 25 pages
	SPECIFICATION	APPLICABLE GROUP MOBILE LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ038Q5DR01

These parts have corresponded with the RoHS directive.

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED BY *J. Kawanishi*

J. KAWANISHI
DEPARTMENT GENERAL MANAGER
ENGINEERING DEPARTMENT I
MOBILE LIQUID CRYSTAL DISPLAY DIVISION II
MOBILE LIQUID CRYSTAL DISPLAY GROUP
SHARP CORPORATION

NOTICE

This publication is the proprietary of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

The application circuit examples in this publication are provided to explain the representative applications of SHARP's devices and are not intended to guarantee any circuit design or permit any industrial property right or other rights to be executed. SHARP takes no responsibility for any problems related to any industrial property right or a third party resulting from the use of SHARP's devices, except for those resulting directly from device manufacturing processes.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP's device.

SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structures and other contents described herein at any time without notice in order to improve design or reliability. Contact SHARP in order to obtain the latest specification sheets before using any SHARP's device. Manufacturing locations are also subject to change without notice.

Observe the following points when using any device in this publication. SHARP takes no responsibility for damage caused by improper use of the devices.

The devices in this publication are designed for use in general electronic equipment designs, such as:

- Personal computers • Office automation • Telecommunication equipment
- Test and measurement equipment • Industrial control • Personal Digital Assistant
- Audio visual and multimedia equipment • Consumer electronics

The appropriate design measures should be taken to ensure reliability and safety when SHARP's devices are used for equipment such as:

- Transportation control and safety equipment(i.e. aircraft, trains, automobiles, etc.)
- Traffic signals • Gas leakage sensor breakers
- Alarm equipment • Various safety devices etc.

SHARP's devices shall not be used for equipment that requires extremely high level of reliability, such as:

- Military and space applications • Nuclear power control equipment
- Medical equipment for life support

Cold cathode fluorescent lamp in devices contains a small amount of mercury.
Please follow local ordinances or regulations for disposal.

Contact a SHARP representative, in advance, when intending to use SHARP's devices for any "specific" applications other than those recommended by SHARP.

Contact and consult with a SHARP representative if there are any questions about the contents of this publication.

(1) Application

This specification literature applies to color TFT-LCD module ,LQ038Q5DR01.

(2) Summary And Features

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor).

It is composed of a color TFT-LCD panel, driver ICs, control-PWB, FPC, frame, front shielding case, back-light unit.

Graphics and texts can be displayed on a 320×3×240 dots panel with 262,144 colors by supplying.

DC/AC inverter isn't composed.

The 3.8 screen produces a high resolution image that is composed of 76,800 pixel elements in a stripe arrangement.

Wide viewing angle technology is employed. (The most suitable viewing angle is in the 6 o'clock direction.)

By adopting an active matrix drive, a picture with high contrast is realized.

Through the use of TN-normally white mode, an image with highly natural color image is realized.

An inverted video display in the vertical and horizontal directions is possible.

This module is adapted to RoHS compliance.

(3) Mechanical Specifications

table 3-1

Parameter	Specifications	Units	Remarks
Display format	76,800	pixels	
	320(W) × RGB × 240(H)	dots	
Active area	78.72 (W) × 53.64 (H)	mm	
Screen size (Diagonal)	9.6 [3.8"]	cm	
Dot pitch	0.082 (W) × 0.2235 (H)	mm	
Pixel configuration	R,G,B Stripe configuration		
Outline dimension	117.6(W)×69.45(H)×13.45(D)	mm	【Note3-1】
Mass	Max.135	g	

【Note 3-1】

Typical values are given. For detailed measurements and tolerances, please refer to Fig. 1.

(4) Input Terminal

4-1) TFT-LCD Panel Driving Part

Used connector: KX14-40K5D-VIE (JAE Co. , Ltd)

Fit connector : KX15-40KLDLE (JAE Co. , Ltd)

Table 4-1 CN1

Pin No.	Symbol	Description	Remarks
1	GND	ground	
2	VCC	Power supply voltage	
3	Hsync	Horizontal synchronous signal	【Note4-1】
4	G3	GREEN data signal	
5	T0	thermistor output1	
6	G4	GREEN data signal	
7	T1	thermistor output2	
8	G5	GREEN data signal(MSB)	
9	HVR	Selection for horizontal and vertical scanning direction	【Note4-3】
1 0	GND	ground	
1 1	GND	ground	
1 2	B0	BLUE data signal(LSB)	
1 3	CLK	Clock signal for sampling each data signal	
1 4	B1	BLUE data signal	
1 5	GND	ground	
1 6	B2	BLUE data signal	
1 7	R0	RED data signal(LSB)	
1 8	GND	ground	
1 9	R1	RED data signal	
2 0	B3	BLUE data signal	
2 1	R2	RED data signal	
2 2	B4	BLUE data signal	
2 3	GND	ground	
2 4	B5	BLUE data signal(MSB)	
2 5	R3	RED data signal	
2 6	GND	ground	
2 7	R4	RED data signal	
2 8	Vsync	Vertical synchronous signal	【Note4-1】
2 9	R5	RED data signal(MSB)	
3 0	TEST	Open use only	
3 1	GND	Ground	
3 2	TEST	Open use only	
3 3	G0	GREEN data signal(LSB)	
3 4	TEST	Open use only	
3 5	G1	GREEN data signal	
3 6	TEST	Open use only	
3 7	G2	GREEN data signal	
3 8	ENAB	Signal to settle the horizontal display position	【Note4-2】
3 9	VCC	Power supply voltage	
4 0	GND	ground	

【Note 4-1】

Hsync	positive
Vsync	positive

【Note 4-2】

The horizontal display start timing is settled in accordance with a rising timing of ENAB signal. In case ENAB is fixed "Low", the horizontal start timing is determined as described in Fig3-A. (Don't keep ENAB "High" during operation.(Fig3-B).)

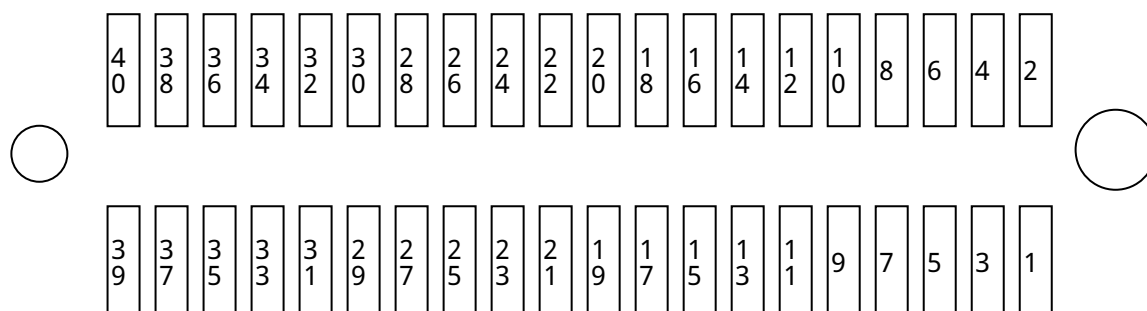
【Note 4-3】

HVR = "Low" : Regular video

HVR = "High" : Horizontally and Vertically inverted video

【Note 4-4】

The position of pin number



4-2) Back-light fluorescent tube driving part

Used connector:BHR-02(8.0)VS-1N(JST Co. ,Ltd)

Fit connctor:SM02(8.0)B-BHS-1N(JST Co. ,Ltd)

Table 4-2 CN2

No.	Symbol	i / o	Function	Color of FL cable
1	VL1	I	input terminal (High Voltage)	RED
2	VL2	I	input terminal (Low Voltage)	WHITE

Caution : Please use this thermistor in order to check the lamp temperature.

Model number of Thermistor : 203GT - 1 (made by Ishizuka electronics Corporation)

Zero load resistance value at 25 : 20.0kΩ± 3 %

(5)Absolute maximum ratings

Table 5-1

GND=0V

Parameter	Symbol	Min.	Max.	Unit	Note
Input voltage	V _I	- 0.3	VCC+0.3	V	【Note 5-1】 Ta=25
+3.3V power supply	VCC	0	5.5	V	Ta=25
Storage temperature	T _{stg}	- 40	+95		【Note 5-2】
Operating temperature (panel surface)	T _{opr1}	- 30	+85		【Note 5-2】
Operating temperature (Ambient temperature)	T _{opr2}	- 30	+60		【Note 5-2】

【Note 5-1】 CK,R0 ~ R5,G0 ~ G5,B0 ~ B5,Hsync,Vsync,ENAB,HVR

【Note 5-2】 Humidity:95%RH Max. at Ta 60

Maximum wet-bulb temperature is less than 58 . at Ta>60 .

Condensation of dew must be avoided as electrical current leaks will occur,

Causing a degradation of performance specifications.

(6)Electrical characteristics

6-1)TFT-LCD panel driving section

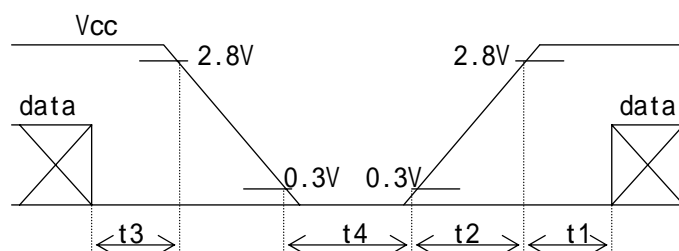
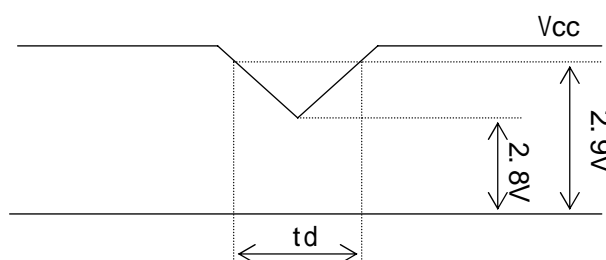
Table 6-1

GND = 0V , Ta = 25

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
+3.3V	Supply voltage	V _{CC}	+2.9	+3.3	+3.7	V	【Note 6-1】
	Current dissipation	I _{CC}	-	140	180	mA	【Note 6-2,3】
Permissive input ripple		V _{RF}	-	-	100	mV _{pp}	
Input Low voltage		V _{IL}	-	-	0.3V _{CC}	V	【Note 6-4】
Input High voltage		V _{IH}	0.7V _{CC}	-	-	V	
Input current (Low)		I _{IL}	-	-	1.0	μA	V _I =0V 【Note 6-5】
Input current (High)		I _{IH}	3.0	-	75	μA	V _I =V _{CC} 【Note 6-5】
Input current (Low)		I _{IL}	3.0	-	75	μA	V _I =0V 【Note 6-6】
Input current (High)		I _{IH}	-	-	1.0	μA	V _I =V _{CC} 【Note 6-6】
Input current (Low)		I _{IL}	6.0	-	150	μA	V _I =0V 【Note 6-7】
Input current (High)		I _{IH}	-	-	2.0	μA	V _I =V _{CC} 【Note 6-7】

【Note 6-1】

On-off conditions for supply voltage

0 < t₁ 10ms0 < t₂ 10ms0 < t₃ 1st₄ 1sV_{CC}-dip conditions1) 2.8V V_{CC} < 2.9Vt_d 10ms2) V_{CC} < 2.8VV_{CC}-dip conditions should also follow the on-off conditions.

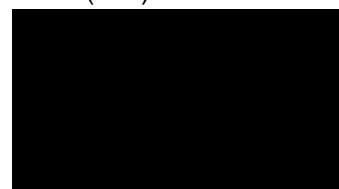
【Note 6-2】

Typical current situation: Black (GS0) pattern

Timing: Typical

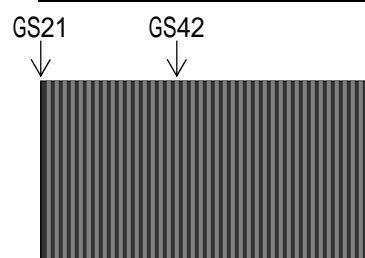
V_{CC} = +3.3 V

Black(GS0)



【Note 6-3】 Maximum current situation: Vertical stripe pattern alternating 21 gray scale (GS21) with 42 gray scale (GS42) every 1 dot.

Timing: Typical

V_{CC} = +3.3 V

【Note 6-4】 CK,R0 ~ R5,G0 ~ G5,B0 ~ B5,Hsync,Vsync,ENAB,HVR

【Note 6-5】 CK,R0 ~ R5,G0 ~ G5,B0 ~ B5,Hsync,Vsync

【Note 6-6】 ENAB

【Note 6-7】 HVR

6-2) Backlight driving section

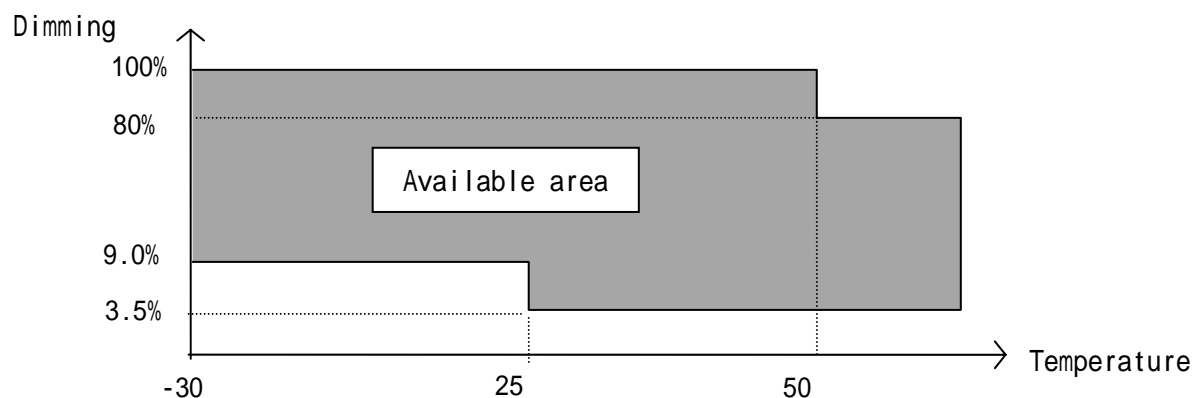
The backlight system is an edge-lighting type with single CCFT (Cold Cathode Fluorescent Tube). The characteristics of Lamp are shown in the following table.

Table 6-2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks	
lamp voltage	VL7	470	530	590	Vrms	IL = 5.5mArms	
lamp current	IL	5.0	5.5	6.0	mArms	ordinary state	
	ILB	-	-	9.0	mArms	PWM dimming state 【Note 6-8】	
lamp frequency	fL	30	-	60	kHz	【Note 6-9】	
kick-off voltage	VS	-	-	1650	Vrms	Ta=+25	【Note 6-10】
		-	-	1700	Vrms	Ta= - 30	

Inverter : HIU-288 [Harison Toshiba Lighting Corp.] (Output capacitor:22pF,frequency:49kHz)

【Note 6-8】 available area



Please turn on the lamp with symmetrical (negative and positive) voltage and current wave form. Don't use the unsymmetrical voltage and current wave which have spike wave.

【Note 6-9】 Lamp frequency may produce interference with horizontal synchronous frequency, and this may cause beat on the display. Therefore lamp frequency shall be detached as much as possible from the horizontal synchronous frequency and from the harmonics of horizontal synchronous to avoid interference.

【Note 6-10】 The open output voltage of the inverter shall be maintained for more than 1s; otherwise the lamp may not be turned on.

7) Timing Characteristics of input signals

Timing diagrams of input signal are shown in Fig.3-A, Fig.3-B.

7-1) Timing characteristics

Table 7-1

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Clock	frequency	1/Tc	4.5	6.3	6.8	MHz	
	High time	Tch	50	-	-	ns	
	Low time	Tcl	50	-	-	ns	
Data	Setup time	Tds	50	-	-	ns	
	Hold time	Tdh	50	-	-	ns	
Hsync-Clock phase difference		THc	50	-	120	ns	
Hsync-Vsync phase difference		TVh	0	-	TH-10	μs	

Note) In case of lower frequency, the deterioration of display quality, flicker etc., may be occurred.

7-2) Horizontal display position

In case ENAB is active

The horizontal display position is determined by ENAB signal and the input data corresponding to the rising edge of ENAB signal is displayed at the left end of the active area. (shown in Fig.3-A.)

Parameter		symbol	Min.	Typ.	Max.	Unit	Remark
Horizontal sync. signal	Cycle	TH	50	63.5	80	μs	
			THe+308	400	440	clock	
	Pulse width	THp	4	12	30	clock	
Enable signal	Setup time	Tes	50	-	Tc - 10	ns	
	Pulse width	Tep		320		clock	
Hsync-Enable signal phase difference		THe	14	-	72	clock	
Horizontal display period		THd	320	320	320	clock	

In Case ENAB is "Low" . (shown in Fig.3-B)

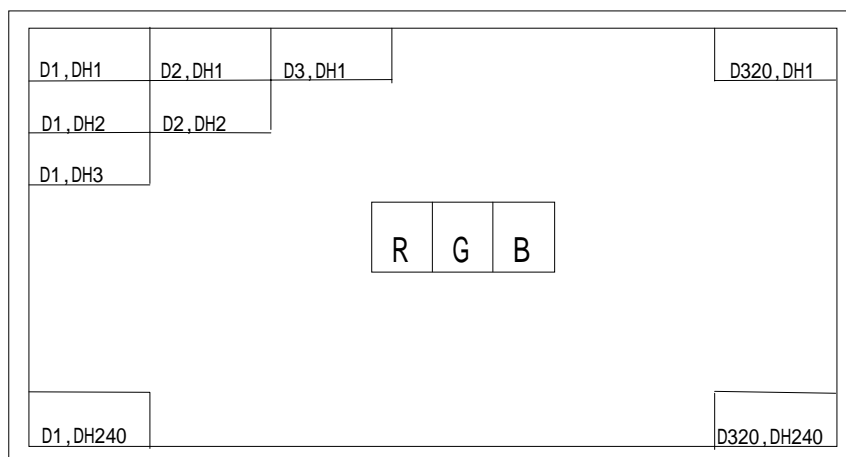
Parameter		symbol	Min.	Typ.	Max.	Unit	Remark
Horizontal sync. signal	Cycle	TH	56	63.5	80	μs	
			380	400	440	clock	
	Pulse width	THp	4	12	30	clock	
Hsync-data signal phase difference		THe	72	72	72	clock	
Horizontal display period		THd	320	320	320	clock	

7-3) Vertical Display Position

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Vertical sync. signal	Cycle	TV	246	263	330	line	
	Pulse width	TVp	1	-	-	line	
Vertical display start position		TVs	6	6	6	line	
Vertical display period		TVd	240	240	240	line	

ENAB signal has no relation to the vertical display position.

7-4) Input Data Signals And Display Position on The Screen



Display position of input data (H,V)

(8) Input Signals, Basic Display Color And Gray Scale of Each Color

	Colors & Gray scale	Data signal																		
		Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic color	Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	-	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	-	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	-	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	-	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale of red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓					↓					↓				
	↓	↓				↓					↓					↓				
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓					↓					↓				
	↓	↓				↓					↓					↓				
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	↓	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	↑	↓				↓					↓					↓				
	↓	↓				↓					↓					↓				
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	↓	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 :Low level voltage 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

(9)Optical Characteristics

Table 9-1

Ta=+25 , VCC=+3.3V

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks	
Viewing angle range	6	CR 5	60	65	-	degree	【 Note 9-1,4】	
	12		35	40	-	degree		
	3		60	65	-	degree		
	9							
Contrast ratio	CRmax	Optimum	100	-	-		【 Note 9-2,4】	
Response time	Rise	= 0 °	-	30	60	ms	【 Note 9-3,4】	
	Fall		-	50	100	ms		
Luminance	Y	IL=5.5mA _{rms}	350	450	-	cd/m ²	【 Note 9-5】	
White chromaticity	x	IL=5.5mA _{rms}	0.263	0.313	0.363		【 Note 9-5】	
	y		0.279	0.329	0.379			
Lamp life time (Reference value)	+25	-	continuation	20,000	-	-	hour	【 Note 9-6】
	- 30	-	intermission	2,000	-	-	times	【 Note 9-7】

DC/AC inverter for external connection shown in following.

Inverter : HIU-288 [Harison Tosihba Lighting Corp.] (Output capacitor:22pF,frequency:49kHz)
measuring after 30minutes

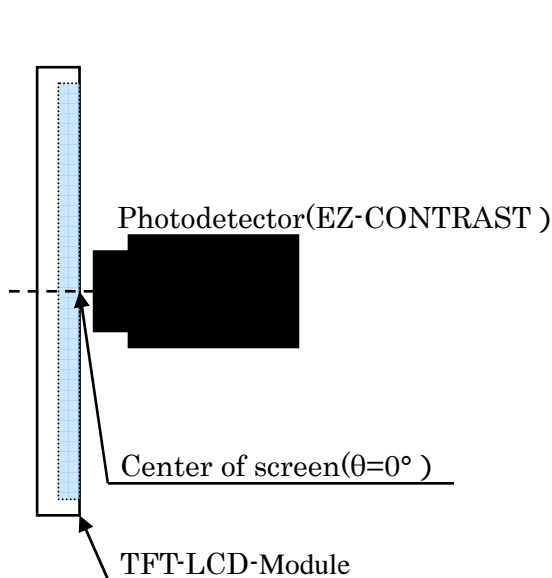


Fig.9-1) Viewing Angle Measurement Method

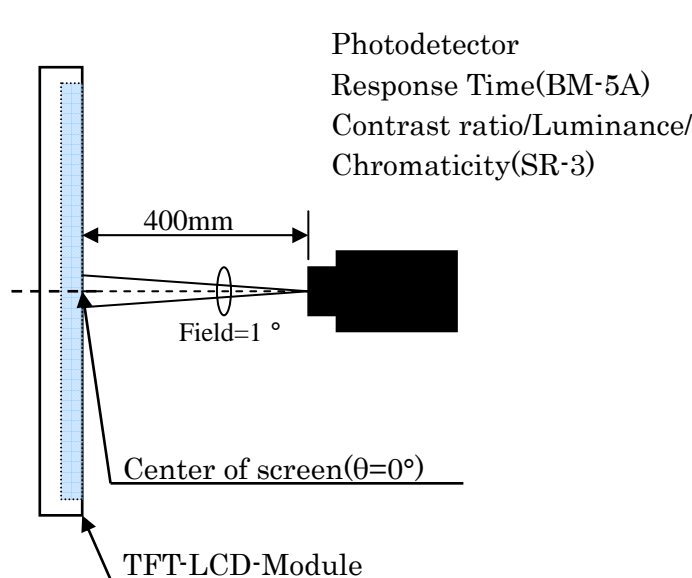
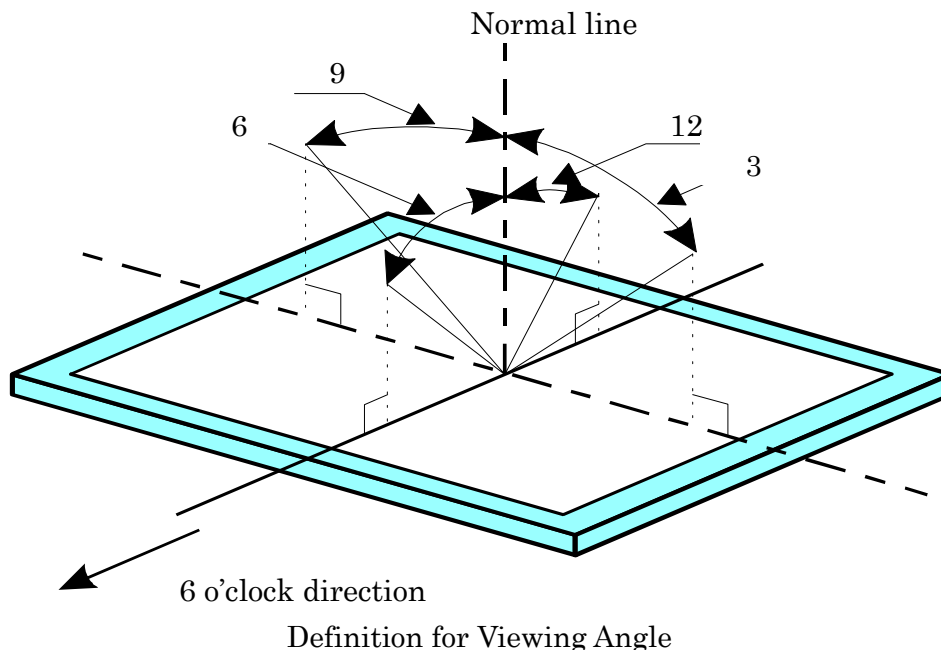


Fig.9-2) Luminance / Contrast ratio / Response time Chromaticity Measurement Method

Fig.9 Optical Characteristics Measurement Method

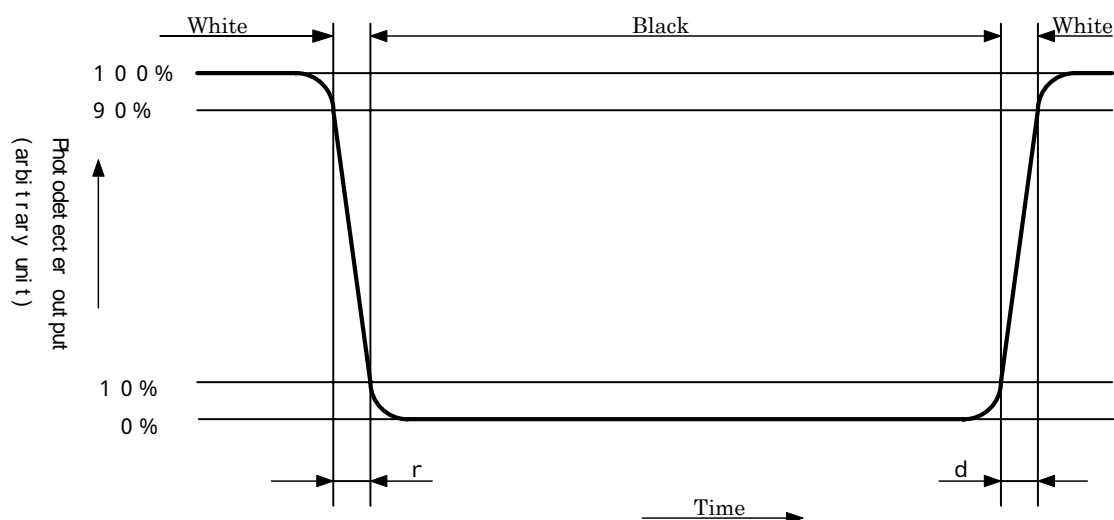
【Note 9-1】 Viewing angle range is defined as follows.



【Note 9-2】 Contrast ratio is defined as follows:

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"}}{\text{Photo detector output with LCD being "black"}}$$

【Note 9-3】 Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".



【Note 9-4】 Measured on the center area of the panel at a viewing cone 2°(= Filed) by TOPCON luminance meter BM-5A, SR-3 or ELDIM luminance meter EZ Contrast.
(After 30 minutes operation)
DC/AC inverter driving frequency:(49 kHz)

【Note 9-5】 Measured on the center area of the panel at a viewing cone 1°(= Filed) by TOPCON luminance meter BM-5A, SR-3.(After 30 minutes operation)
DC/AC inverter driving frequency:(49 kHz)

【Note 9-6】 Lamp is consumables. In the following condition, the lamp life time is 20,000 hours as the reference value and it is not guaranteed in this specification sheet by SHARP.

Lamp life time is defined that it applied either or under this condition.

Continuous turning on at $T_a = 25^\circ\text{C}$, $I_L = 5.5\text{mA rms}$ and PWM dimming 80%~5% ($I_L = 9.0\text{mA rms}$ $T_a = 25^\circ\text{C}$).

Brightness becomes 50% of the original value under standard condition.

Kick-off voltage at $T_a = -30^\circ\text{C}$ exceeds maximum value (1700Vrms).

Lamp life time shortens according to the state of mounting and use.

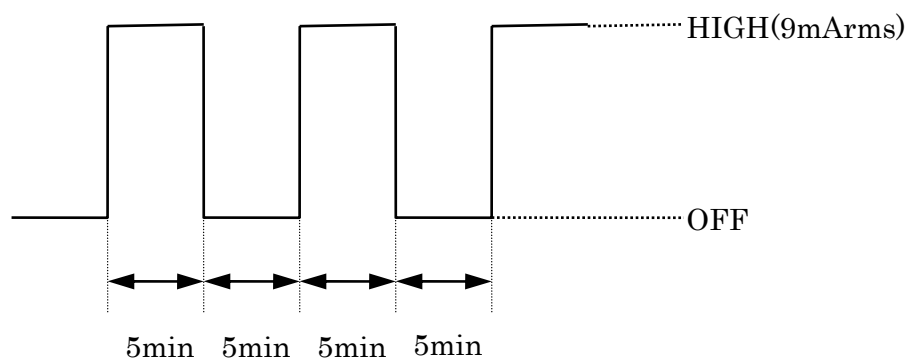
In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.

Continuous operating for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.

In case of such usage under lower temp environment, periodical lamp exchange is recommended.

【Note 9-7】 The intermittent cycles is defined as a time when brightness not to become under 50% of the original value under the condition of following cycle.

Ambient temperature : -30°C



Don't use the unsymmetrical voltage and current wave which have spike wave.

【Note 9-8】 The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp.

When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occur. when you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Be sure to use a back light power supply with the safety protection circuit such as the detection circuit for the excess voltage, excess current and or electric discharge waveform.

【Note 9-9】 Please make it to the structure not touching directly insulating the high voltage part.

Please stop the circuit by the protection element such as fuses for generation of heat and the ignition prevention, and use a flame resisting and high material for the substrate and the resin material.

【Note 9-10】 Under the environment of 10lx or less, miss-lighting delay may occur.

(10) Mechanical Characteristics

10-1) External Appearance

Do not exist extreme defects. (See Fig. 1)

10-2) Panel Toughness

The panel shall not be broken ,when 19N is pressed on the center of the panel by a smooth sphere having 15 mm diameter.

Caution : In spite of very soft toughness, if, in the long-term, add pressure on the active area, it is possible to occur the functional damage.

10-3) Input / Output Connector Performance

I/O connector of backlight driving circuit 【JST】

Lump connector

Symbol	Used Connector	Corresponding Connector
CN A, B	BHR-02(8.0)VS-1N	SM02(8.0)B-BHS-1N(assembled on PWB)
		SM02(8.0)B-BHS-TB(assembled on PWB)
		BHMR-03V (interconnector)

(11) Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standards for TFT-LCD.

(12) Handling Instructions

12-1) Mounting of Module

The TFT-LCD module is designed to be mounted on equipment using the mounting tabs in the four corners of the module at the rear side.

Connect GND to these mounting tabs to stabilize against EMI and external noise.

On mounting the module, as the M2.6 tapping screw fastening torque is 0.3 through 0.5N·m is recommended, be sure to fix the module on the same plane, taking care not to wrap or twist the module.

Don't reach the pressure of touch-switches of the set side to a module directly, because images may be disturbed.

Please power off the module when you connect the input/output connector.

Please connect the metallic shielding cases of the module and the ground pattern of the inverter circuit surely. If that connection is not perfect, there may be a possibility that the following problems happen.

- a). The noise from the backlight unit will increase.
- b). The output from inverter circuit will be unstable. Then, there may be a possibility that some problems happen.
- c). In some cases, a part of module will heat.
- d). Please taking care to pull back-light's cable, when you connect the back-light cable's connector.

12-2) Precautions in Mounting

Polarizer which is made of soft material and susceptible to flaw must be handled carefully. Protective film (Laminator) is applied on the surface to protect it against scratches and dirties. It is recommended to peel off the laminator immediately before the use, taking care of static electricity.

Precautions in peeling off the laminator

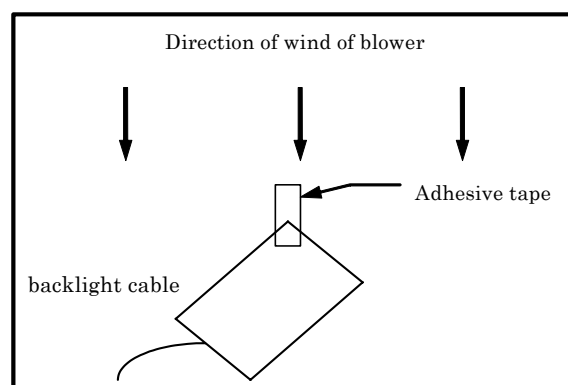
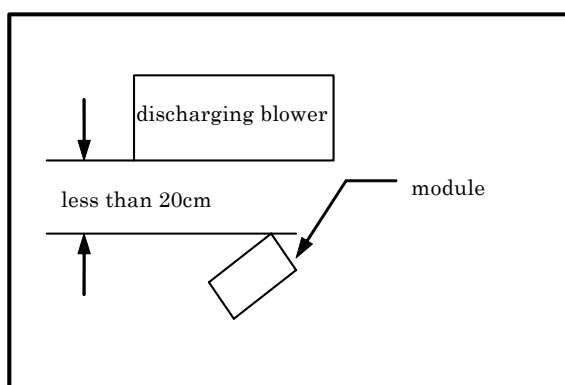
A) Working Environment

When the laminator is peeled off, static electricity may cause dust to stick to the polarizer surface. To avoid this, the following working environment is desirable.

- a) Floor : Conductive treatment of 1M or more on the tile
(conductive mat or conductive paint on the tile)
- b) Clean room free from dust and with an adhesive mat on the doorway.
- c) Advisable humidity : 50% ~ 70% Advisable temperature : 15 ~ 27
- d) Workers shall wear conductive shoes, conductive work clothes, conductive gloves and an earth band.

B) Working Procedures

- a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently. Keep the distance between module and discharging blower within 20 cm.
- b) Attach adhesive tape to the laminator part near discharging blower so as to protect polarizer against flaw.
- c) Peel off laminator, pulling adhesive tape slowly to your side taking 5 or more second.
- d) On peeling off the laminator, pass the module to the next work process to prevent the module to get dust.
- e) Method of removing dust from polarizer
 - Blow off dust with N₂ blower for which static electricity preventive measure has been taken.
 - Since polarizer is vulnerable, wiping should be avoided.



C) How to remove dust on the polarizer

- a) Blow out dust by the use of an N₂ blower with antistatic measures taken. Use of an ionized air Gun is recommendable.
- b) When the panel surface is soiled, wipe it with soft cloth.

D) In the case of the module's metal part (shield case) is stained, wipe it with a piece of dry, soft cloth. If rather difficult, give a breath on the metal part to clean better.

- E) If water dropped, etc. remains stuck on the polarizer for a long time, it is apt to get discolored or cause stains. Wipe it immediately.
- F) As a glass substrate is used for the TFT-LCD panel, if it is dropped on the floor or hit by something hard, it may be broken or chipped off.
- G) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.

12-3) Precautions in Adjusting module

Adjusting volumes on the rear face of the module have been set optimally before shipment. Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described here may not be satisfied.

12-4) Caution of Product Design

The LCD module shall be protected against water salt-water by the waterproof cover. Please take measures to interferential radiation from module, to do not interfere surrounding appliances. The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

12-5) Others

- A) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment. The panel characteristic might be deteriorated and the display fineness decrease when strong light is irradiated to the liquid crystal panel.
- B) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to electrical shock. When exchange lamps or service, turn off the power without fail.
- C) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.
- D) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter, or line processing.
- E) The lamp used for this product is very sensitive to the temperature. Luminance decreases rapidly when it is used for a long time or repeatedly under the environment of the low temperature or the module is being cooled. Please avoid the continuous or repeating use of it under such an environment. It may decrease up to 50% of the initial luminance in about one month under the low temperature environment. Please consult our company when it is used under the environment like the above mentioned.
- F) If stored at temperatures below the rated values, the inner liquid crystal may freeze, causing cell destruction. At temperatures exceeding the rated values for storage, the liquid crystal may become isotropic liquid, making it no longer possible to come back to its original state in some cases.
- G) If the LCD is broken, do not drink liquid crystal in the mouth. If the liquid crystal adheres to a hand or foot or to clothes, immediately cleanse it with soap.
- H) If a water drop or dust adheres to the polarizer, it is apt to cause deterioration. Wipe it immediately.
- I) Be sure to observe other caution items for ordinary electronic parts and components.
- J) When handling LCD modules and assembling them into cabinets, that long-terms storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent,

solvent, adhesive, resin, etc. which generate these gasses, causes corrosion and discoloration of the modules. Therefore, please avoid these use. Epoxy resin (amino series curing agent), silicone adhesive material (dealcoholization series and oxime series), Tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration. Be sure to confirm the component of them.

- K) In case of attaching protective board (or tatch-panel, etc) over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
- L) The LED used for thes product is very sensitive to the temperature. Luminance decreases rapidly when it issued for a long time under the environment of the high temperature. Please consult our company when it is used under the environment like the above mentioned.
- M) Please be careful that you don't keep the screen displayed fixed pattern image for a long time, since retention may occur.
- N) Disassembling the module can cause permanent damage and you should be strictly avoided. Please don't remove the fixed tape, insulating tape etc that was pasted on the original module.(Except for protection film of the panel.)
- O) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.
- P) VCOM value have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
- Q) Be sure to use a power supply with the safety protection circuit such as the fuse for the excess voltage, excess current and or electric discharge waveform.
- R) If you pressed down a liquid crystal display screen with your finger and so on, the alignment disorder of liquid crystal will occur. And then It will become display fault. Therefore, be careful not to touch the screen directly, and to consider not stressing to it.
- S) If any problem arises regarding the items mentioned in this specification sheet or otherwise, it should be discussed and settled mutually in a good faith for remedy and/or improvement.

(13) Packing Form (shown in Fig.4.)

Piling number of cartons	: MAX 10
Package quantity in one carton	: 50 pcs
Carton size	: 503 (W)×166 (H)×338 (D) mm
Total mass of one carton filled with full modules	: MAX. 7.5kg

Conditions for storage.

Environment

Temperature : 0 ~ 40

Humidity : 60%RH or less (at 40)

No dew condensation at low temperature and high humidity.

Atmosphere : Harmful gas, such as acid or alkali which bites electronic components and/or wires, must not be detected.

Direct sunshine : Please keep it in the state of wrapping or the darkroom so that direct sunshine should not strike directly into the product.

Asking for be dewy prevention

- Please do not put directly on the floor, and keep the wrapping box on the palette or the stand to avoid the be dewy. Moreover, please arrange it in a constant direction correctly to improve ventilation under the palette.
- Please separate from the wall in the storage warehouse and keep it.

- Please note that ventilation is improved and consider the installation such as ventilators in the warehouse.
- Please manage so that there is no rapid temperature change more than natural environment.

Period : about 3 months

Opening of the package : In order to prevent the LCD module from breakdown electrostatic charges, please control the room humidity over 50%RH and open the package taking sufficient countermeasures against electrostatic charges, such as earth, etc.

(14) Reliability Test

Reliability test conditions for the TFT-LCD module are shown in Table 14.

(15) Indication of Lot Number

Attached location of the label : See Fig. 1

Indicated contents of the label

LQ038Q5DR01 M

model No.

lot No.

Contents of lot No.	the 1st figure	production year (ex. 2010 : 0)
	the 2nd figure	production month 1,2,3, ,9,X,Y,Z
	the 3rd ~ 8th figure	serial No. 000001 ~
	the 9th figure	revision marks A,B,C

Reliability Test Conditions for TFT-LCD Module

Table 14

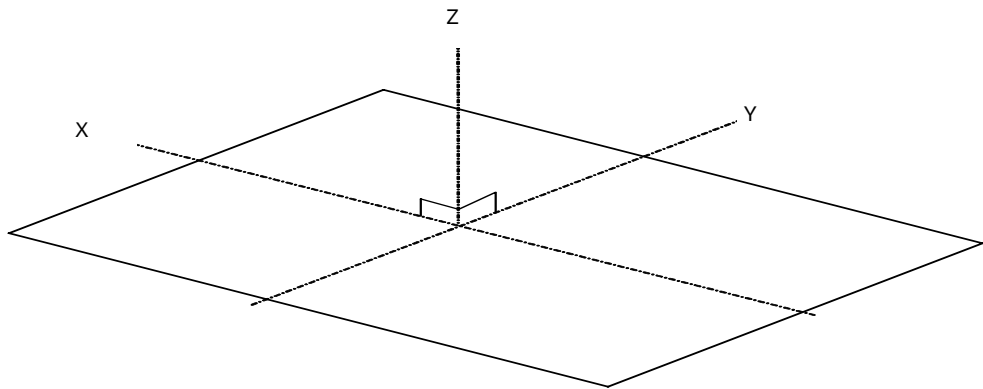
Remark) Temperature condition is based on operating temperature conditions on (5)-Table 5-1.

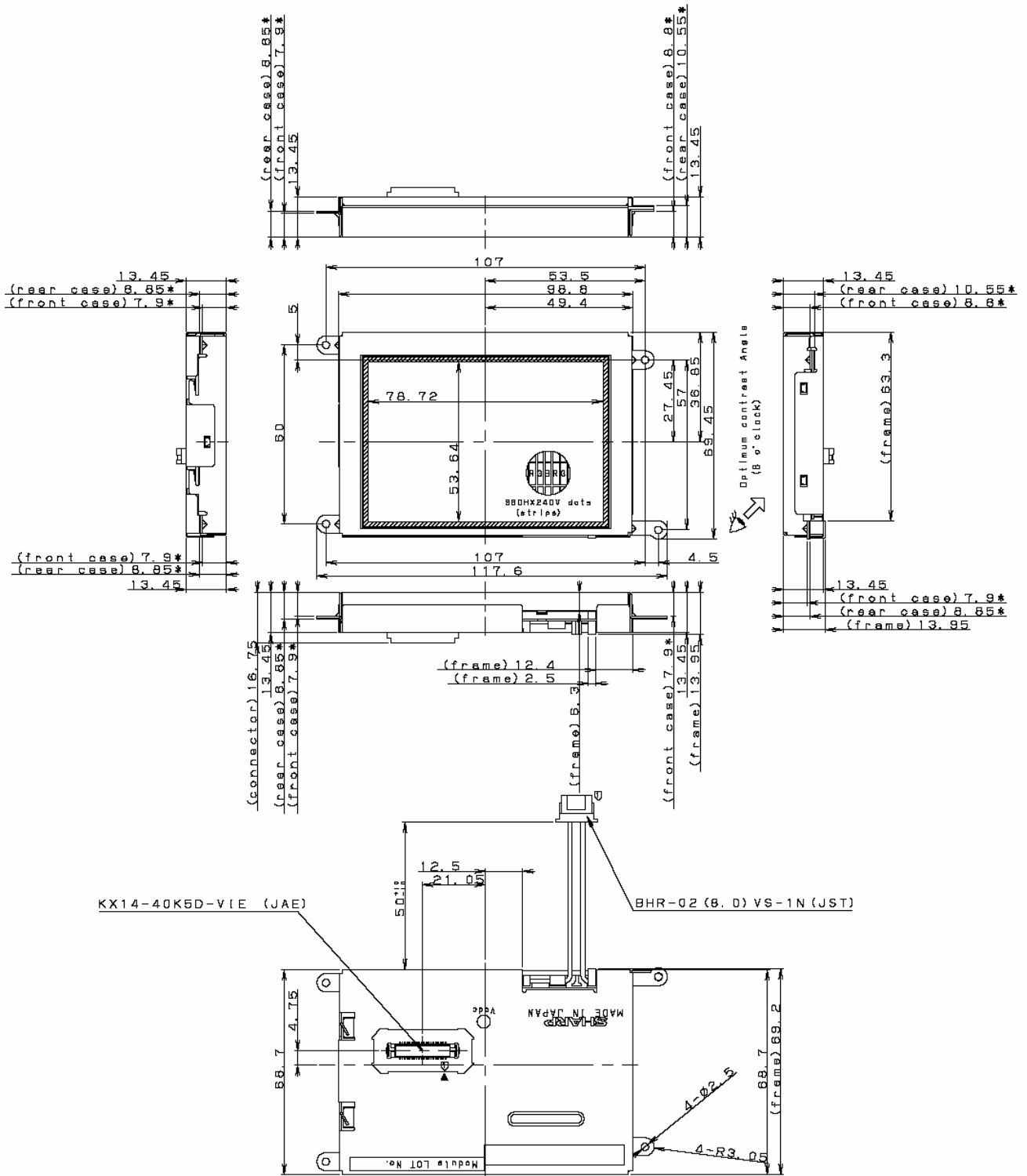
No.	Test items	Test Conditions
1	High temperature storage test	$T_a = +95$ 240h
2	Low temperature storage test	$T_a = -40$ 240h
3	High temperature and high humidity operating test	$T_p = +60$, 95%RH 240h
4	High temperature operating test	$T_p = +85$ 240h
5	Low temperature operating test	$T_a = -30$ 240h
6	Electro static discharge test	$\pm 200V \cdot 200pF(0$) 1 time for each terminals
7	Shock test	$980m/s^2 \cdot 6ms, \pm X ; \pm Y ; \pm Z$ 3 times for each direction (JIS C0041, A-7 Condition C)
8	Vibration test	Frequency range : 8 ~ 33.3Hz Stroke : 1.3mm Sweep : 33.3Hz ~ 400Hz Acceleration : $28.4m/s^2$ Cycle : 15 minutes X,Z 2 hours for each directions, 4 hours for Y direction (total 8 hours) 【caution】(JIS D1601)
9	Heat shock test	$T_a = -40 \sim +95$ / 200 cycles (0.5h) (0.5h)

【Note】 T_a = Ambient temperature, T_p = Panel temperature

【Check items】 In the standard condition, there shall be no practical problems that may affect the display function.

【caution】 X,Y,Z directions are shown as follows:





note1) General tolerance is ± 0.3
 note2) Unit is mm
 note3) The dimension marked * shows the base of mounting tab

OUTLINE DIMENSIONS of LQ038Q5DR01

2005. 8. 3
 No: LCM-00040A

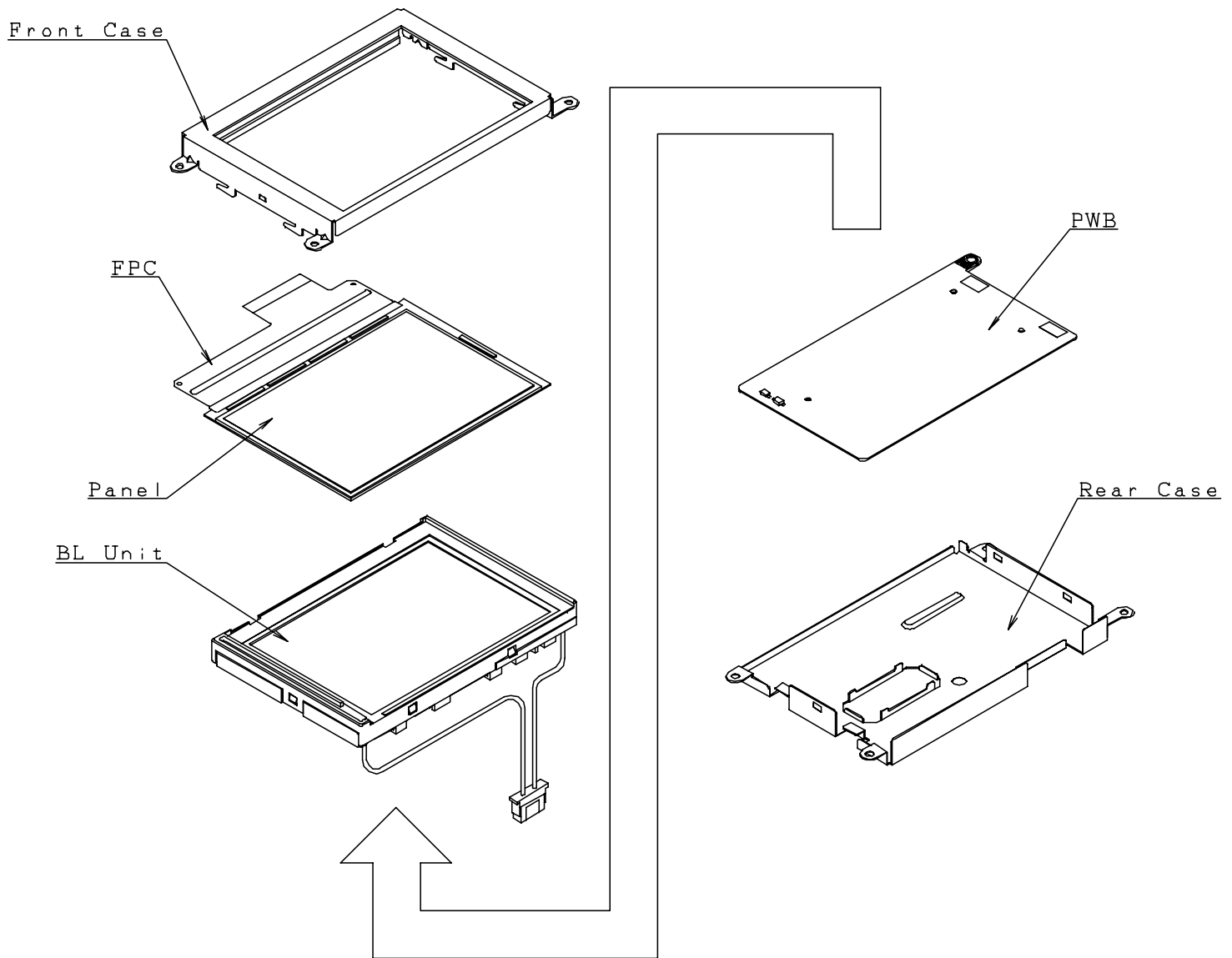


Fig.2. Structure of the module

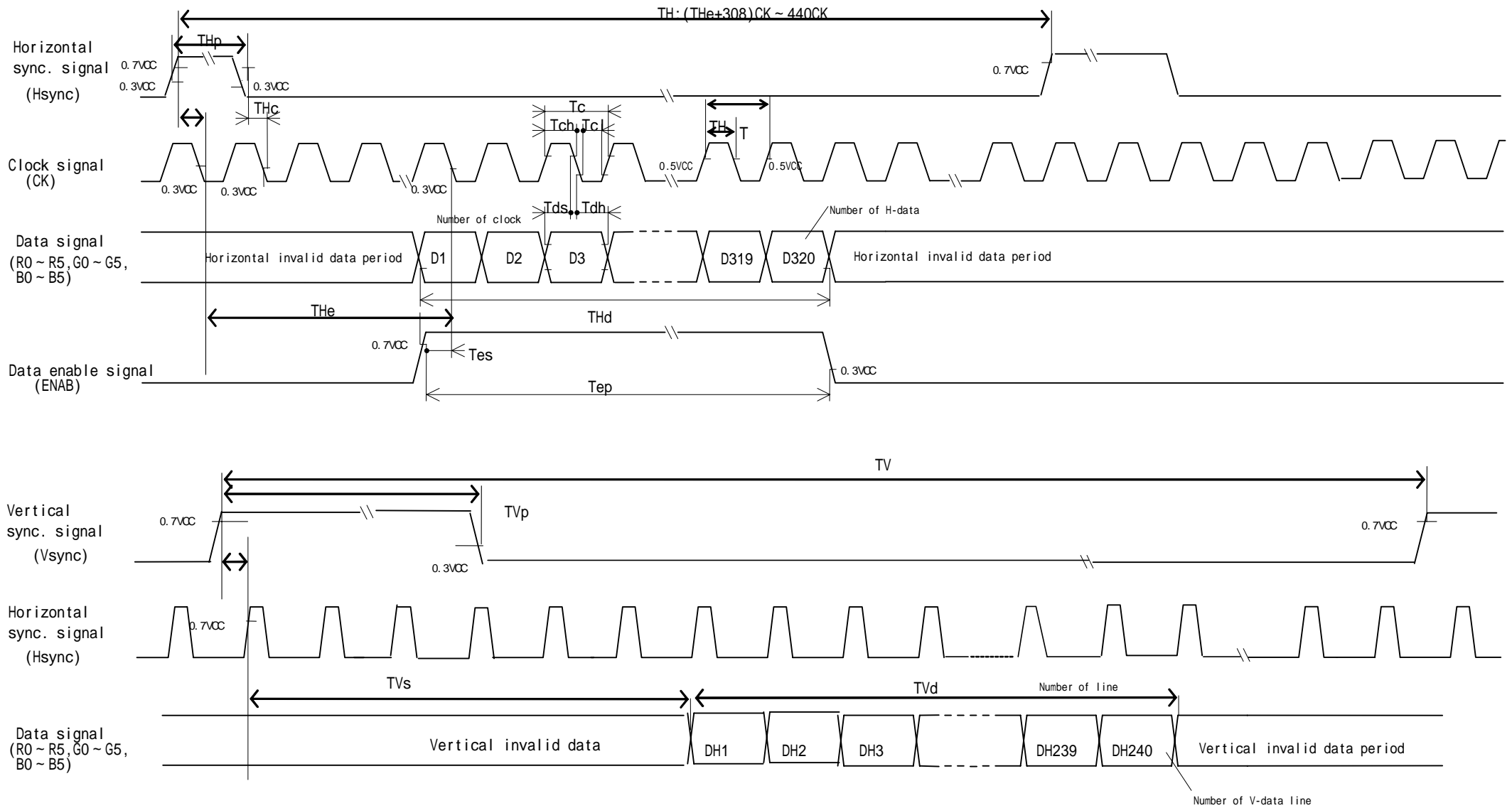


Fig3-A) Input Signal Waveform

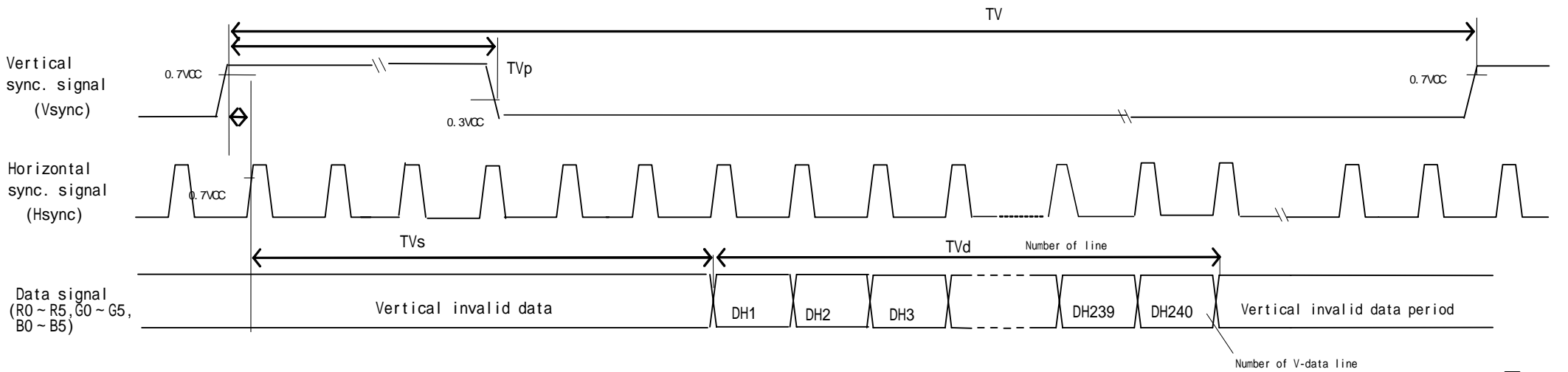
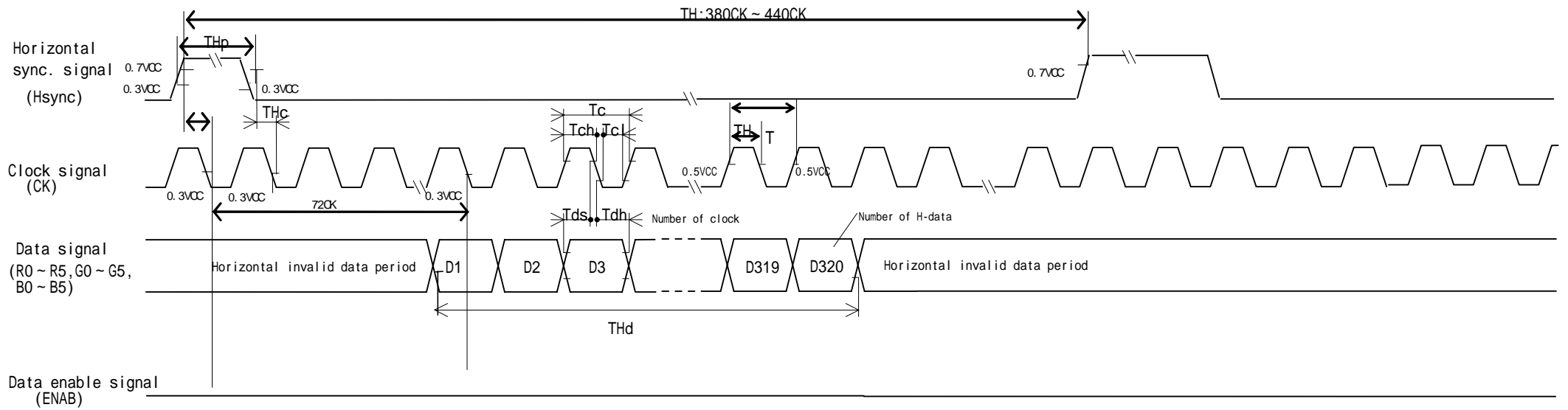


Fig3-B) Input Signal Waveform

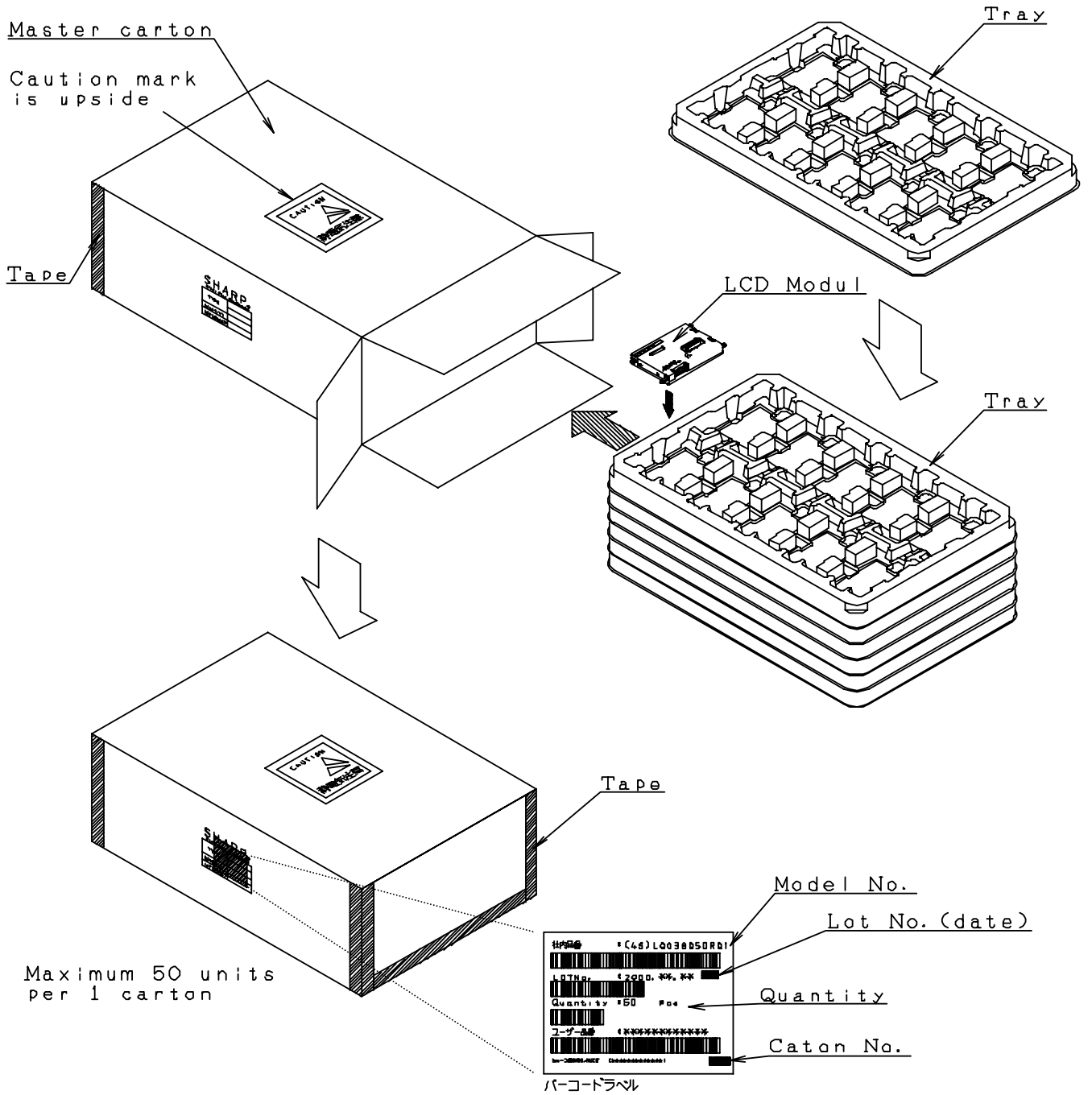


Fig.4.Packing form

LCD Specification

LCD Group



NORTH AMERICA

Sharp Microelectronics of the Americas
5700 NW Pacific Rim Blvd.
Camas, WA 98607, U.S.A.
Phone: (1) 360-834-2500
Fax: (1) 360-834-8903
www.sharpsma.com

TAIWAN

Sharp Electronic Components
(Taiwan) Corporation
8F-A, No. 16, Sec. 4, Nanking E. Rd.
Taipei, Taiwan, Republic of China
Phone: (886) 2-2577-7341
Fax: (886) 2-2577-7326/2-2577-7328

CHINA

Sharp Microelectronics of China
(Shanghai) Co., Ltd.
28 Xin Jin Qiao Road King Tower 16F
Pudong Shanghai, 201206 P.R. China
Phone: (86) 21-5854-7710/21-5834-6056
Fax: (86) 21-5854-4340/21-5834-6057
Head Office:
No. 360, Bashen Road,
Xin Development Bldg. 22
Waigaoqiao Free Trade Zone Shanghai
200131 P.R. China
Email: smc@china.global.sharp.co.jp

EUROPE

Sharp Microelectronics Europe
Division of Sharp Electronics (Europe) GmbH
Sonninstrasse 3
20097 Hamburg, Germany
Phone: (49) 40-2376-2286
Fax: (49) 40-2376-2232
www.sharpsme.com

SINGAPORE

Sharp Electronics (Singapore) PTE., Ltd.
438A, Alexandra Road, #05-01/02
Alexandra Technopark,
Singapore 119967
Phone: (65) 271-3566
Fax: (65) 271-3855

KOREA

Sharp Electronic Components
(Korea) Corporation
RM 501 Geosung B/D, 541
Dohwa-dong, Mapo-ku
Seoul 121-701, Korea
Phone: (82) 2-711-5813 ~ 8
Fax: (82) 2-711-5819

JAPAN

Sharp Corporation
Electronic Components & Devices
22-22 Nagaïke-cho, Abeno-Ku
Osaka 545-8522, Japan
Phone: (81) 6-6621-1221
Fax: (81) 6117-725300/6117-725301
www.sharp-world.com

HONG KONG

Sharp-Roxy (Hong Kong) Ltd.
Level 26, Tower 1, Kowloon Commerce Centre,
No. 51, Kwai Cheong Road, Kwai Chung,
New Territories, Hong Kong
Phone: (852) 28229311
Fax: (852) 28660779
www.sharp.com.hk
Shenzhen Representative Office:
Room 602-603, 6/F,
International Chamber of Commerce Tower,
168 Fuhua Rd. 3, CBD,
Futian District, Shenzhen 518048,
Guangdong, P.R. China
Phone: (86) 755-88313505
Fax: (86) 755-88313515

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Suggested applications (if any) are for standard use; See Important Restrictions for limitations on special applications. See Limited Warranty for SHARP's product warranty.

The Limited Warranty is in lieu, and exclusive of, all other warranties, express or implied.

ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR USE AND FITNESS FOR A PARTICULAR PURPOSE, ARE SPECIFICALLY EXCLUDED. In no event will SHARP be liable, or responsible in any way, for any incidental or consequential economic or property damage.