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DEVICE SPECIFICATION FOR

TFT - LCD module

MODEL No. LQ088H9DZ03

CUSTOMER'S APPROVAL

DATE

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MODEL No：LQ088H9DZ03

SPEC No.	Date	NO.	PAGE	SUMMARY	NOTE
LCY-05064	Nov. 18. 2005	-	-		1st Issue
LCY-06036	Sep.19. 2006	-	4	4-2) Backlight fluorescent tube driving part ~~Used connector: BHR-02 (0.8) VS-1N~~ Used connector: BHR-02 (8.0) VS-1N	2nd Issue
			6	Table 6-2 Parameter name ~~Discharge pipe electric power(two)~~ ⇒Lamp power consumption Table 6-2 Symbol name ~~WL~~ ⇒ PL Table 6-2 TYP、MAX value of PL TYP － ⇒ 3.15W 、MAX ~~9W~~ ⇒ 3.85W 【Note6-1】 ~~style light~~ ⇒ Dimming	
			8	Table 7-1 characteristic value (MIN/TYP/MAX) 1/Tc (~~═,═,25~~) ⇒ (8.47,12.59,25) TV (~~14.7,16.67,22.65~~) ⇒ (14.7,16.65,22.65) TV (~~249,═,282~~) ⇒ (249,262,282) TVh (~~═,═,0.5~~) ⇒ (0,－,0.5)	
			13	- Contrast ratio (Optimal. typ) added - Contrast ratio (Perpendicular) added Typ. at 25℃, -25℃, 0℃, 60℃ - Gamma tolerance added	
			13/18	Table 9-1 - Uniformity of luminance Added. 【Note 9-11】Added. - Flicker rate Added. 【Note 9-12】Added.	
			18	Definition of Uniformity of luminance corrected.	
			19	(10) Mechanical characteristics Added	
			22	Table 14-1 Heat shock test Added.	
			24	Fig.2 The Construction Form Added.	
LCY-06036B	Oct.16. 2006	B	14	Gamma curve & gamma ratio revised.	3rd Issue
			15	Table 9-2 Luminance ratio (Reference data) added	

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(1) Application

This specification applies to color TFT-LCD module, LQ088H9DZ03

(2) Summary and Features

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is practicable in both penetration-type and reflection-type modes. It is composed of a color TFT-LCD panel, driver ICs, control-PWB, FPC, flex rigid –PWB, frame, shielding front case, shielding back case and backlight unit Graphics and texts can be displayed on a 640×3×240 dots panel with 262,144 colors by supplying 18 bit data signals(6 bit/color).

It isn't composed DC/AC inverter.

Utilizes a panel with an 8:3 aspect ratio, which makes the module suitable for use in wide-screen systems.

The 8.8 screen produces a high-resolution image that is composed of 153,600 pixels elements in a stripe arrangement.

Wide viewing field angle technology is employed

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

Reflection due to external light is minimized through the use of a low reflection, black matrix and an antiglare (AG) and antireflection (AR) plate. A thin, light and compact module is accomplished through the use of COG mounting technology.

An AG and AR surface polarization plate is used.

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

Having considered vehicle-based use, the module contains a self heating backlight system whose emission characteristics are improved in low temperature.

(3) Mechanical specifications

table 3-1

Parameter	Specifications	Units	Remarks
Display format	153,600	pixels	
	1,920(W)×240(H)	dots	
Active area	209.28（W）×78.48(H)	mm	
Screen size (Diagonal)	22.35[8.8”]	cm	
Dot pitch	0.109（W）×0.327（H）	mm	
Pixel configuration	R,G,B Stripe configuration		
Outline dimension	231.6(W)×103.25 (H)×14.4(D)	mm	【Note3-1】
Mass	370【max】	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:DF9MA-31P-1V (Gilding type: Hirose Electric Co.,Ltd)

Fit connctor:DF9□-31S-1V(Gilding type: Hirose Electric Co.,Ltd)

(□:A,B or M type)

Table 4-1

Pin No.	Symbol	Description	Remarks
1	VGH	power supply	
2	VSH	power supply	
3	VSH	power supply	
4	ENAB	Signal to settle the horizontal display position	【Note4-2】
5	HVR	Selection for horizontal and vertical scanning direction	【Note4-3】
6	B5	BLUE data signal(MSB)	
7	B4	BLUE data signal	
8	B3	BLUE data signal	
9	B2	BLUE data signal	
10	B1	BLUE data signal	
11	B0	BLUE data signal(LSB)	
12	GND	ground	
13	G5	GREEN data signal(MSB)	
14	G4	GREEN data signal	
15	G3	GREEN data signal	
16	G2	GREEN data signal	
17	G1	GREEN data signal	
18	G0	GREEN data signal(LSB)	
19	GND	ground	
20	R5	RED data signal(MSB)	
21	R4	RED data signal	
22	R3	RED data signal	
23	R2	RED data signal	
24	R1	RED data signal	
25	R0	RED data signal(LSB)	
26	VGL	power supply	
27	Vsync	Vertical synchronous signal	【Note4-1】
28	Hsync	Horizontal synchronous signal	【Note4-1】
29	GND	ground	
30	CK	Clock signal for sampling each data signal	
31	GND	ground	

【Note 4-1】

Hsync	Positive
Vsync	Positive

【Note 4-2】

In case ENAB is fixed “Low”, the horizontal start timing is determined as described in Fig7-1.
(Don’t keep ENAB “High” during operation.(7-2).)

【Note 4-3】

HVR = "High": Regular video
HVR = "Low" : Horizontally and Vertically inverted video

4-2) Backlight fluorescent tube driving part

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

Fit connector: SM02 (8.0) B-BHS-1N (Gilding type: JST Co.Ltd)

Table 4-2 terminal: **CNA, CNB**

No.	symbol	i /o	function	Color of FL cable
1	VL1	i	input terminal(Hi voltage side)	RED
2	NC	—	non connection	
3	VL2	i	input terminal (Low voltage side)	BLACK

4-3)Backlight operating part

Table 4-3

terminal	No.	symbol	remarks
CNC	1	TH1	Thermistor
	2	TH2	Thermistor

【Note4-4】Use for the detection of the lamp temperature.

Kind of thermistor :203GT-1(Gilding type: Ishizuka Electric Co.Ltd)

Zero load resistance value about 25℃：20kΩ±3%

(5)Absolute maximum ratings

Table 5-1 **GND＝0V**

Parameter	Symbol	MIN	MAX	Unit	Note
Input voltage	V_I	-0.3	+3.6	V	【Note 5-1,7】
+5V power supply	VSH	0	+6.0	V	【Note 5-7】
+10Vpower supply High	VGH	0	+12	V	【Note 5-7】
－10Vpower supply Low	VGL	0	-12	V	【Note 5-7】
Storage temperature	Tstg	-40	+95	℃	【Note 5-2,3,6,8】
Operating temperature (panel surface)	Topr1	-40	+85	℃	【Note 5-2,3,4,6,8,9】
Operating temperature （Ambient temperature ）	Topr2	-40	+80	℃	【Note 5-5,6,8,9】

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

【Note 5-2】This rating applies to all parts of the module and should not be exceeded.

【Note 5-3】Maximum wet-bulb temperature is less than 49℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

【Note 5-4】The operating temperature only guarantees operation of the circuit. For contrast, speed response, and other factors related to display quality, determine operating temperature using the formula Ta=＋25℃

【Note 5-5】If the environment temperature will be over +80°C, lamp current must be reduced in order to keep the agreed panel operating temperature of +85°C.

【Note 5-6】Refer to Table 14-1.

【Note 5-7】Tp= －40～+95℃

【Note 5-8】85°C 240h; 95° 120h

【Note 5-9】Operating temperature between -40° C to -31°C does not provide a correct image on the LCD, but no damage of the display function will occur

Reduced requirements for operating tests:

"damp heat, cyclic" (GS95003-4 6.8) Polarizer degradation occurs in high temperature/ high humidity cycles so it is not used for judgment of the test:

"lifetime test" (GS95003-1) 1500h have been tested with a small degradation of polarizer

(6)Electrical characteristics

6-1)TFT-LCD panel driving section

Table 6-1 **GND＝0V,** Tp= －40～+85℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
+5V	Supply voltage	VSH	+4.5	+5.0	+5.5	V	【Note 6-1】
	Current dissipation	ISH	—	40	80	mA	【Note 6-2】
+10V	Supply voltage	VGH	+9.5	+10.0	+10.5	V	
	Current dissipation	IGH	—	25	40	mA	【Note 6-2】
－10V	Supply voltage	VGL	-9.5	-10.0	-10.5	V	
	Current dissipation	IGL	—	-20	-40	mA	【Note 6-2】
Permissive input ripple		V_{RF}	—	—	100	mVpp	
Input Low voltage		V_{IL}	—	0	0.9	V	
Input High voltage		V_{IH}	2.3	3.3	—	V	【Note 6-3】
Input current (Low)		I_{IL}	—	—	1.0	μA	V_I=0V 【Note 6-4】
Input current (High)		I_{IH}	—	—	1.0	μA	V_I=3.3V 【Note 6-3】

◎Turn on :VGL→VSH→VGH or same time

◎Turn off :VGH→VSH→VGL or same time

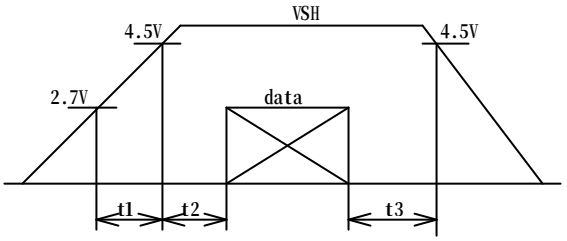
【Note 6-1】

VSH-turn-on conditions

t1≦10ms

0<t2≦10ms

0<t3≦1s



VSH-dip conditions

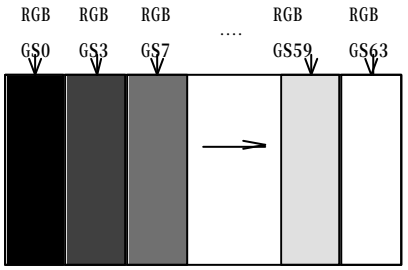
VSH-dip conditions should also follow the VSH-turn-on conditions.

【Note 6-2】

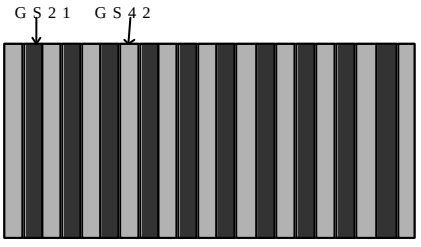
Typical current situation:64-gray-bar pattern Timing; CK=25MHz

Max current situation: Vertical stripe pattern alternating 21 gray scale (GS21) with 42 gray scale (GS42) every 1 dot. Timing; CK=25MHz

VSH=+5.0V VGH=+10V VGL=－10V



Typical current situation



Max current situation

【Note 6-3】V_I=3.3V

CK,R0～R5,G0～G5,B0～B5,Hsync,Vsync,ENAB,HVR

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

6-2)Backlight driving section

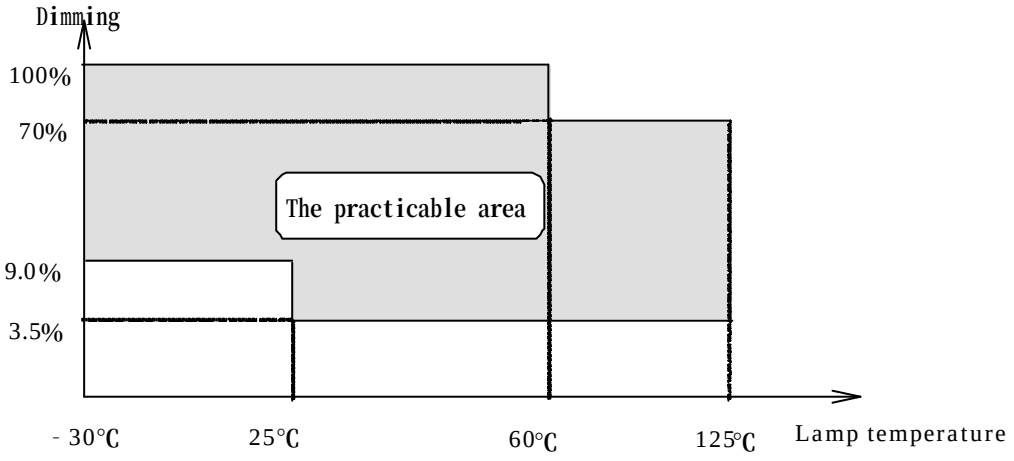
The backlight system is an edge-lighting type with double CCFT (Cold Cathode Fluorescent Tube). The characteristics of Lamp are shown in the following table.

Table 6-2

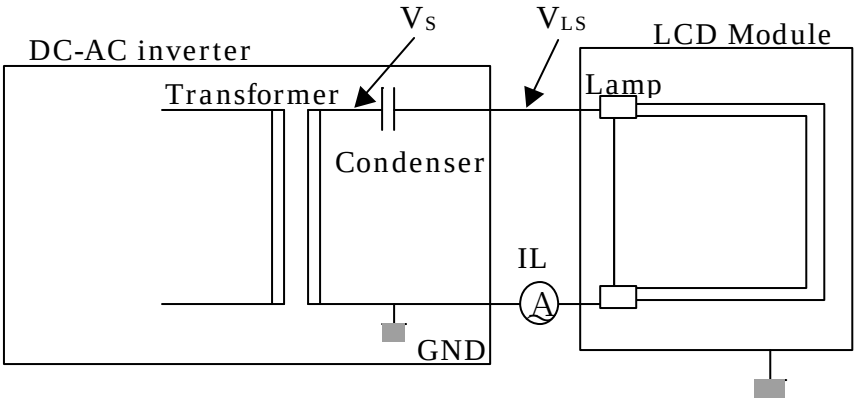
Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
lamp voltage	VL	560	630	700	Vrms	IL=5.0mArms
lamp current	IL	4.0	5.0	5.5	mArms	Per piece
	ILB	—	—	9.0	mArms	In case of the style light 【Note6-1】
lamp frequency	fL	30	50	75	kHz	
Lamp power consumption	PL	—	3.15	3.85	W	When the fixed case lights up. Power consumption per lamp. (2lamp in module used)Ta=+25℃
kick-off voltage	VS	—	—	1900	Vrms	Ta=+25℃【Note6-2】
		—	—	1950	Vrms	Ta=-30～+85℃【Note6-2】
Kick-off voltage	V_{LS}	—	1037	1296	Vrms	Ta=+25℃【Note6-2】
		—	1064	1330	Vrms	Ta=-30～+85℃【Note6-2】
Ignition time	TI	—	—	1	sec	Ta=+25℃【Note6-2】
		—	—	1	sec	Ta=-30℃【Note6-2】

(Inverter : HIU-359A-S2 [Harison Toshiba Lighting Corp.] C=18pF 50kHz)

【Note6-1】The lighting-up practicable



【Note6-2】The kick-off voltage is specified under the condition in just putting the Backlight on the LCD module. (The Backlight cable is not unbent.)
The kick-off voltage depends on way to lead the cable between inverter and Backlight.



【caution】

Please use the inverter which has the one of the sine wave. With regards to the inverter, it should be negative/positive wave symmetry and the spike wave should not be occurred.

6-3) Lamp Monitoring Interface

Temperature Censor
Thermistor Typ: 203 GT –1 made by Ishizuka Electronics Corporation

According to the spec of the temperature sensor;
B= InR1 – InR2 / (1/T1 – 1/T2)
T1, T2 : absolute temperature (K)
R1, R2 : Zero load resistance on T1, T2 (ohm)
B : Constant of B (K)
R25 = 20.00 kΩ ±3%
B = 4.282K ±2%

Temperature °C	R-Thermistor kΩ (typ)
-50	1901
-45	1304
-40	909.0
-35	637.2
-30	453.2
-25	325.3
-20	236.6
-15	173.2
-10	128.3
-5	95.82
0	72.32
5	55.01
10	42.24
15	32.66
20	25.47
25	20.00
30	15.82
35	12.59
40	10.10
45	8.150
50	6.620
55	5.407
60	4.444
65	3.671
70	3.050
75	2.547
80	2.138
85	1.803
90	1.527
95	1.300
100	1.111
105	0.9530
110	0.8209
115	0.7098
120	0.6160
125	0.5364
130	0.4686
135	0.4108
140	0.3613
145	0.3187
150	0.2820

(Data above is under the condition of R=4.282K and temp=25 to 85 degree C)

(7)Timing Characteristics of input signals

Timing diagrams of input signal are shown in Fig.7-1

7-1) Timing characteristics

Table 7-1 Tp = −40～+85℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Clock	frequency	1/Tc	8.47	12.59	25	MHz	
	High time	Tch	18	−	−	ns	
	Low time	Tcl	18	−	−	ns	
Data	Setup time	Tds	5	−	−	ns	
	Hold time	Tdh	10	−	−	ns	
Horizontal sync. signal	Cycle	TH	59.1	−	80.32	μs	
			680	800	1675	clock	
	Pulse width	THp	4	48	96	clock	
Vertical sync. signal	Cycle	TV	14.7	16.65	22.65	ms	【Note 7-1】
			249	262	282	line	
	Pulse width	TVp	3	4	128	line	
Horizontal display period		THd	640	640	640	clock	
Vertical display period		TVd	240	240	240	line	
Hsync-Clock phase difference		THc	5	Tc/2	TH−5	ns	
Hsync-Vsync phase difference		TVh	0	−	0.5	μs	
Vertical display invalid line		TVe	7	7	7	line	

【Note 7-1】 To be driven with more than 50Hz (TV<=20ms).

If less than 50Hz (TV>=20ms), the flicker might be occur gradually.

7-2) Horizontal display position

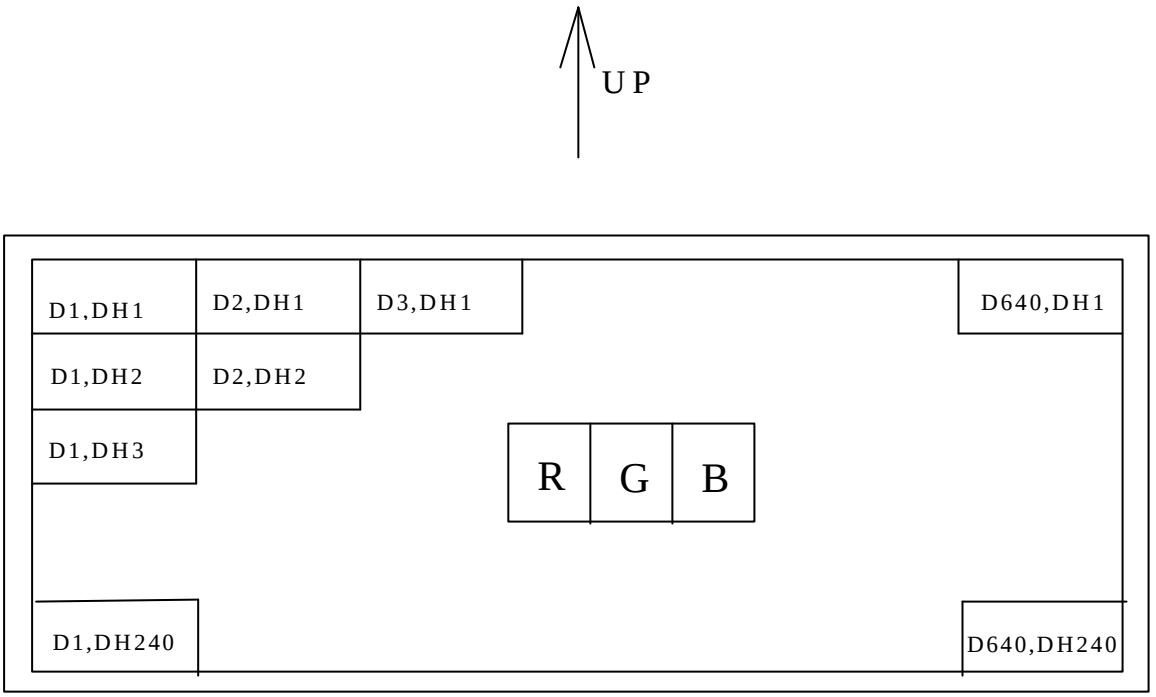
The horizontal display position is determined by ENAB signal.

Table 7-2 Tp = −40～+85℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Enable signal	Setup time	Tes	5	Tc/2	Tc−5	ns	
	Pulse width	Tep	10	−	TH−10	clock	
Hsync-Enable signal phase Difference		THe	5	16	256	clock	≦256

Note) When ENAB is fixed “Low”, the display starts from the data of 16 clock (C16) as shown in Fig.7-1.

7-3) Input Data Signals and Display Position on the screen



Display position of input data (H,V)

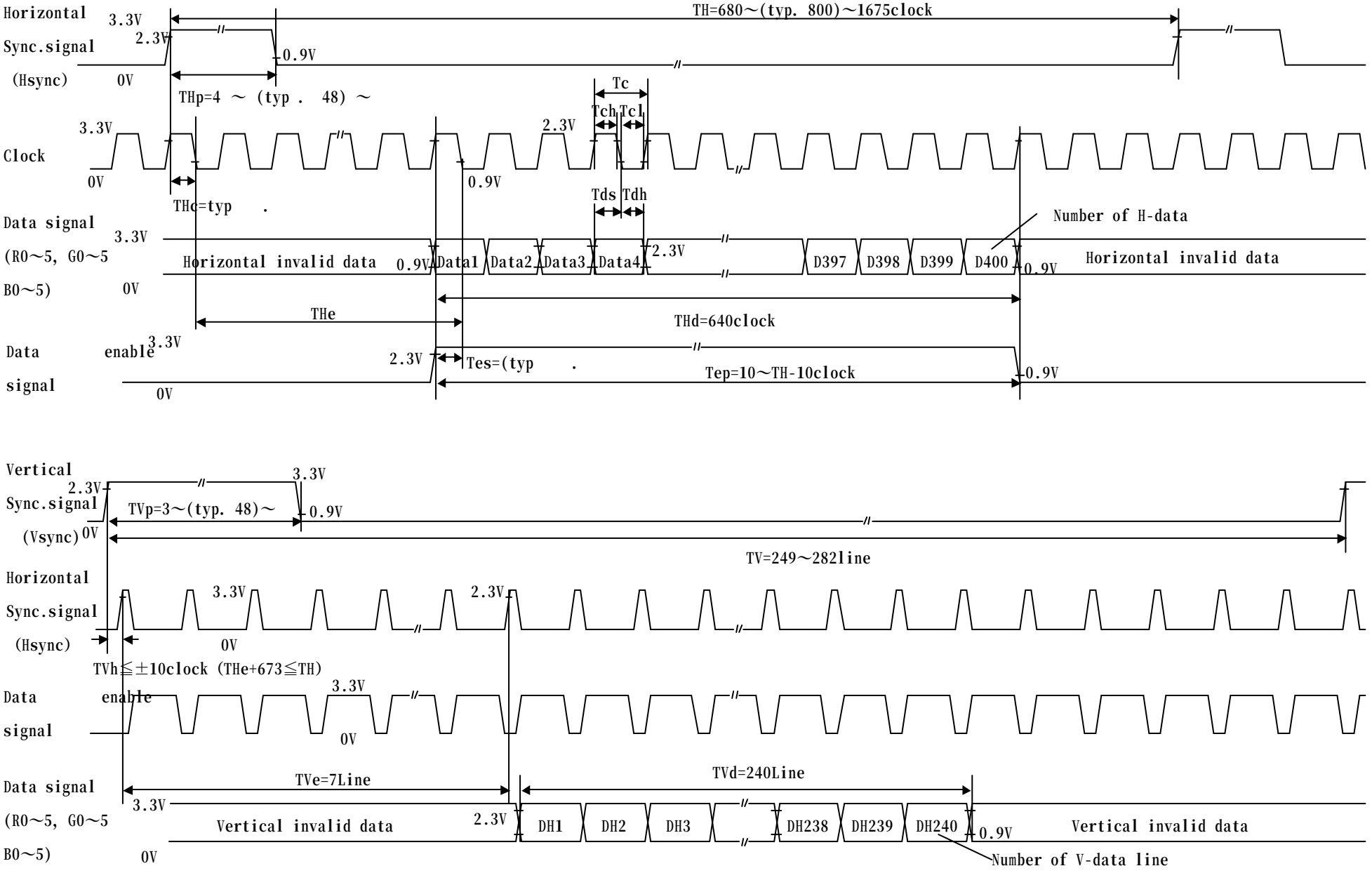


Fig.7-1 Input signal waveforms
(ENAB:active)

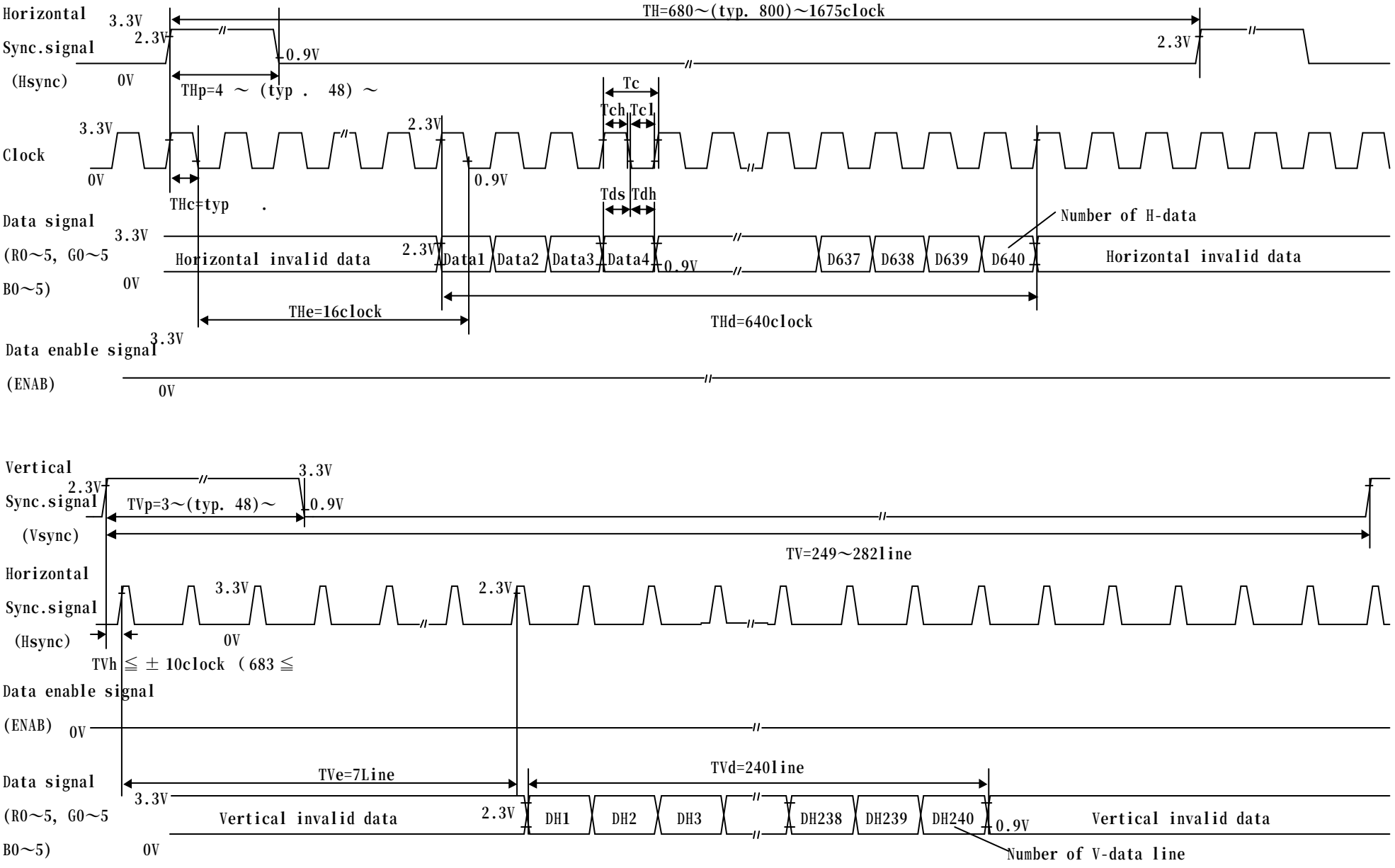


Fig.7-2 Input signal waveforms

(ENAB:Low)

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

	Colors &		Data signal												0 :Low level voltage 1 :High level voltage					
	Gray scale	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 bleu	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
	Bleu	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

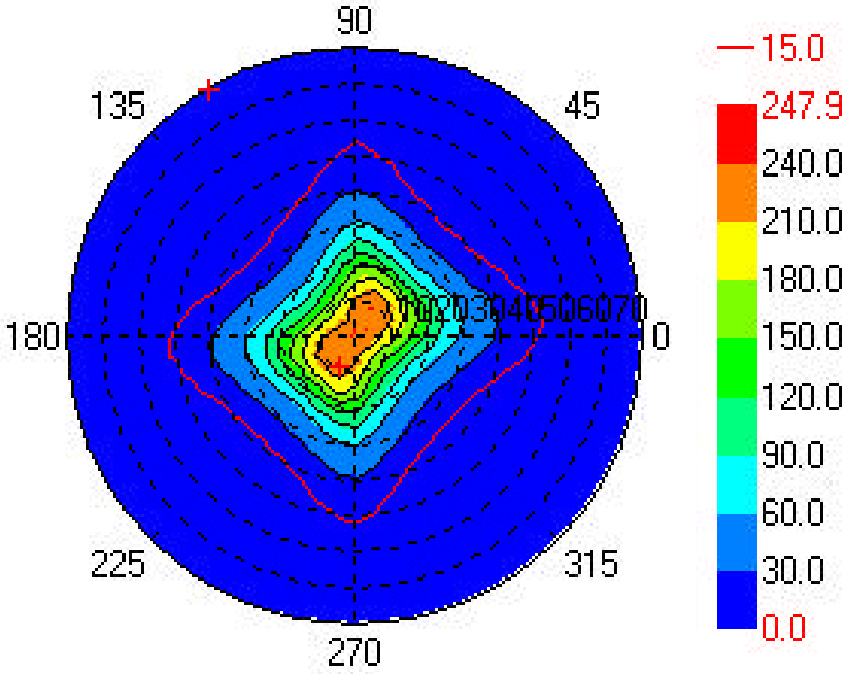
Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

(9)Optical characteristics

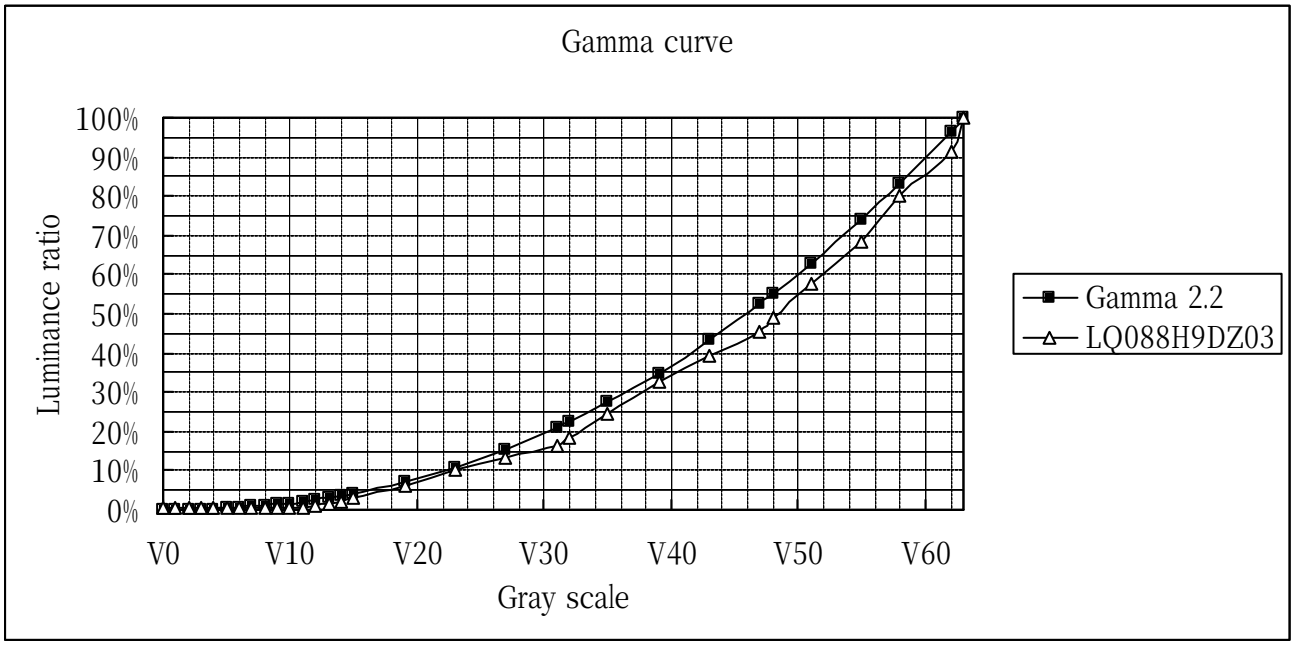
Table 9-1　　Ta＝25℃, VSH=+5V,VGH=+10V,VGL=－10V

Parameter			Symbol	Condition	Min	Typ	Max	Unit	Remarks
Transmissive mode	Viewing angle range		θ11/θ12/	CR≧15	35	45	－	°(degree)	【Note 9-1】
			θ21/θ22		40	50	－		
	Contrast ratio		Cr max	Optimal Viewing angle	150	260	－		【Note 9-2】
	Contrast ratio (Perpendicular)		θ=0°	Ta = 25℃	140	180	－		
			θ=0°	Ta = -25℃		90			Reference
			θ=0°	Ta = 0℃		140			Reference
			θ=0°	Ta = 60℃		170			Reference
	Response time	Black→White(τr)	θ＝0° Ta＝25℃ IL=5mArms		－	10	20	ms	【Note 9-3】
		White→Black(τd)			－	15	30		
		Black→L10			－	100	150		
		L10→Black			－	15	30		
		Black→White(τr)	θ＝0° Ta＝0℃ IL=9mArms		－	15	30		
		White→Black(τd)			－	25	50		
		Black→L10			－	250	370		
		L10→Black			－	40	80		
		Black→White(τr)	θ＝0° Ta＝-20℃ IL=9mArms		－	50	100		
		White→Black(τd)			－	80	160		
		Black→L16			－	550	700		
		L16→Black			－	110	150		
		Black→White(τr)	θ=0° ,Ta=-30℃ IL=9mArms		－	130	260		
		White→Black(τd)			－	180	360		
	Luminance		Y	IL=5mArms	180	250	－	cd/m²	【Note 9-4】
	Uniformity of luminance		－		－	－	1.43		【Note 9-11】
	Cold brightness's standing-up[-20℃]		Y_{LOW}	IL=9mArms	－	70	－	%	【Note 9-5】
	White chromaticity		x	IL=5mArms	0.273	0.313	0.353		【Note 9-4】
			y		0.289	0.329	0.369		
	Red chromaticity		x		0.519	0.569	0.619		
			y		0.281	0.331	0.381		
	Green chromaticity		x		0.252	0.302	0.352		
			y		0.500	0.550	0.600		
	Blue chromaticity		x		0.101	0.151	0.201		
			y		0.080	0.130	0.180		
Reflective mode	Viewing angle Range		θ11/θ12/ θ21/θ22	CR≧4	25	40	－	°(degree)	【Note 9-1】
	Contrast ratio		CR	θ＝0°	5	8	－		【Note 9-6】
	Response time	Rise	τr		－	10	20	ms	【Note 9-3】
		Fall	τd		－	15	30		
	Reflective ratio		Rf		4.4	5.5	－	%	【Note 9-7】
	White chromaticity		x		0.269	0.319	0.369		【Note 9-8】
			y		0.299	0.349	0.399		
	Red chromaticity		x		0.492	0.542	0.592		
			y		0.264	0.314	0.364		
	Green chromaticity		x		0.221	0.271	0.321		
			y		0.491	0.541	0.591		
	Blue chromaticity		x		0.105	0.155	0.205		
			y		0.112	0.162	0.212		
	Flicker rate		－	L0－L31	－	－	30	%	【Note 9-12】
	Gamma tolerance		L10		0.3	－	0.9	%	Reference
			L32		15	－	24	%	Reference
Surface reflectance			Rf2		－	0.6	－	%	【Note 9-7】
Lamp lifetime	+25℃		－	continuation	10000	－	－	hour	【Note 9-9】
	±0℃		－	intermission	12000	－	－	hour	【Note 9-10-1】
	-30℃		－	intermission	2000	－	－	time	【Note 9-10-2】

For the lighting-up evaluation of this backlight unit, it uses our company recommendation inverter.
※measuring after 30 minutes. It does the optical measurement of the characteristic in the condition which is equal to the darkroom or this using the way of measuring the following figure.



[Note 9-11] Iso-contrast diagram (Ta=25℃)
[Reference value]



＊V0-V63 2.2 Gamma curve & gamma ratio (Ta=25℃)
[Reference value]

Table 9-2 Luminance ratio (Reference data)

Gray Scale	LQ088H9DZ03	Gamma 2.2	Gray Scale	LQ088H9DZ03	Gamma 2.2
V0	0.4%	0.0%	V19	6.2%	7.2%
V1	0.4%	0.0%	V23	10.4%	10.9%
V2	0.4%	0.1%	V27	13.3%	15.5%
V3	0.4%	0.1%	V31	16.5%	21.0%
V4	0.4%	0.2%	V32	18.4%	22.5%
V5	0.4%	0.4%	V35	24.4%	27.4%
V6	0.4%	0.6%	V39	32.7%	34.8%
V7	0.4%	0.8%	V43	39.3%	43.2%
V8	0.4%	1.1%	V47	45.6%	52.5%
V9	0.4%	1.4%	V48	48.8%	55.0%
V10	0.5%	1.7%	V51	57.9%	62.8%
V11	0.7%	2.2%	V55	68.3%	74.2%
V12	1.0%	2.6%	V58	80.1%	83.4%
V13	1.5%	3.1%	V62	91.1%	96.5%
V14	2.2%	3.7%	V63	100.0%	100.0%
V15	3.0%	4.3%			

Optical characteristics measurement method (Transmissive mode)

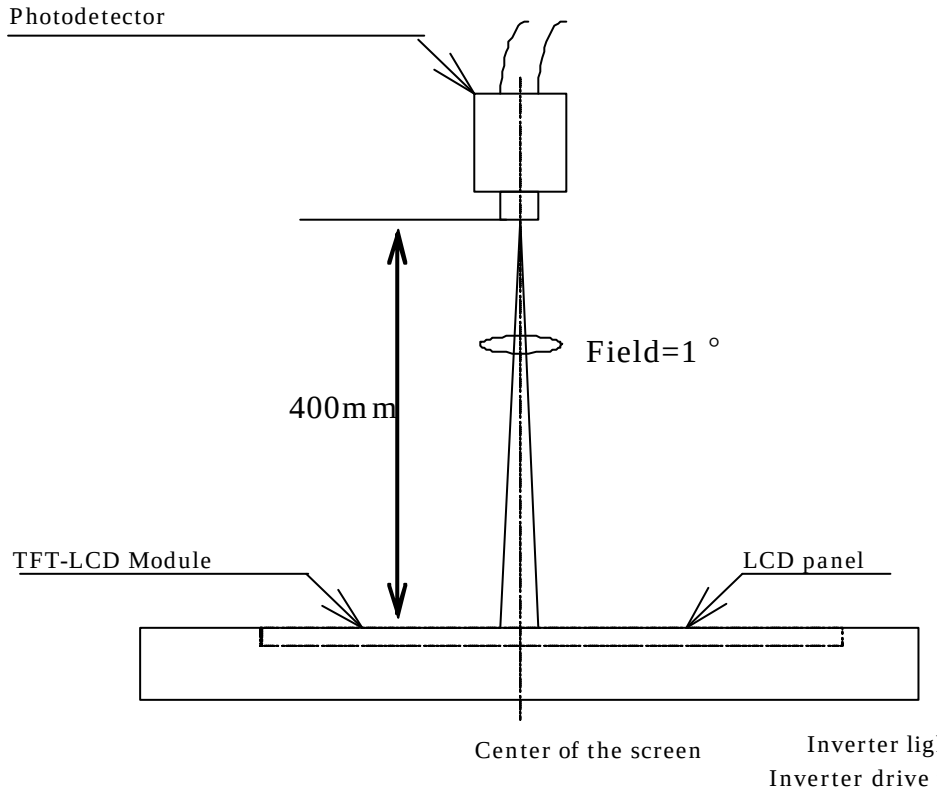


Fig.9-1 Optical characteristics measurement method

Optical characteristics measurement method (Reflective mode)

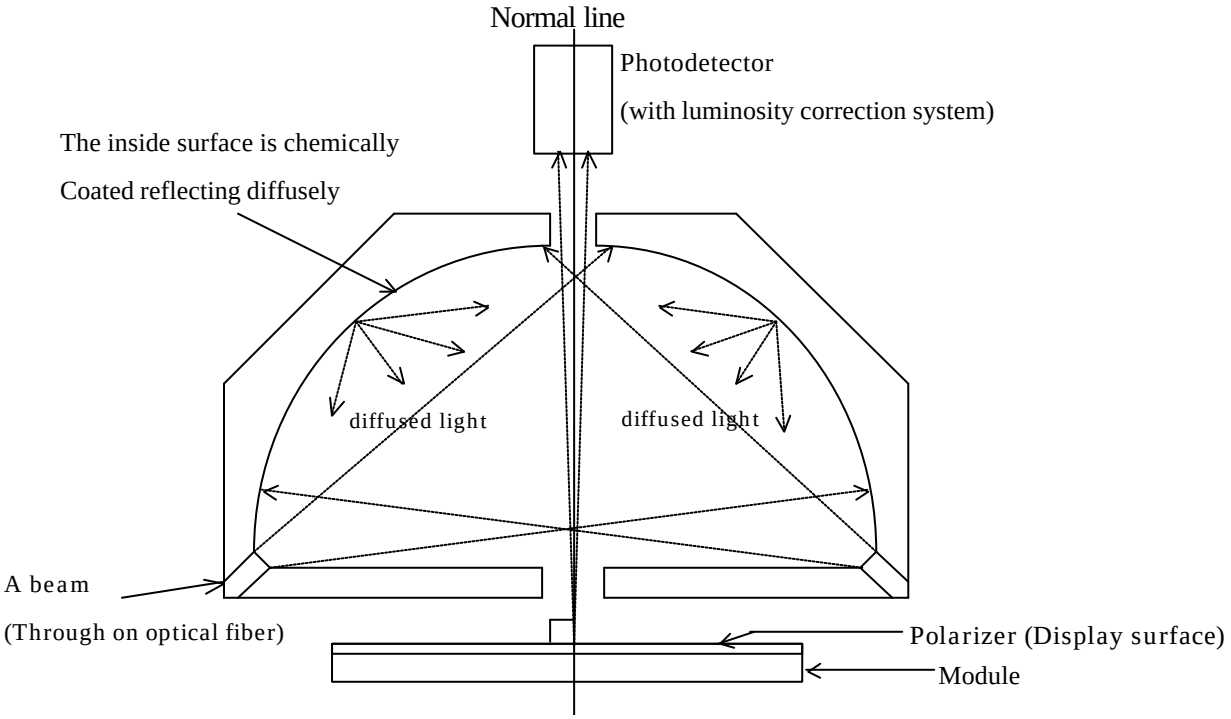
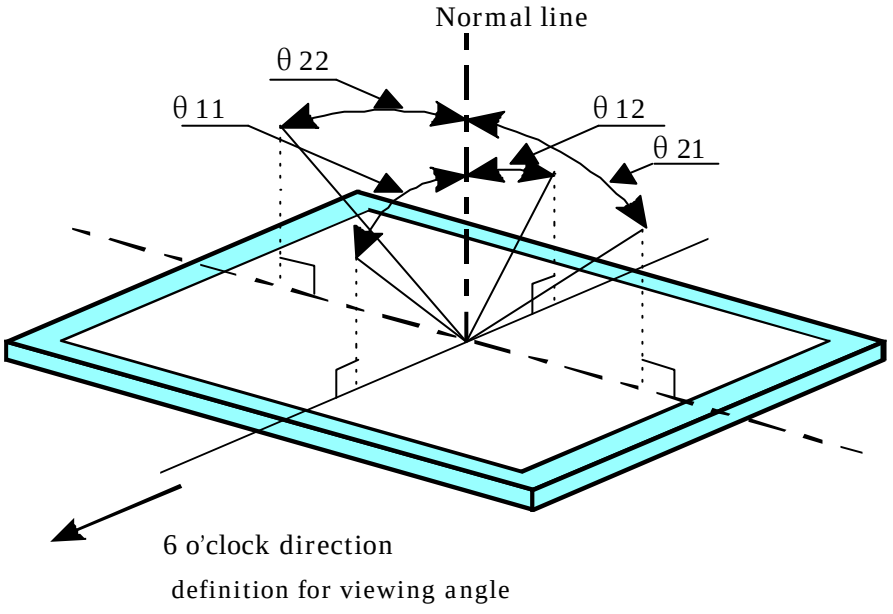


Fig.9-2 Optical characteristics measurement method

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



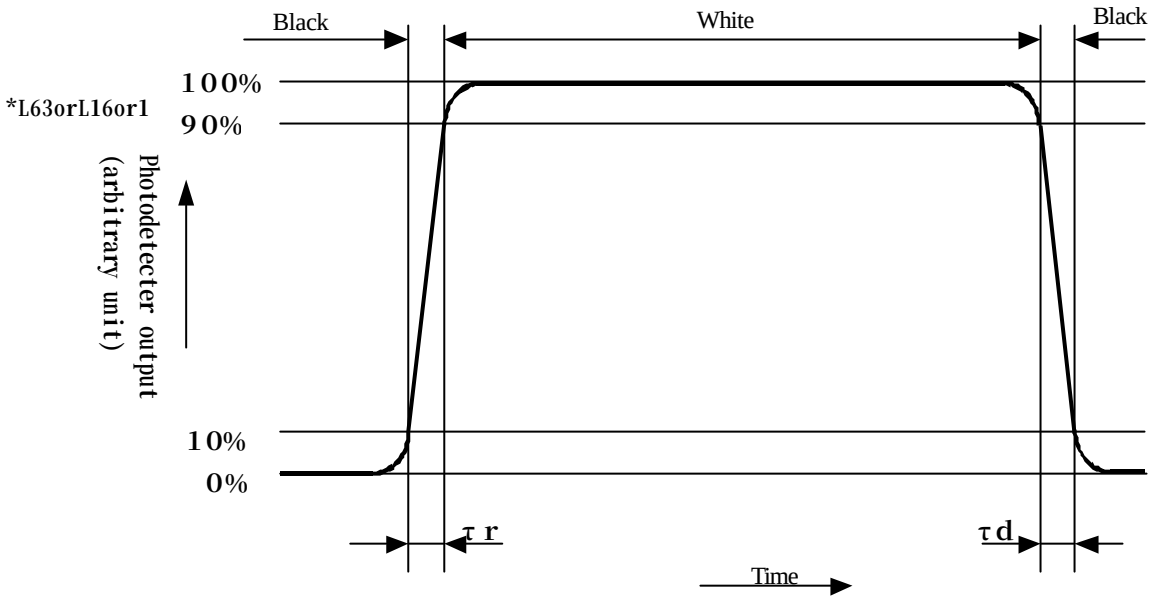
definition for viewing angle

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

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

*** ELDIM EZContrast**

【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". For environmental temperature LC response time is measured after module diving and its panel side temperature is stabilized.



【Note 9-4】 Measured on the center area of the panel at a viewing cone 1° by TOPCON luminance meter BM-7.(After 30 minutes operation)
DC/AC inverter driving frequency: 50kHz

【Note 9-5】 Relative luminance of module stored for sufficient time at —20℃ (the module temperature is also —20℃)after 2min switching on compared with the luminance at 25℃.

【Note 9-6】Contrast ratio of reflection is defined as follows :

$$\text{Contrast ratio of reflection (CR)} = \frac{\text{Photodetecter output with all pixels white}}{\text{Photodetecter output with all pixels black}}$$

【Note 9-7】Reflective ratio is defined as follows:

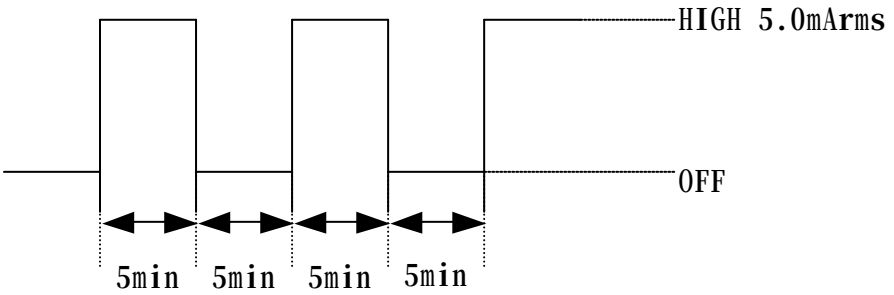
$$\text{Reflective ratio} = \frac{\text{Light detected level of the reflection by the LCD module}}{\text{Light detected level of the reflection by the standard}} \times 100$$

【Note 9-8】It is assumed that chromaticity of the light source is (x=0.313,y=0.329).
The measuring system is CM-2002 (with the unit reflecting diffusely) made by MINOLTA co.,ltd.

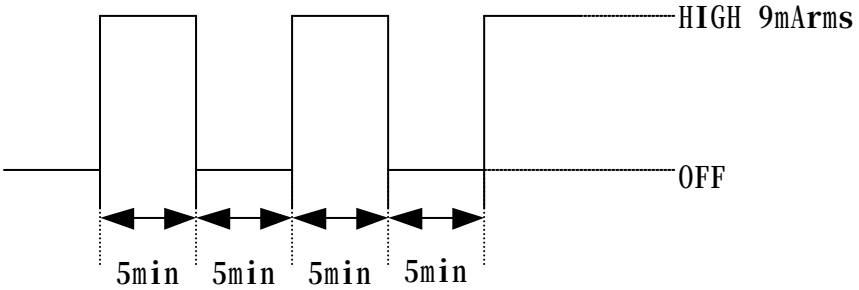
【Note 9-9】The operation time that the brightness value on the panel surface doesn't become equal to or less than 50% of the brightness value in the early stages in the following condition .
(Lighting-up condition)
In case of the electric current style light: Continuation lighting-up, IL=5.0mArms.
In case of PWM style light: Continuation lighting-up, IL=9mArms, DUTY=70%～5%

【Note 9-10】 The ON-OFF number of times that the brightness value on the panel surface doesn't become equal to or less than 50% of the brightness value in the early stages in the following lighting-up condition.

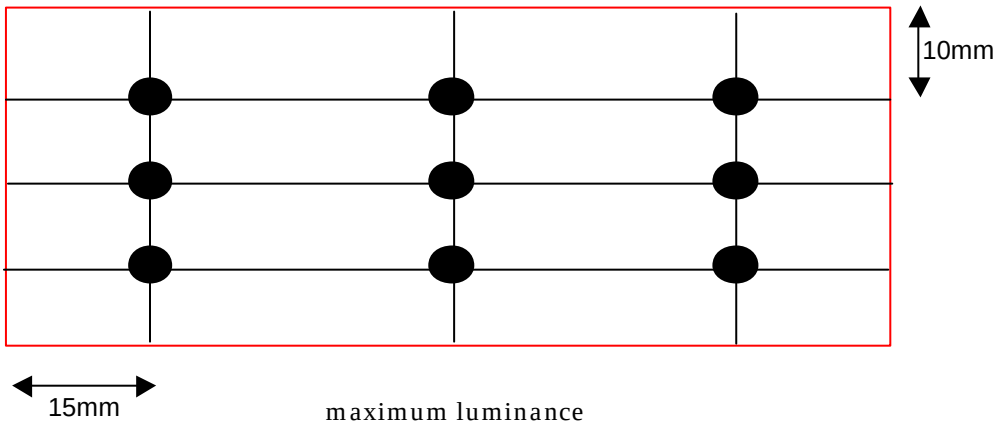
【Note 9-10-1】
(Lighting-up condition) Ambient temperature: 0℃



【Note 9-10-2】
(Lighting-up condition) Ambient temperature:-30℃



【Note 9-11】 Uniformity of luminance is measured in the measurement part shown in the figure below.
The measurement part is "●"symbol shown below.

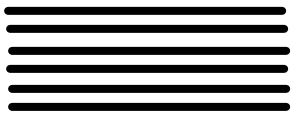


$$\text{Uniformity of luminance} \Rightarrow \frac{\text{maximum luminance}}{\text{minimum luminance}}$$

(Uniformity measurement is not included in SHARP outgoing inspection):
Cpk = 1.42

【Note 9-12】The flicker rate is provided under the following condition.

Measurement machine	:	YOKOGAWA multimedia display tester 3298
Display signal	:	Stripe pattern of horizontal direction.
		Stripe pattern is a pattern that horizontally repeats black(V0) and white(V31) every one line.(V63 is a white step of 100%.)



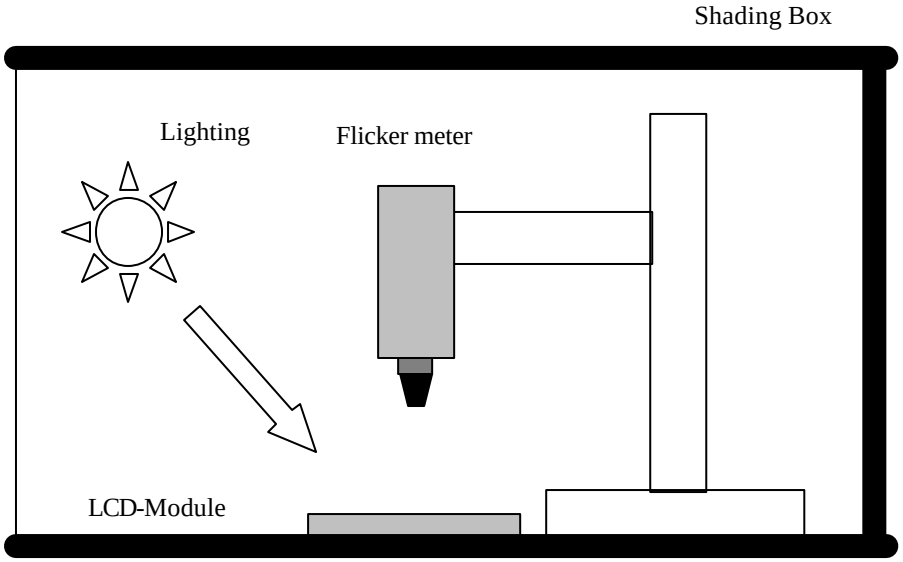


Fig. Measurement environment

(10) Mechanical characteristics

10-1) External appearance

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

10-2) Panel toughness

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

(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.

On mounting the module, as the M2.6 tapping screw fastening torque is 0.3 ±0.05N・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). Don't pull a CCFT lead line with the power beyond 10.0N. It has the possibility of the breakage in the lamp, the connection part of the lead line, and so on.

12-2) Precautions in mounting

Polarizer which is made of soft material and susceptible to flaw must be handled carefully.

Protective film 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 protective film.

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 1MΩ or more on the tile (conductive mat or conductive paint on the tile)

b) Clean room free form 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.

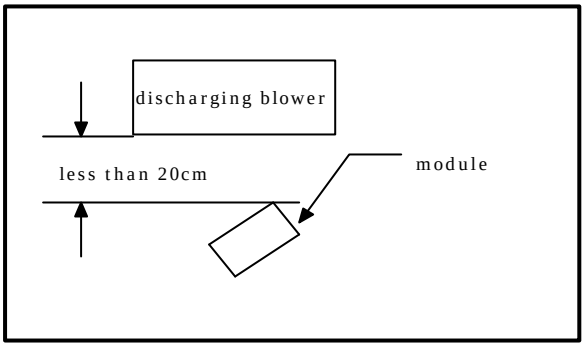
B) Working procedures

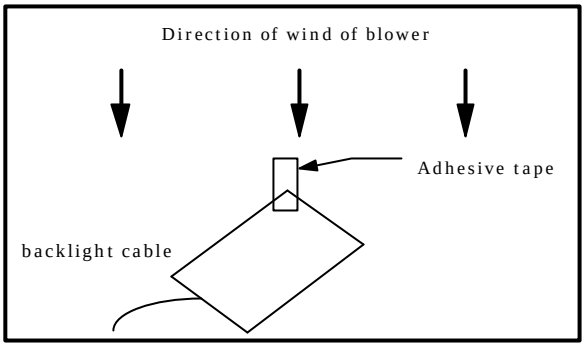
a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently. Keep the distance between module and discharging blower within 20 cm.

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 film, 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.

But when the panel has stain or grease, we recommend to use adhesive tape to softly remove them from the panel.

When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth. For stubborn dirties, wipe the part, breathing on it. Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots. TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Handle with care. Since CMOS LSI is used in this module, take care of static electricity and earth your body 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.

12-5) Others

Do not expose the module to direct sunlight or intensive ultraviolet rays for several hours; liquid crystal is deteriorated by ultraviolet rays. Store the module at a temperature near the room temperature. At lower than the rated storage temperature, liquid crystal solidifies, causing the panel to be damaged. At higher than the rated storage temperature, liquid crystal turns into isotropic liquid and may not recover. The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around. If LCD panel breaks, there may be a possibility that the liquid crystal escapes from the panel. Since the liquid crystal is injurious, do not put it into the eyes or mouth. When liquid crystal sticks to hands, feet or clothes, wash it out immediately with soap. Observe all other precautionary requirements in handling general electronic components.

(13) Packing form

a)Piling number of cartons : MAX 16

b)Package quantity in one carton 10 pcs

c)Carton size: 318(W)×177(H)×312(D) mm

d)Total mass of one carton filled with full modules: 4.4 kg

e)Conditions for storage.

Environment

①Temperature : 0～40℃

②Humidity : 60%RH or less (at 40℃)

No dew condensation at low temperature and high humidity.

③Atmosphere :Harmful gas, such as acid or alkali which bites electronic components and/or wires, must not be detected.

④Period : about 3 months

⑤Opening of the package : In order to prevent the LCD module from breakdown by 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) Others

a) Adjusting volume have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.

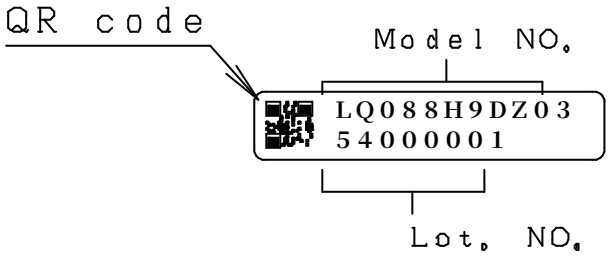
b) Disassembling the module can cause permanent damage and should be strictly avoided.

c) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

d) Indication of lot number

The lot number is shown on a label. Attached location is shown in Fig.1 (Outline Dimensions).

Indicated contents of the label



contents of lot No. the 1st figure ‥ production year (ex. 2005 : 5)

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‥

(15) Reliability Test Conditions for TFT-LCD Module

Table 15-1

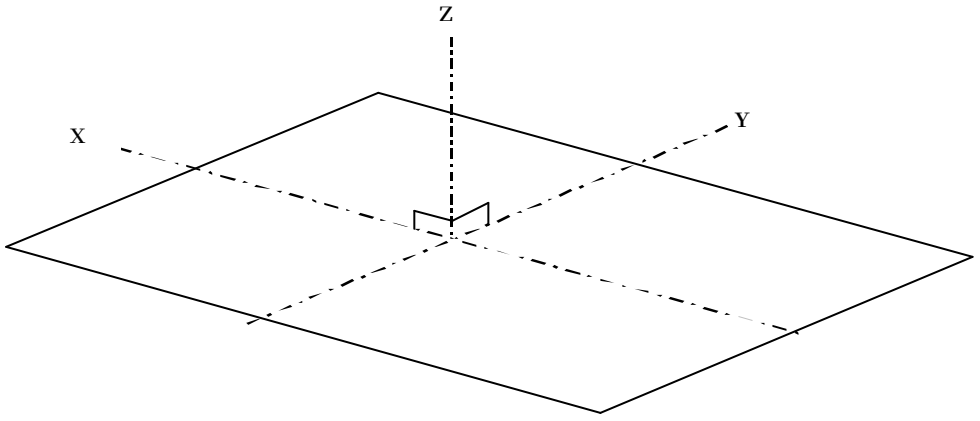
Remark) Temperature condition is based on operating temperature conditions on (5)-Table 5-1.

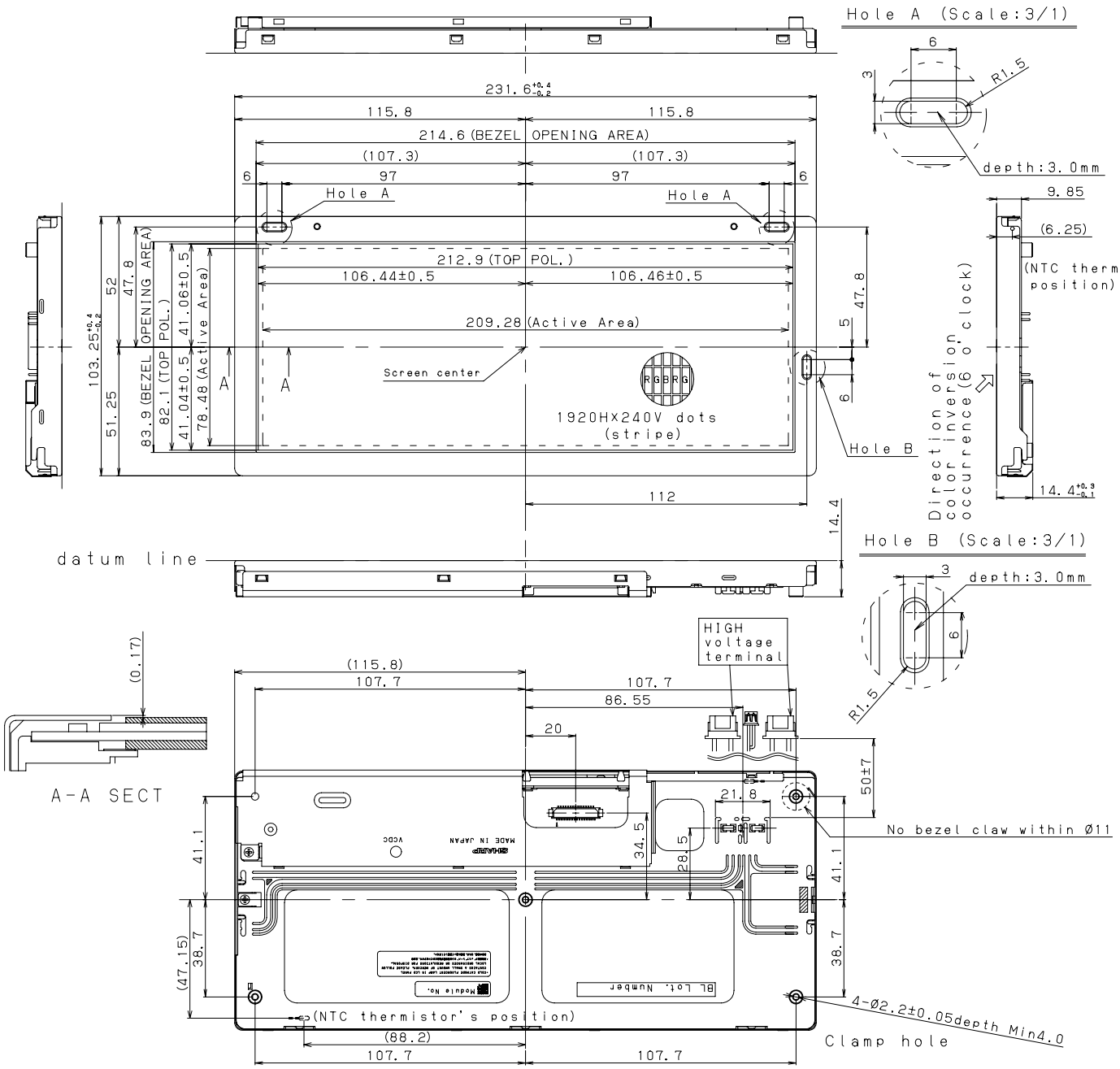
No.	Test items	Test conditions
1	High temperature storage test	Ta= +85℃ 240h
2	High temperature storage test	Ta= +95℃ 120h
3	Low temperature storage test	Ta= -40℃ 240h
4	High temperature and high humidity operating test	Tp=+50℃ 95% RH 240h
5	High temperature operating test	Tp= +85℃ 240h
6	Low temperature operating test	Ta= -40℃ 240h
7	Electro static discharge test	±200V・200pF(0Ω) 1 time for each terminals
		±2kV 150pF(330ohm) 3 time for each terminals
		±15kV 150pF(330ohm) 3 time for each Display center
8	Shock test	980m/s²・6ms, ±X；±Y；±Z 3 times for each direction (JIS C0041, A-7 Condition C)
9	Vibration test	Frequency range：8～33.3Hz Stroke：1.3mm Sweep：33.3Hz～400Hz Acceleration：28.4m/s² Cycle：15 minutes X,Z 2 hours for each directions, 4 hours for Y direction (total 8 hours) 【caution】 (JIS D1601)
10	Heat shock test	Ta= －30℃ ～ +85℃ / 200cycles (0.5h) (0.5h)

【Note】Ta= Ambient temperature, Tp= 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

5		
4		
3		
2		
1		
No.	DATE	REVISION

DATE	Oct.14.2005
MODEL	LQ088H9DZ03
DRAWING No	LCM-05056

Fig.1 Outline dimensions

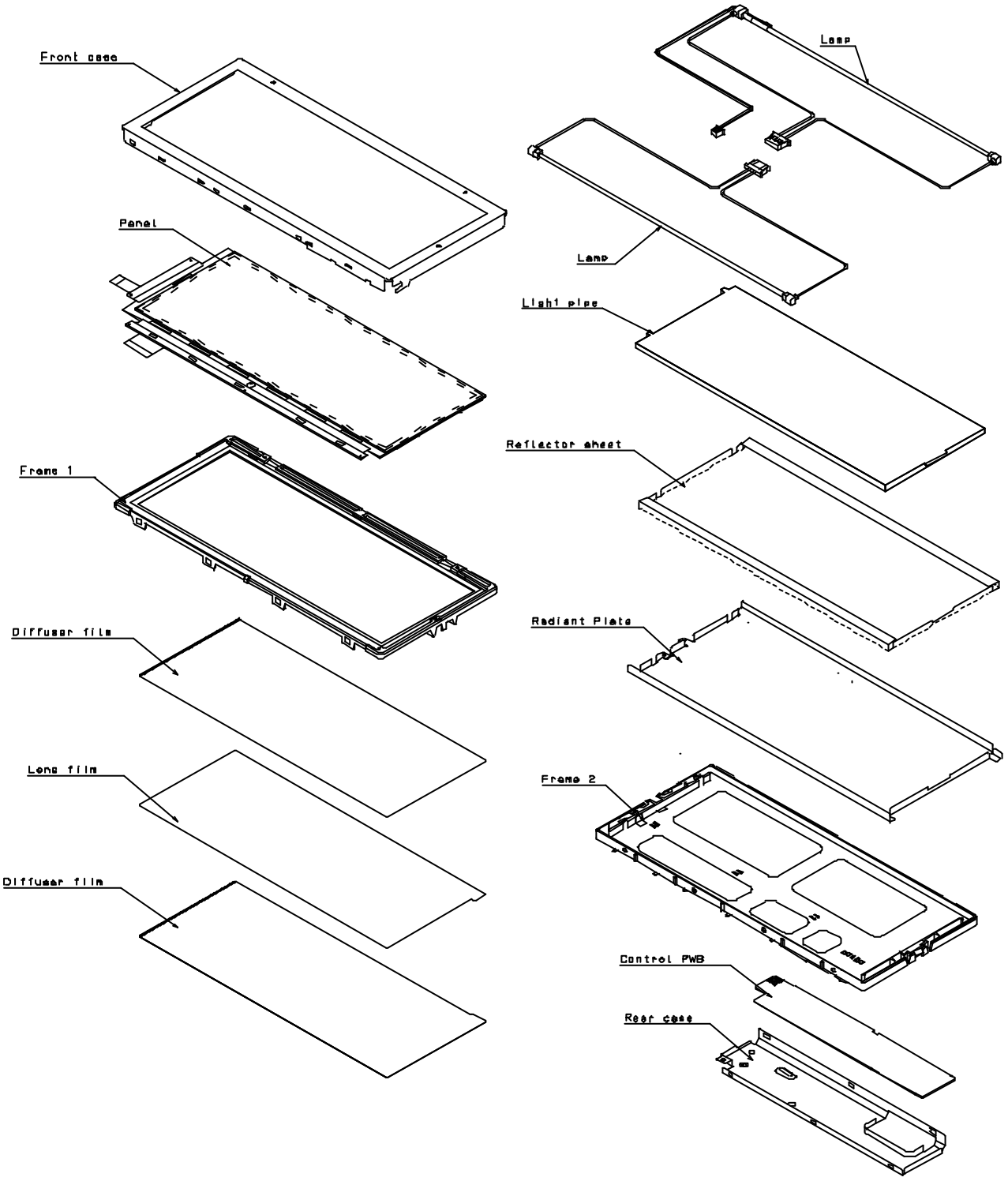


Fig.2 The Construction Form

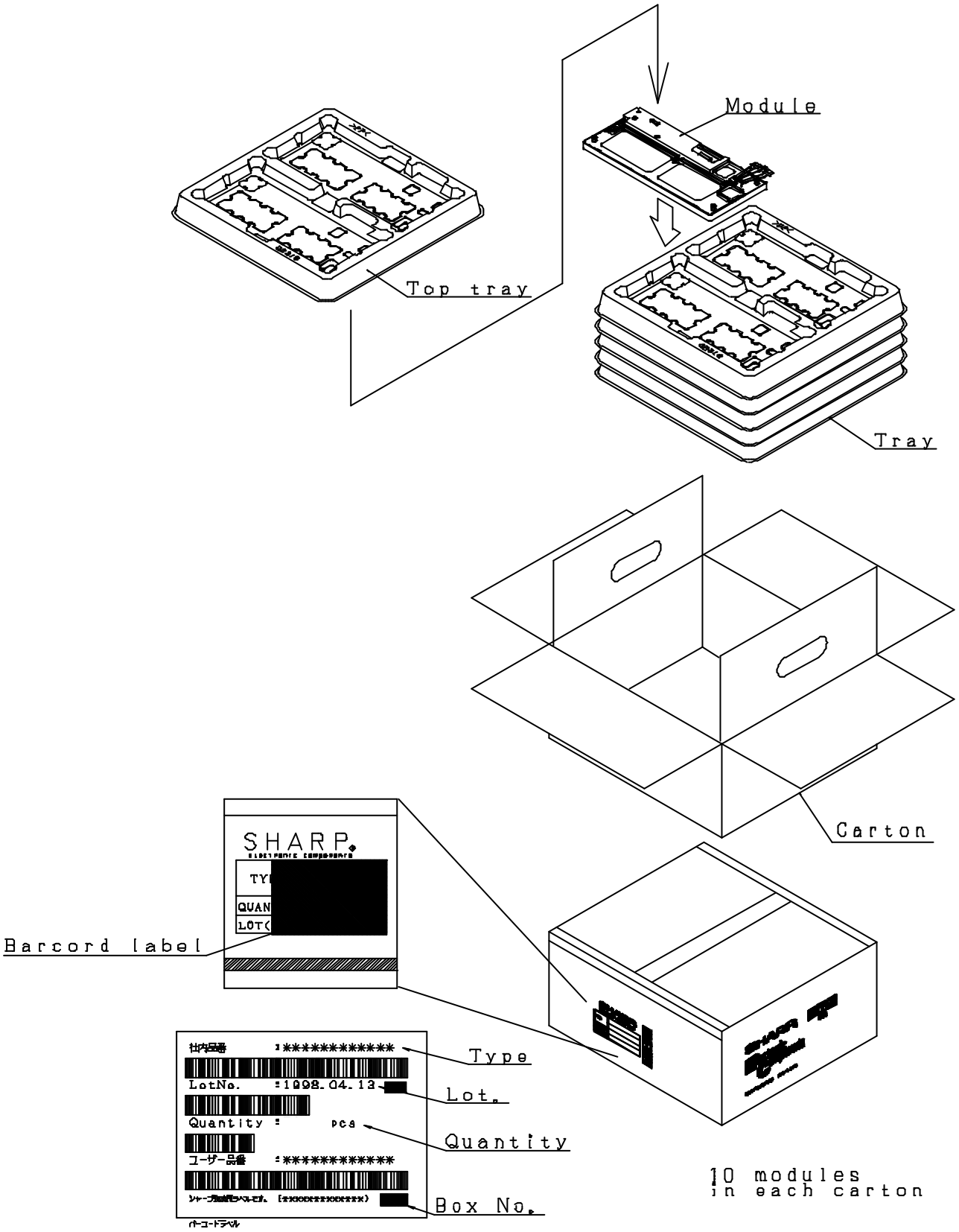


Fig.3 Packing Form