

PREPARED BY:	DATE
APPROVED BY:	DATE

SHARP

LIQUID CRYSTAL DISPLAY GROUP
SHARP CORPORATION

SPECIFICATION

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APPLICABLE GROUP Liquid Crystal Display Group

DEVICE SPECIFICATION FOR

TFT-LCD unit

MODEL No. LQ10D011



CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED BY Y. Kanatani

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 SHARP CORPORATION

1. Application

This specification applies to color TFT-LCD unit, LQ10D011.

2. Overview

This unit is a color active matrix LCD unit incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit and power supply circuit. Graphics and texts can be displayed on 640 x 480 dot panel in 512 colors by supplying 9 bit data signal, three kinds of timing signals, +5V and +12V DC supply voltages and supply voltage for backlight. The detachable backlight case design allows easy replacement of backlight for user convenience.

3. Mechanical Specifications

Parameter	Specifications	Unit
Unit outline dimensions	283 (W) x 217(H) x 25(D)	mm
Effective viewing area	10.4 (Diagonal)	Inch
	211.2(W) x 158.4(H)	mm
Display format	640 x (RGB) x 480	Pixel
	(1 pixel = R + G + B dots)	
Pixel pitch	0.33(W) x 0.33(H)	mm
Pixel configuration	R.G.B vertical stripe	
Display mode	Normally white	
Weight	960	g

4. Absolute Maximum Ratings

4-1 Electrical Absolute Maximum Ratings

(Ta = 25°C)

Parameter	Symbol	Rating	Unit
Input voltage	Vi	-0.3 to Vcc + 0.3	V
5V supply voltage	Vcc	-0.3 to + 7	V
12V supply voltage	Vbb	-0.3 to + 14	V

4-2 Environmental Conditions

Parameter	Tstg	Topr	Remark
Ambient temperature(Ta)	-25°C to +60°C	0°C to +40°C	Note 1
Panel temperature (Tp)	-25°C to +60°C	0°C to +60°C	Note 2
Humidity	Note 3	Note 3	No condensation
Vibration	Note 4		
Shock	Note 5		

Note 1 Ambient temperature for this unit

Note 2 Surface temperature of LCD panel

Note 3 $T_a \leq 40^\circ\text{C}$... 95% RH max.

$T_a > 40^\circ\text{C}$... Relative humidity shall be no more 80% RH

Note 4 Frequency: 10 to 57 Hz

Vibration width(One side): 0.075mm

Frequency: 58 to 500 Hz

Gravity:1G

Sweep time: 11 min.

Test period: 6 hours (2 hours for each direction of X/Y/Z)

(Based on IEC 68-2-6, IEC 68-2-47)

Note 5 Max. gravity: 50G

Pulse width: 11ms sin wave

Direction: $\pm X, \pm Y, \pm Z$

3 times for each direction

(Based on IEC 68-2-49)

5. Electrical Characteristics

($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit
+5V Supply voltage	Vcc	+ 4.75	+ 5.0	+ 5.25	V
Current dissipation	Icc			100	mA
+12V Supply voltage	Vbb	+ 11.4	+ 12.0	+ 12.6	V
Current dissipation	Ibb			420	mA
Input voltage (Low)	VIL			+ 0.8	V
Input voltage (High)	VIH	+ 2.0			V
Input leakage current	IOL	- 10		+ 10	μA
VI= 0V to Vcc					

As for backlight, refer to 11-a)

6. Input Terminal Function

CN1 (Interface signal, Power supply) Used connector : LX-22P-DT1-P1 (JAE)

Corresponding connector: LX-DC22(JAE)

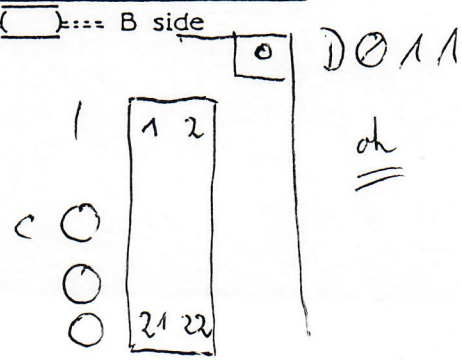
Terminal	Symbol	Function	Remark
1	CK	Clock signal for sampling each data signal	
2	GND	-	
3	R0	RED data signal (LSB)	Plus
4	R1	RED data signal	Plus
5	R2	RED data signal (MSB)	Plus
6	GND	-	
7	G0	GREEN data signal (LSB)	Plus
8	G1	GREEN data signal	Plus
9	G2	GREEN data signal (MSB)	Plus
10	GND	-	
11	B0	BLUE data signal (LSB)	Plus
12	B1	BLUE data signal	Plus
13	B2	BLUE data signal (MSB)	Plus
14	GND		
15	Hsync	Horizontal sync. signal	Minus
16	GND		
17	Vsync	Vertical sync. signal	Minus
18	Vcc	+ 5V power supply (Logic, LCD drive)	
19	GND		
20	Vdd	+ 12V power supply (LCD drive)	
21	---	RESERVED(Do not use this terminal)	
22	---	RESERVED(")	

CN2, CN3 (Power supply for backlight) Used connector : 51006-0800(MOLEX)

Corresponding connector: 51005-0800(MOLEX)

Terminal	Symbol	Function	Remark
1	Vlamp1	Power supply for lamp (A side)	
2		NC	
3	Vlamp1	Power supply for lamp (A side)	
4		NC	
5	Vlamp2	Power supply for lamp (B side)	
6		NC	
7	Vlamp2	Power supply for lamp (B side)	
8		NC	

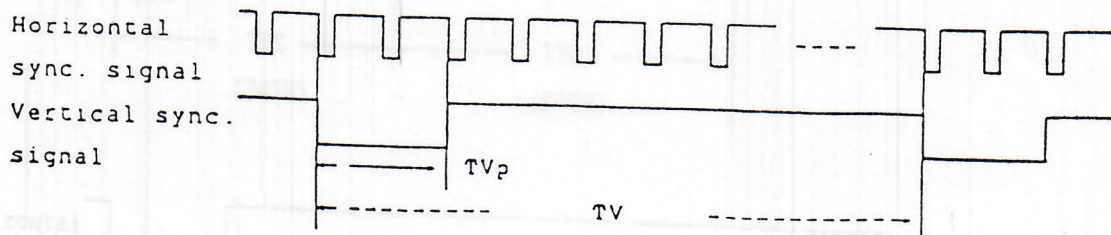
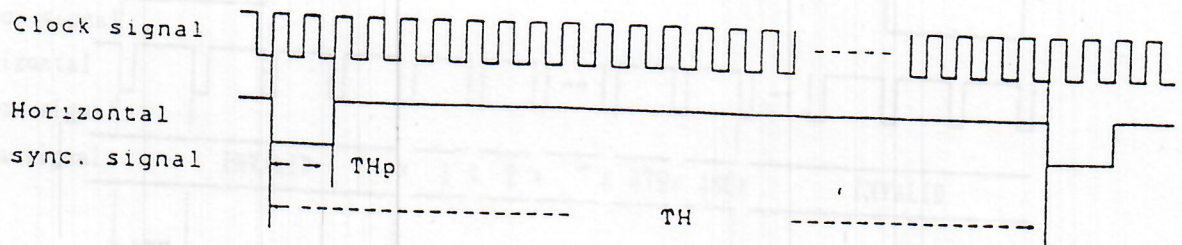
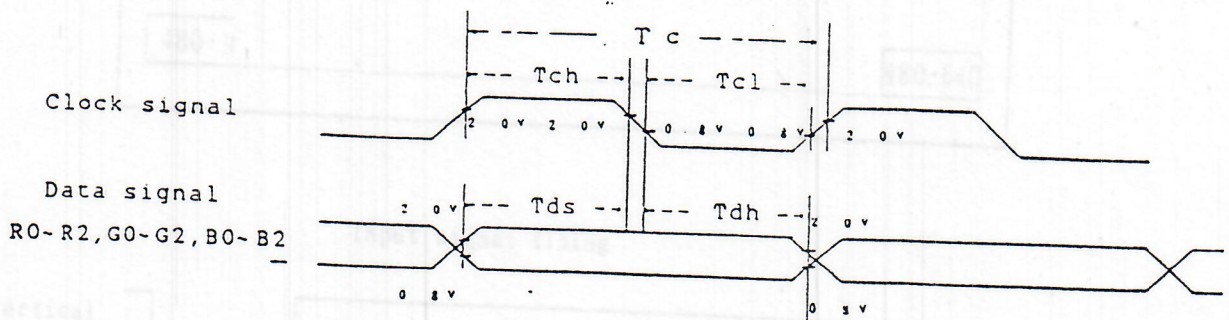
CN2: For upper lamp, CN3: For lower lamp, A side --- () --- B side



7. Timing Characteristics of input signals

Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	1/Tc		25.175 25.175 ₃	28.322	MHz
	High time	Tch	5			ns
	Low time	Tcl	10			ns
Data	Setup time	Tds	0			ns
	Hold time	Tdh	10			ns
Horizontal sync.signal	Cycle	TH	30	31.78	31.77	μs
			770	800	900	Clock
	Pulse width	THp		96		Clock
Vertical sync.signal	Cycle	TV		16.7		ms
				525		Line
	Pulse width	TVp		2		Line
Horizontal sync. signal	Display start-up period	THS		144		Clock
	Display period	THD		640		Clock
Vertical sync. signal	Display start-up period	TVS		34		Line
	Display period	TVD		480		Line

Note: Make sure that timing of the signals are within the specifications to ensure right display position.



9. Input Signals, Basic Display Colors and Gray Scale of Each Color

color	Data signal									
	R 0	R 1	R 2	G 0	G 1	G 2	B 0	B 1	B 2	
Basic color	Black	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	1	1	1
	Green	0	0	0	1	1	1	0	0	0
	Light blue	0	0	0	1	1	1	1	1	1
	Red	1	1	1	0	0	0	0	0	0
	Purple	1	1	1	0	0	0	1	1	1
	Yellow	1	1	1	1	1	1	0	0	0
	White	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0
	↑	1	0	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0
	↑	1	1	0	0	0	0	0	0	0
	↓	0	0	1	0	0	0	0	0	0
	Brighter	1	0	1	0	0	0	0	0	0
	↓	0	1	1	0	0	0	0	0	0
	Red	1	1	1	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0
	↑	0	0	0	1	0	0	0	0	0
	Darker	0	0	0	0	1	0	0	0	0
	↑	0	0	0	1	1	0	0	0	0
	↓	0	0	0	0	0	1	0	0	0
	Brighter	0	0	0	1	0	1	0	0	0
	↓	0	0	0	0	1	1	0	0	0
	Green	0	0	0	1	1	1	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0
	↑	0	0	0	0	0	0	1	0	0
	Darker	0	0	0	0	0	0	0	1	0
	↑	0	0	0	0	0	0	1	1	0
	↓	0	0	0	0	0	0	0	0	1
	Brighter	0	0	0	0	0	0	1	0	1
	↓	0	0	0	0	0	0	0	1	1
	Blue	0	0	0	0	0	0	1	1	1

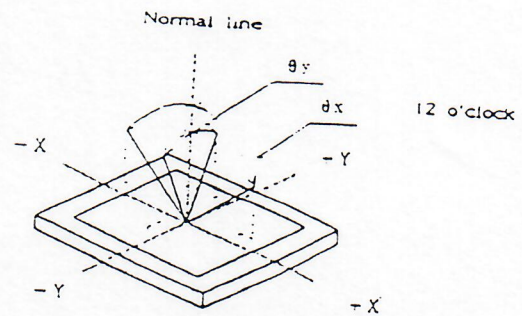
0: Low level voltage
1: High level voltage

Each color is displayed in 8 gray scales from 3 bit data signal input. According to the combination of total 9 bit data, 512 colors are displayed.

Ta=25°C, Vcc=-5V, Vdd=-12V

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	
Viewing angle range	Horizontal	θ_x	$Co > 10$	-45	-	-45	Deg.	Note 1
	Vertical	θ_y		-30	-	+10	Deg.	Note 1
Contrast ratio	Co	Optimum viewing angle	60					Note 2
Response time	Rise	τ_r	-	30	-	ms	Note 3	
	Decay	τ_d	-	50	-	ms		
White chromaticity	x	$\theta_x = 0^\circ$	-	0.3101	-			
	y	$\theta_y = 0^\circ$	-	0.3162	-			
Brightness			60	80	-	nt	Note 4	

Note 1 Definitions of viewing angle range:



Note 2 Definitions of Contrast Ratio:

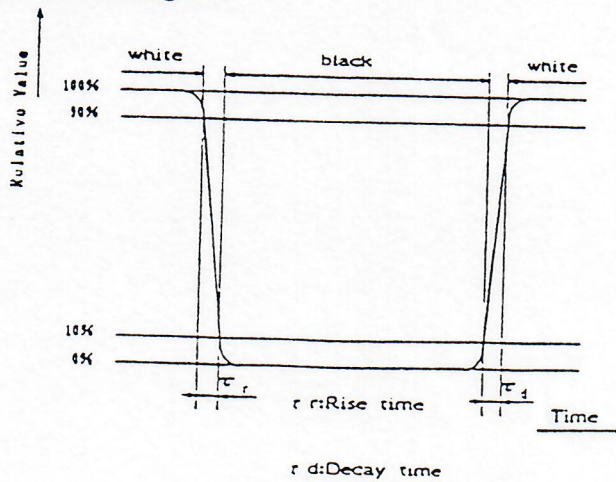
The contrast ratio is calculated using the following formula with optical characteristics measurement method.(Fig.1)

$$\text{Contrast ratio} = \frac{\text{Luminance (brightness) when all pixels are "white"}}{\text{Luminance (brightness) when all pixels are "black"}}$$

(measured in darkroom)

Note 3 Definitions of Response Time:

The response characteristics of photodetector output are measured when input signals for "black" are turned on and turned off, respectively.(Refer to the below figure)

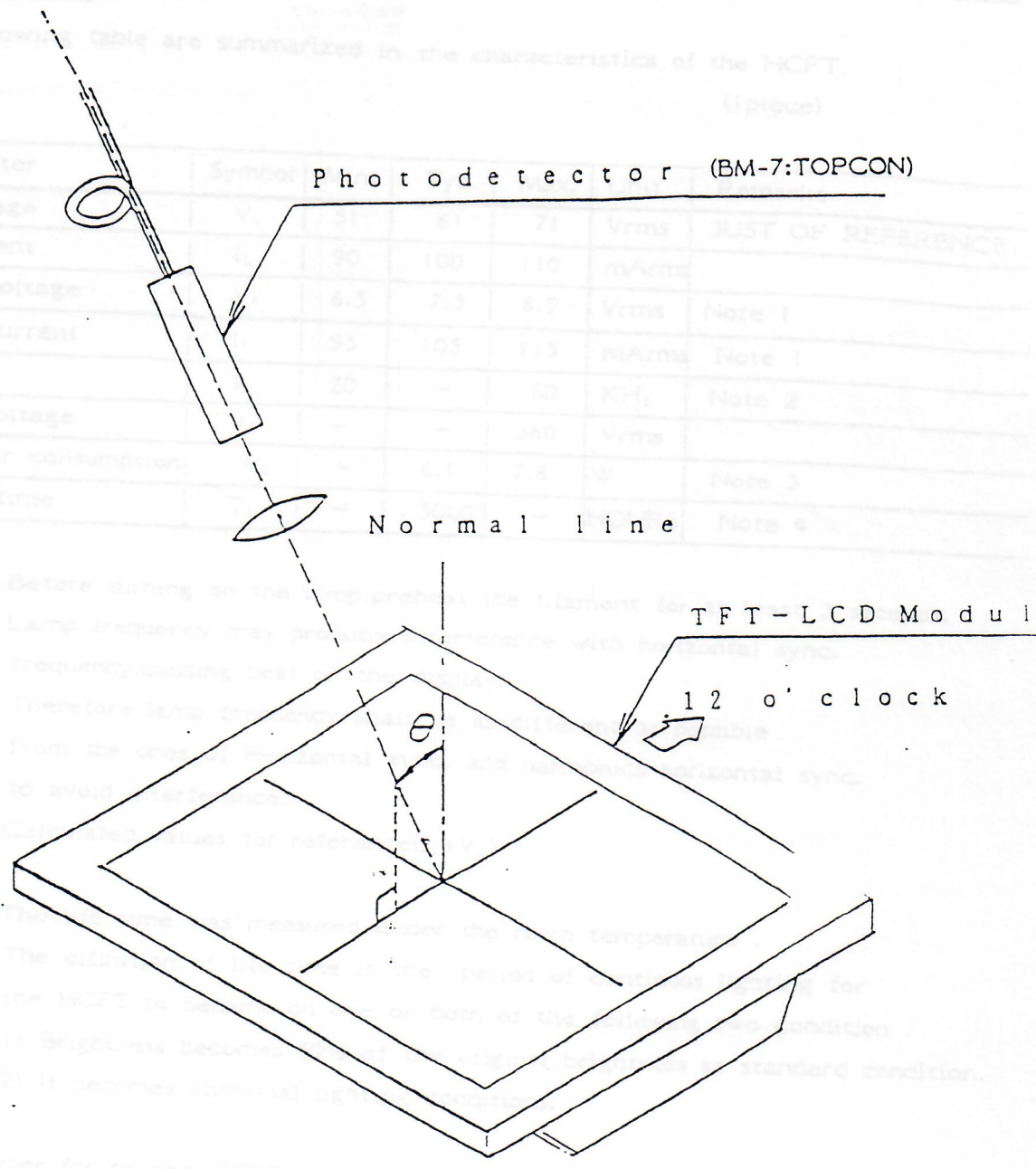


Note 4 The measurement shall be executed 20 minutes after turning on, with the display being in "white" state.

The backlight system is composed with couple of HCFT (FLAEX-D/265T/2/L5 Toshiba Light-tech.Co.)

The following table are summarized in the characteristics of the HCFT.

Parameter	Symbol	51	61	71	Unit	REMARKS
Lamp voltage	V_L	90	100	110	Vrms	JUST OF REFERENCE
Lamp current	I_L	6.5	7.5	8.5	mA rms	Note 1
Filament voltage	V_f	95	105	115	Vrms	Note 1
Filament current	I_f	-	-	360	Vrms	Note 2
Frequency	f	-	-	60	KHz	Note 2
Kick-off voltage	V_{KO}	-	-	-	V	Note 3
Lamp power consumption	P_L	-	6.1	7.4	W	Note 3
Lamp life time	t_L	-	-	-	h	Note 4



Note 1: Before during on the HCFT, check the filament for the lamp.

Note 2: Lamp frequency may vary with the lamp size with horizontal sync frequency causing best results with vertical sync.

Note 3: Call out values for reference only. The actual values may vary from the original design and may not be suitable for standard condition.

Note 4: The actual life time may vary with the lamp temperature.

DC/AC inverter for driving HCFT is not built in the models.

Fig1. Optical characteristics mesurment method

11. Backlight Characteristics 20

The backlight system is composed with couple of HCFT(FL6EX-D/265T12/LB Toshiba Light-tech.Co.)

The following table are summarized in the characteristics of the HCFT.
(1piece)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lamp voltage	V_L	51	61	71	Vrms	JUST OF REFERENCE
Lamp current	I_L	90	100	110	mArms	
Filament voltage	V_F	6.5	7.5	8.5	Vrms	Note 1
Filament current	I_f	95	105	115	mArms	Note 1
Frequency	f_L	20	-	60	KHz	Note 2
Kick-off voltage	V_s	-	-	360	Vrms	
Lamp power consumption	W_L	-	6.1	7.8	W	Note 3
Lamp life time	T_L	-	5000	-	HOURS	Note 4

Note 1: Before turning on the lamp, preheat the filament for at least 3 seconds.

Note 2: Lamp frequency may produce interference with horizontal sync. frequency, causing beat on the display.

Therefore lamp frequency shall be as different as possible from the ones of Horizontal sync. and harmonics horizontal sync. to avoid interference.

Note 3: Calculated values for reference ($I_L \times V_L$)

Note 4: The life time was measured under the room temperature .

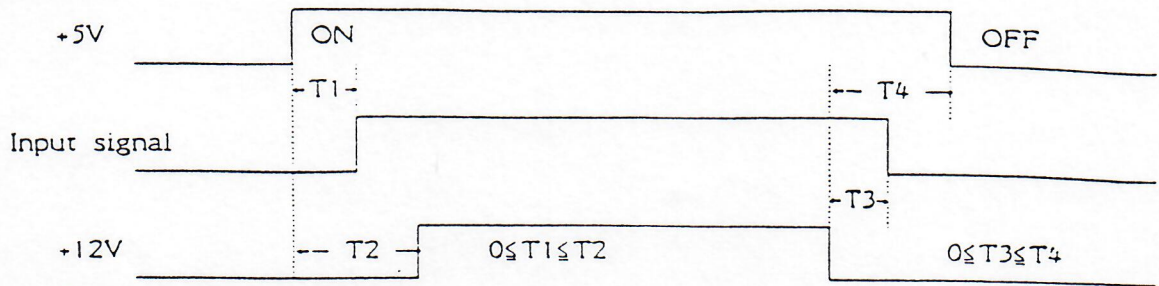
The definition of life time is the period of continuous lighting for the HCFT to become on one or both of the following two condition .

- 1) Brightness becomes 50% of the original brightness at standard condition.
- 2) It becomes abnormal lighting conditions.

※ DC/AC inverter for driving HCFT is not built in the modele.

12. Power ON/OFF sequential timing

To prevent the latch-up of the circuit in the unit, keep the sequential timing between the input signal and supply voltages as follows,



13. Handling Precautions

- 1) When installing the unit, be sure to fix the unit on the same plane, taking care not to warp or twist the unit.
- 2) A transparent acrylic resin board or other type of transparent protective plate should be attached to the front of the unit to protect the LCD panel.
- 3) Since the front polarizer is easily damaged, pay attention not to scratch it.
- 4) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 5) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 6) Since the unit uses glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- 7) Since CMOS LSI is used in this unit, take care of static electricity and ground your body when handling.

14. Others

1. Acceptance criteria for display are specified in the Inspection Standard (LDI90Y26).
2. If any problem occurs in relation to the description of this specification, it shall be resolved through discussion with spirit of cooperation.

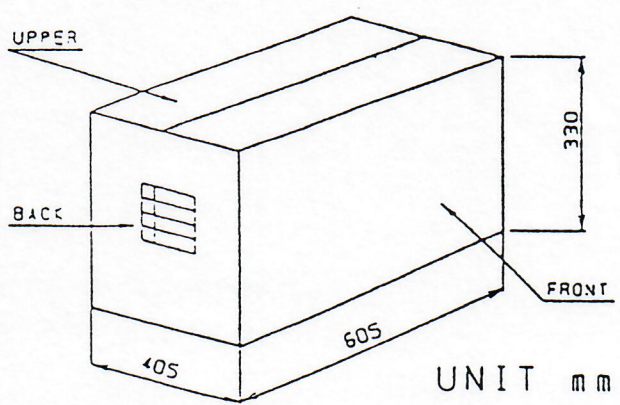
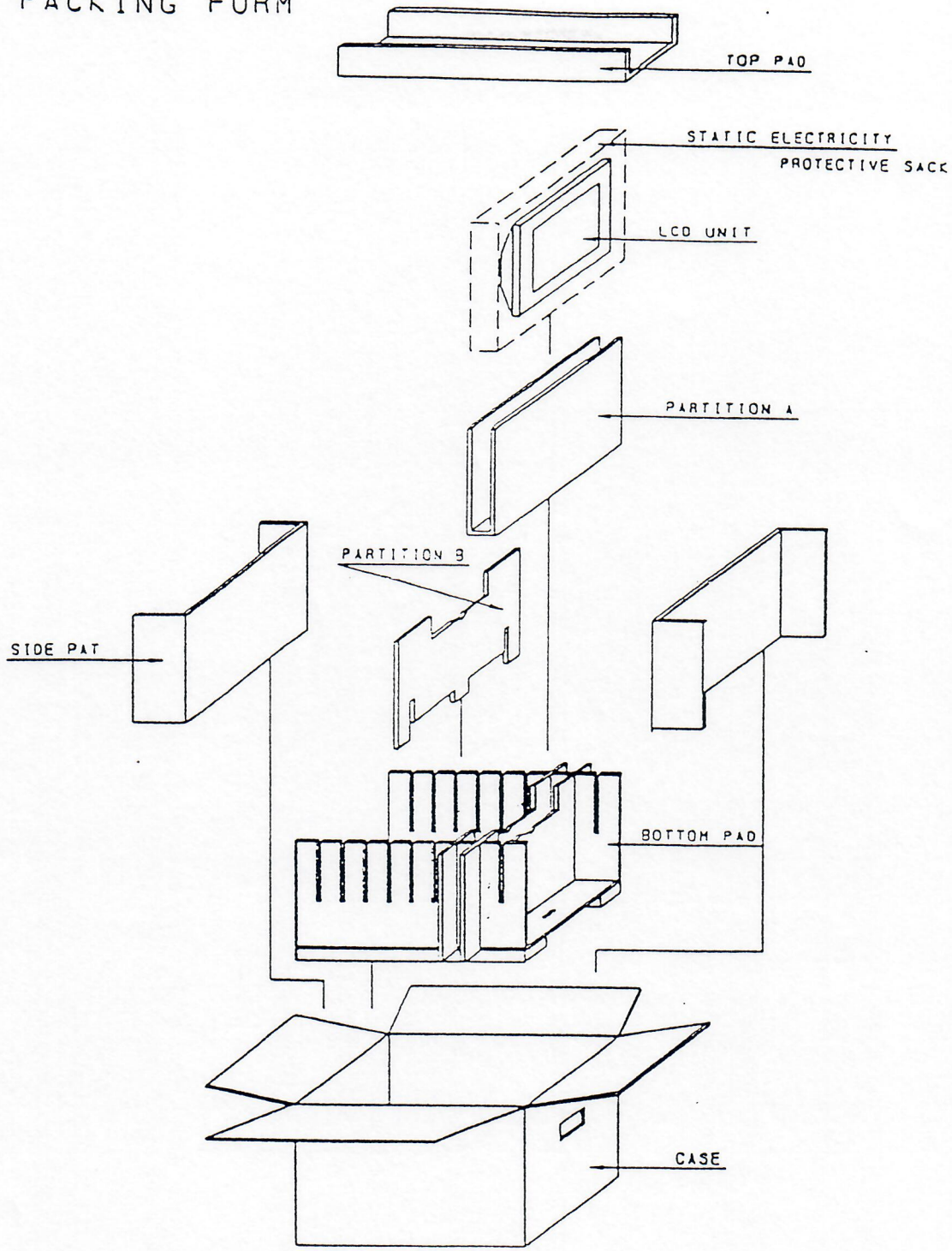
15. COCOM Information

This product falls under "STRATEGIC PRODUCT" according to the export trade control ordinance in force. And export of the item requires an export licence issued by the relative authorities.

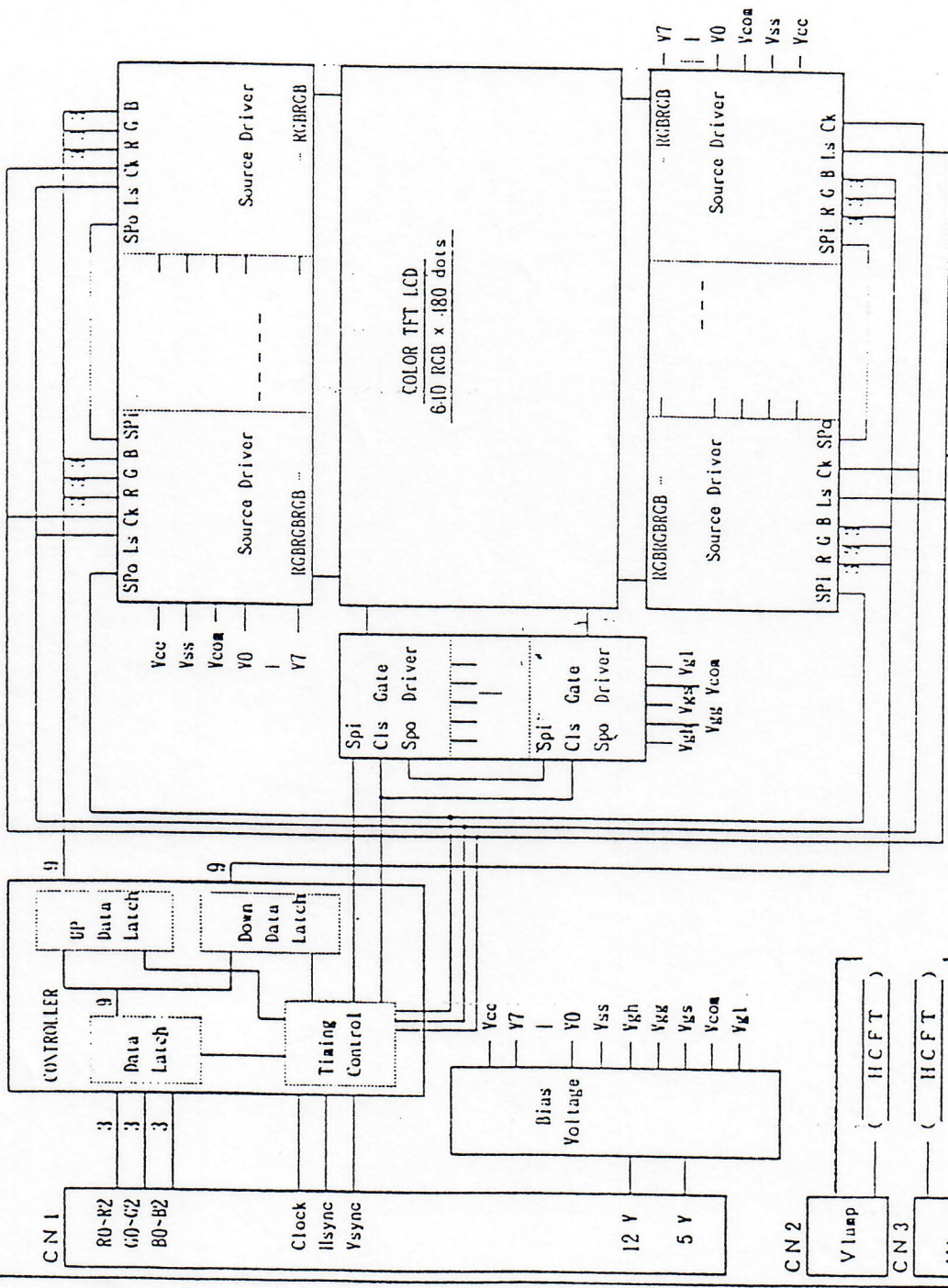
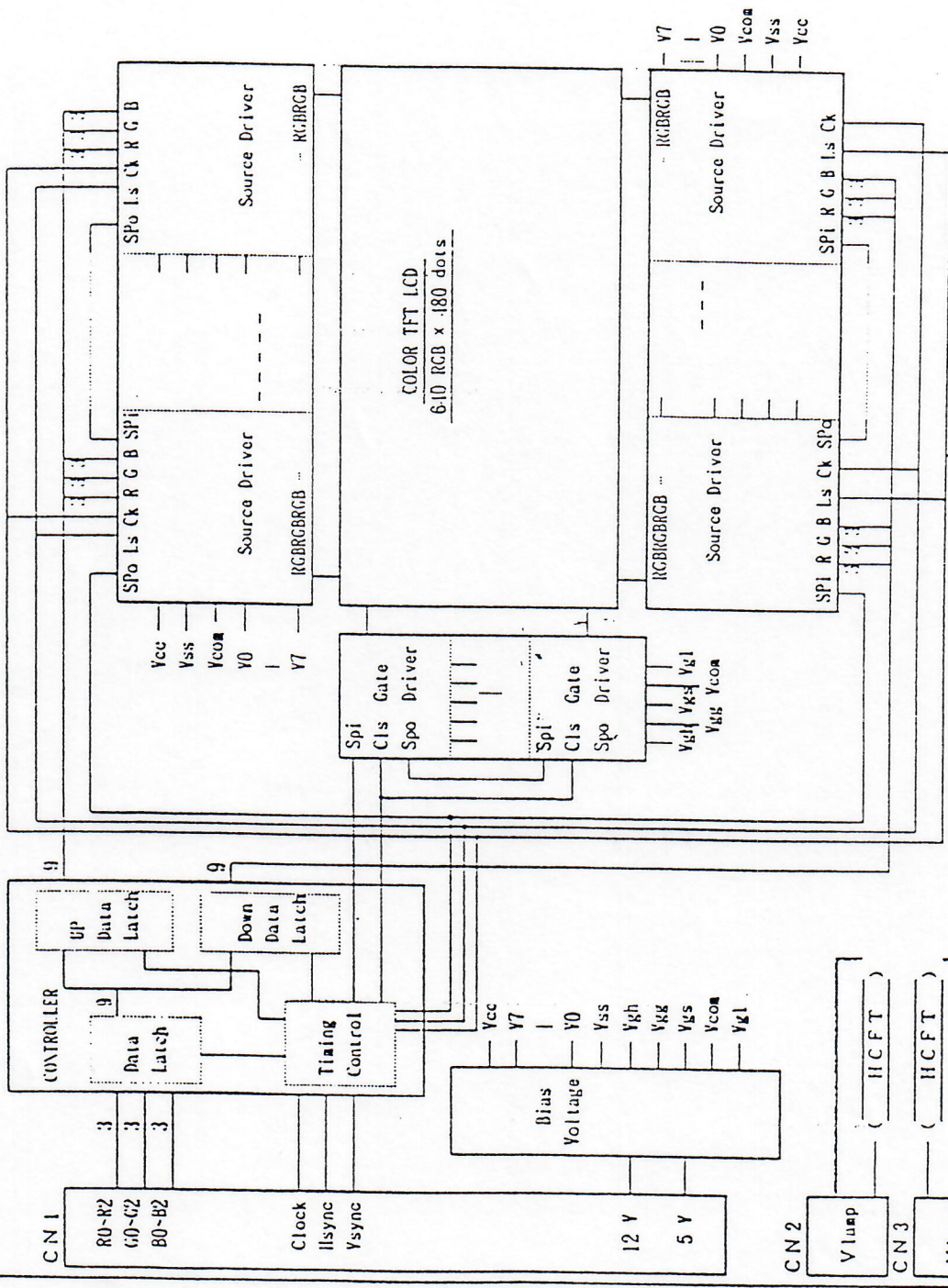
Please confirm us whether the licence is necessary since the ordinance may be revised by the authorities.

PACKING FORM

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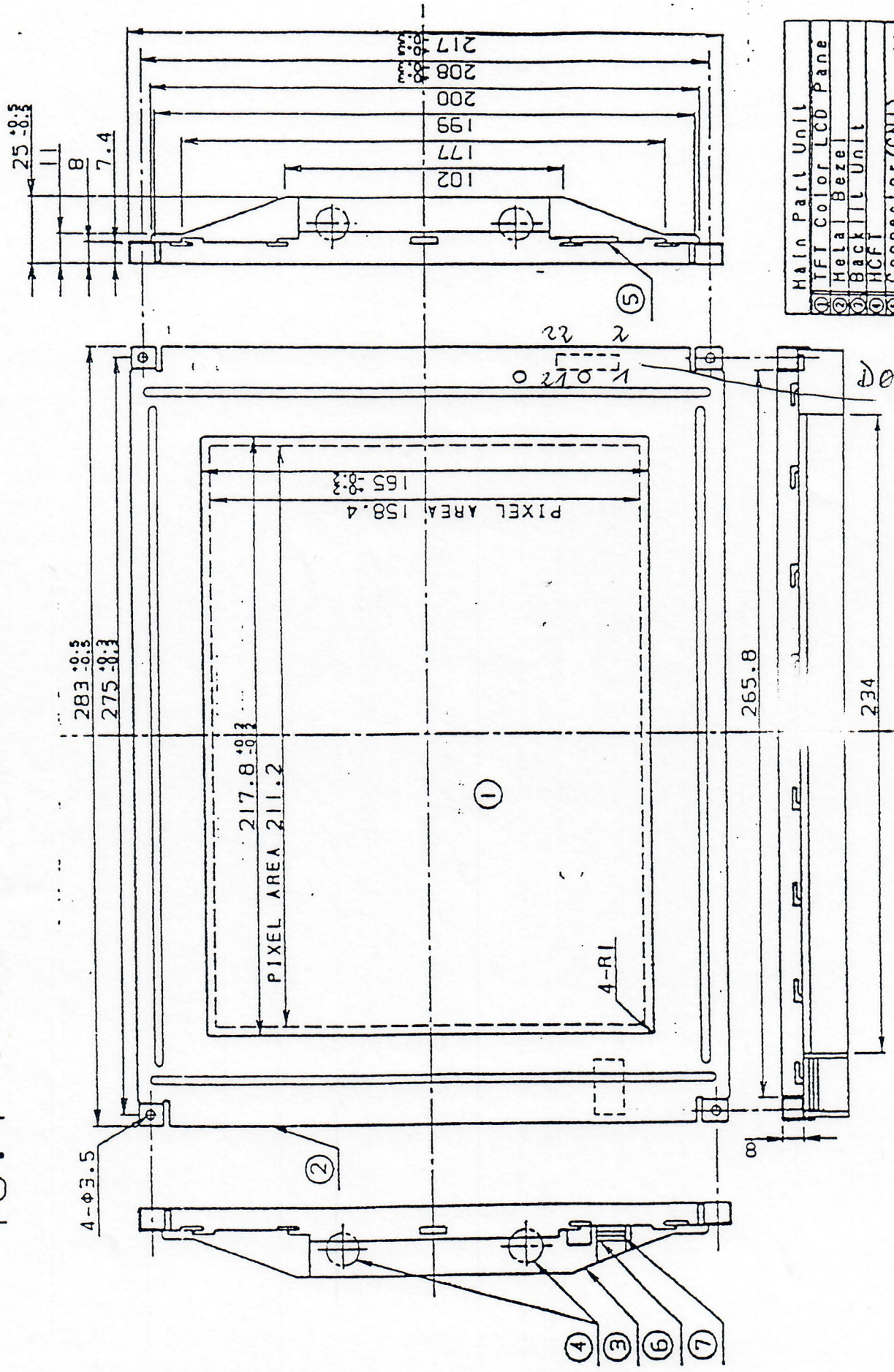
512 Color Circuit Block Diagram



LQ100011

10.4 inch TFT COLOR LCD UNIT

2/2



Main Part Unit	
①	TFT Color LCD Pane
②	Metal Bezel
③	Backfill Unit
④	HCFT
⑤	Connector (CN1)
⑥	Connector (CN2)
⑦	Connector (CN3)

UNIT 10
 表示単位: 公差値 ± 0.5

10.5mm IF NOT SPECIFIED

DSiPA-B204-11