HITACHI

KAOHSIUNG HITACHI
ELECTRONICS CO.,LTD
P.O. BOX 26-27
2,13TH EAST ST. K.E.P.Z.
KAOHSIUNG TAIWAN R.O.C.
TEL:(07) 821-5811 (7 LINE)
FAX:(07) 821-5815

FOR MESSRS :   DATE : Apr.01,2008

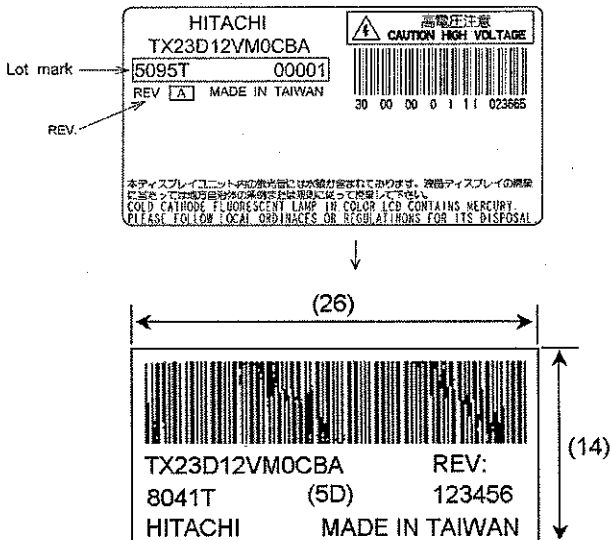## CUSTOMER'S ACCEPTANCE SPECIFICATIONS
TX23D12VM0CBA
C O N T E N T S

No.	ITEM	SHEET No.	PAGE
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*When product will be discontinued, customer will be informed by HITACHI with twelve months prior announcement.

ACCEPTED BY;   PROPOSED BY; Dan Cheng

RECORD OF REVISION

DATE	SHEET No.	SUMMARY
Apr.01,'08	7B64PS 2701 – TX23D12VM0CBA-2 Page 4-1/2	4.1 ENVIROMENTAL ABSOLUTE MAXIMUM RATINGS Changed :
		7B64PS 2706- TX23D12VM0CBA-2 PAGE 6-1/3
	7B64PS 2710- TX23D12VM0CBA-2 PAGE 10-2/2	10.2 BACK VIEW The lot label size and position is changed
	7B64PS 2711- TX23D12VM0CBA-2 PAGE 11-1/1	11.1 LOT MARK

4.1 ENVIROMENTAL ABSOLUTE MAXIMUM RATINGS
Changed :

ITEM	OPERATING	
	MIN.	MAX.
Temperature	(-10)	(60)

↓

ITEM	OPERATING	
	MIN.	MAX.
Temperature	-10	55

Note 6) In operation condition (Ta>60℃) → (Ta>55℃)

6.2.3 MECHANICAL CHARACTERISTICS
Changed:

ITEM	SPECIFICATION	NOTE
Pen Input Pressure	5~80gF	R0.8, Polyacetal Pen

↓

ITEM	SPECIFICATION	NOTE
Pen Input Pressure	1.2N max	R0.8, Polyacetal Pen

11.1 LOT MARK
Changed : 5 digits for production number
↓
6 digits for production number

11.3 LOCATION OF LOT MARK
Changed :

3. GENERAL DATA

The following specifications are applied to the following Supper-TFT module.
Note : Inverter for Back-Light unit is not built in this module.

Product Name	TX23D12VM0CBA	
Effective Display Area	(H)195.0 x (V)117.0	[mm]
Number of Pixels	(H)800 x (V)480	[pixels]
Pixel Pitch	(H)0.24375 x (V)0.24375	[mm]
Color Pixel Arrangement	R+G+B Vertical Stripe	
Display Mode	Transmissive Mode	
	Normally Black Mode	
Top Polarizer Type	Anti-Glare	
Number of Colors	262,144	[colors]
Viewing Angle Range	Super Wide Version	
	(Horizontal & Vertical : 170° , CR≧10)	
Color Gamut	60%(typ.) For NTSC	
Input Signal	CMOS	
Backlight	CCFL ,1 pc Side-light type (U shape)	
External Dimensions	(H)236.0 x (V)135.0 x (t)14.0 typ.	[mm]
Weight	470 typ.	[g]
Touch Panel	Resistance type	
	The surface is antiglare type.	

4. ABSOLUTE MAXIMUM RATINGS

4.1 ENVIROMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		UNIT	NOTE
	MIN.	MAX.	MIN.	MAX.		
Temperature	-10	55	-20	70	℃	1),5),6),7)
Humidity	(Note 2)		(Note 2)		%RH	1)
Vibration	-	4.9(0.5G)	-	14.7(1.5G)	m/s^2	3)
Shock	-	29.4(3G)	-	294(30G)	m/s^2	4)
Corrosive Gas	Not Acceptable		Not Acceptable		-	
Illumination at LCD Surface	-	50,000	-	50,000	lx	

Note 1) Temperature and Humidity shall be applied to the glass surface of a Super-TFT Module , not to the system installed with a module.
The temperature at the lower right of rear surface (nearby the terminal of the CCFL) should be less than 80℃ on the condition of operating.
Operating temperature means the temperature a TFT-LCD Module can be driven , the screen performance (contrast , brightness , response time etc.) is judged at Ta=25℃. The brightness of a CCFL tends to drop at low temperature.
Besides , the life-time becomes shorter at low temperature.

2) Ta≦40℃······Relative humidity should be less than 85%RH max. Dew is prohibited.
Ta>40℃······Relative humidity should be lower than the moisture of the 85%RH at 40℃

3) Frequency of the vibration is between 20Hz and 50Hz.
(Remove the resonance point)

4) Pulse width of the shock is 10 ms.

5) In Non-operation condition (Ta>70℃) the TFT-LCD module should be put within 100 hrs.
In Non-operation condition (Ta<-20℃) the TFT-LCD module should be put within 48 hrs and without condensation.

6) In operation condition (Ta>55℃) the TFT-LCD module should be put within 100 hrs.
In operation condition (Ta<-10℃) the TFT-LCD module should be put within 48 hrs and without condensation.

7) Operation temp range is reference.

4.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS
4.2.1 SUPER-TFT MODULE

VSS=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	VDD	0	4.0	V	
Input Voltage for logic	VI	-0.3	VDD+0.3	V	1)
Electrostatic Durability	VESD0	±100		V	2),3)
	VESD1	±8		kV	2),4)

Note 1) It shall be applied to pixel data signal and clock signal.
2) Discharge Coefficient : 200pF - 250Ω, Environmental : 25℃ - 70%RH
3) It shall be applied to I/F connector pins.
4) It shall be applied to the surface of a metallic bezel a LCD panel.

4.2.2 BACK-LIGHT

GND=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Input Current	IL	-	7.0	mArms	1)
Input Voltage	VL	-	2000	Vrms	2)

Note 1) It is defined at ground line.
2) It shall be applied at connector pins for a CFL at start-up.

5. OPTICAL CHARCACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

    Measuring equipment : Top com BM-7 , ritchard 1980A, or equivalent

    Temperature = 25℃ , VDD=3.3V , fV=60Hz , IL=(6.0)mArms

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR		200	400	-	-	2)
Response Time	RISE	ton		-	13	30	ms	3)
	FALL	toff		-	17	35	ms	3)
Brightness of White		Bwh		200	240	-	cd/m^2	
Brightness Uniformity		Buni		70	-	-	%	.4)
Color Chromaticity (CIE)	Red	x	$\theta=0°$ (Note 1)	0.57	0.62	0.67	-	
		y		0.29	0.34	0.39		
	Green	x		0.24	0.29	0.34		
		y		0.55	0.60	0.65		
	Blue	x		0.09	0.14	0.19		
		y		0.05	0.10	0.15		
	White	x		0.26	0.31	0.36		
		y		0.28	0.33	0.38		
Viewing Angle (CR≧10)	x - x'	θx	$\phi=0°$	85	-	-	deg.	
		θx'	$\phi=180°$	85	-	-		
	y – y'	θy	$\phi=90°$	85	-	-		
		θy'	$\phi=270°$	85	-	-		

Note 1) Definition of Viewing Angle

θ=0°   eye

φ=90°
(12 o'clock)   Y

θ

φ=180°   X'
(9 o'clock)

φ
φ=0°
X   (3 o'clock)

Super-TFT Module

Z'

φ=270°
Y'   (6 o'clock)
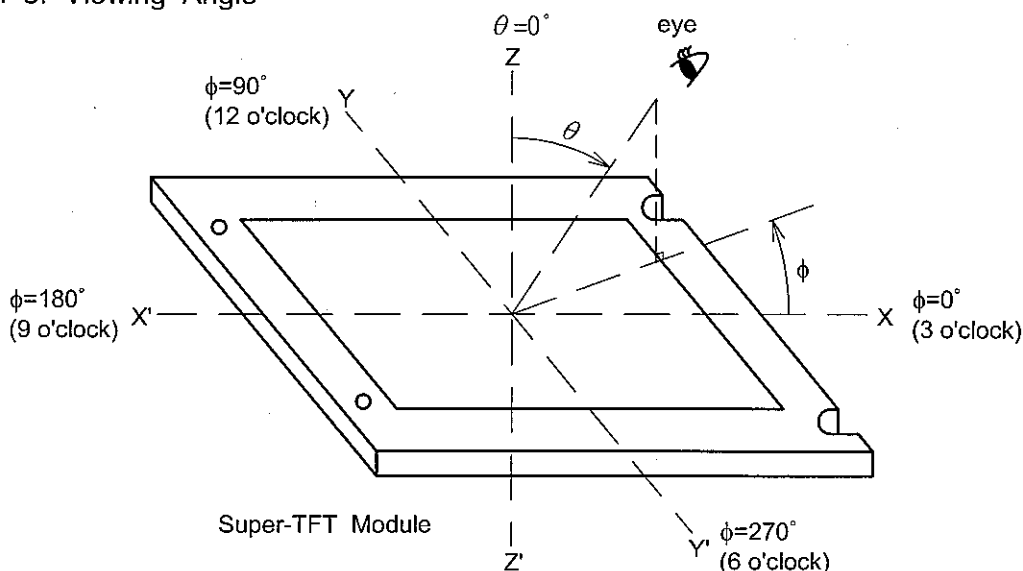
2) Definition of Contrast Ratio(CR) :

$$CR= \frac{(Luminance\ at\ displaying\ WHITE)}{(Luminance\ at\ displaying\ BLACK)}$$

3) Definition of Response Time

| Displaying Data Signal | Black | White | Black |

Optical Response (Luminance)

ton   toff

%
100
90

10
0

4) Definition of Birghtness Uniformity

90%
50%
10%

(1)   (3)
(5)
(7)   (9)

90%
50%
10%
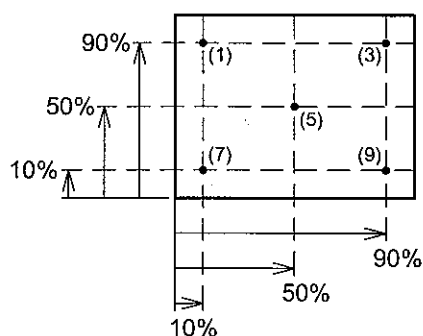
• : measuring point

Display pattern is white (63 level). The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximun and minimum brightness is calculated.

$$Buni= \frac{Bmin}{Bmax} \times 100$$

6 ELECTRICAL CHARACTERISTICS
6.1 TFT-LCD MODULE

Ta=25°C , VSS=0V

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT.	NOTE
Power Supply Voltage		VDD	3.15	3.3	3.45	V	
Input Voltage for Logic	Hi	VIH	0.8 x VDD	-	VDD	V	1)
	Lo	VIL	VSS	-	0.8		
Power Supply Current		IDD	-	300	500	mA	2)
Vsync Frequency		fV	-	60	75	Hz	
Hsync Frequency		fH	-	31.6	39.2	kHz	
DCLK Frequency		fCLK	-	33.3	40	MHz	

Note 1) It shall be applied to pixl data signal and clock signal.
   2) DC current at fv=60.0Hz,fCLK=33.3MHz,VDD=3.3V and display pattern is white.
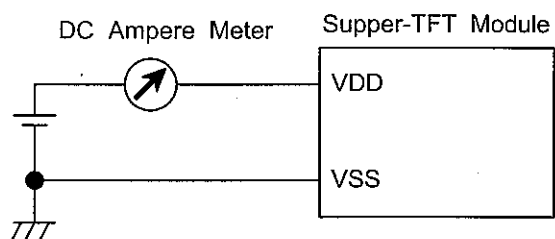
   3) Current capacity for power supply VDD should be larger than 3A
      This TFT-LCD Module has a fuse 1A.

6.2 ELECTRICAL CHARACTERISTICS OF TOUCH PANEL
6.2.1 OPERATING CONDITION

ITEM	SPECIFICATION	NOTE
Operating Voltage	5 VDC	7 VDC max.
Operating Current	20 mA max.	-

6.2.2 ELECTRICAL CHARACTERISTICS

ITEM		SPECIFICAYION	NOTE
Resistance Between Terminai	X1-X2	370~1010 Ω	At Connector
	Y1-Y2	200~590 Ω	At Connector
Insulation Resistance	X-Y	20 MΩ min.	Operating Voltage : 25V DC
Linearity	X	1.5% max.	(Note 1,2,3)
	Y	1.5% max.	
Chattering		10ms max.	

6.2.3 MECHANICAL CHARACTERISTICS

ITEM	SPECIFICATION	NOTE
Pen Input Pressure	1.2N max	R0.8mm polyacetal pen
Surface Hardness	3H	JIS K5400

6.2.4 OPTICAL CHARACTERISTICS

ITEM	SPECIFICATION	NOTE
Transparency	80% min.	

Note 1 : Operating Volatge 5V DC
Note 2 : Test Area of Linearity
Note 3 : (1) Marerial of Pen = Poly - Acetalresin
       (2) End Shape = R0.8mm
       (3) Test force = 150gF
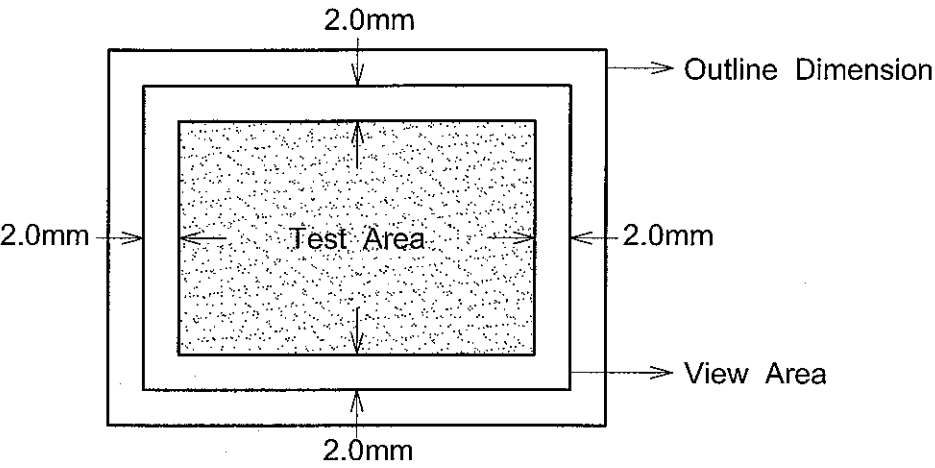
Note 4 : Measurement condition of Linearity

Linearity Definition
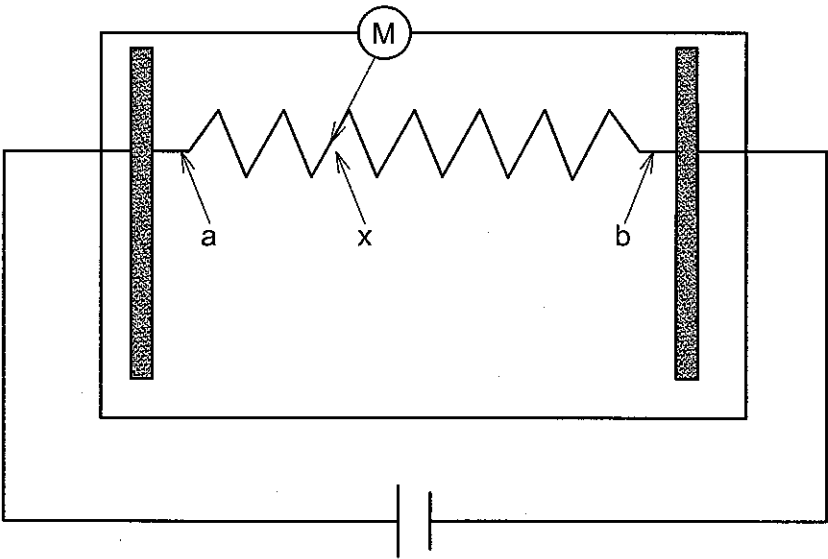
Va : maximum voltage in the active area of touch panel
Vb : minimum voltage in the active area of touch panel
X : random measuring point
Vxm : Actual voltage of Lx point
Vxi : Theoretical voltage of Lx point

Distance(mm)
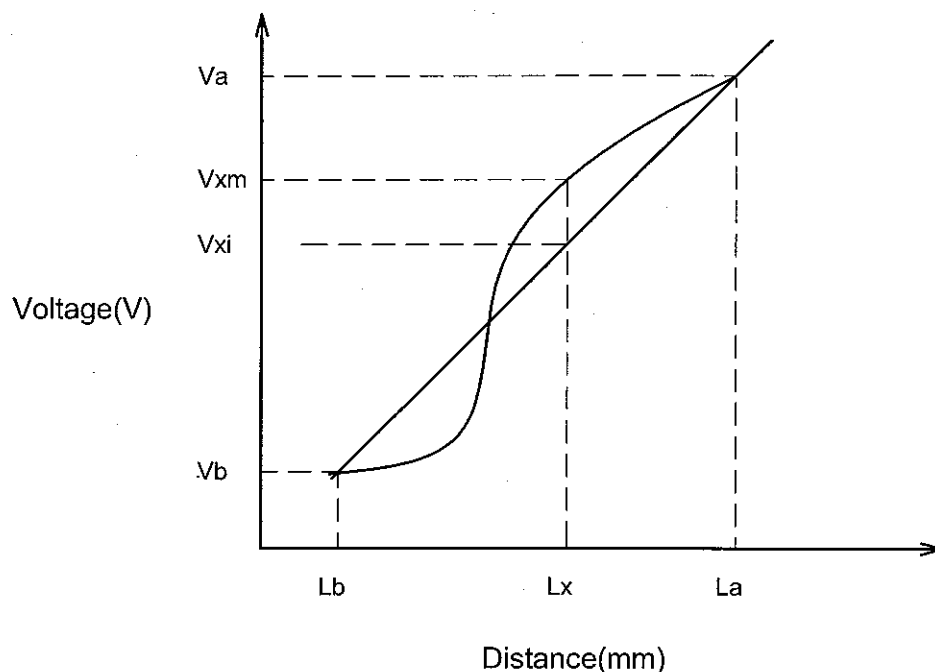
Linearity:[|Vxi-Vxm| /(Va-Vb)]*100%

6.3 BACK LIGHT

Ta=25°C , VSS=0V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT.	NOTE
Lamp Current	IL	4.0	6.0	7.0	mArms	1) , 3)
Lamp Voltage	VL	-	(1000)	-	Vrms	
Frequency	fL	50	-	70	kHz	2)
Starting Lamp Voltage	VS	1400	-	-	Vrms	6)
		1600	-	-		6) , 7)

Note 1) Higher IL caduses short life time of CCFL.
   2) Lamp frequency may cause interference with HSYNC frequency , causing beat or flicker on the display. Therefore lamp frequency shall be as different as possible from HSYNC frequency in order to avoid the interference.
   3) It is defined at GND line.
   4) The output voltage of the inverter should be kept 1 sec at least. Otherwise the lamp may not be turned on.
   5) The power supply characteristics of the inverter are very important to the performance of the back light , for example lighting characteristics or life time.
   Please evalute the power supply matching with the back light by the set which is near to the actual systems sufficiently , in order to avoid the abnormal lighting. (flicker , mislighting etc).
   The inverter should be built-in a safety circuit which detects over current , over voltage and distorted wave form of lamp current.
   6) Starting voltage should be more than Vs(Min.)
   7) Ta=0°C.

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7. BLOCK DIAGRAM
7.1 SUPER-TFT MODULE

```
                              CN1
Display data.  ━━▷             ┌──────────┐
                              │ │ Timing   │              ┌───┐  G1 ━▶  ┌──────────────────────┐
Timing signal                 │ │Controller│              │ G │  G2 ━▶  │                      │
                              │ └──────────┘              │ a │          │                      │
                              │                            │ t │          │      TFT-LCD         │
                              │ ┌──────────┐              │ e │  G480    │                      │
DC power supply ━━▷           │ │ DC/DC    │              │ D │  ━━━▶    │                      │
                              │ │Converter │              │ r │          └──────────────────────┘
                              │ └──────────┘              │ i │           ▲  ▲       ────      ▲
                              │                            │ v │          D1  D2             D2400
                              │                            │ e │          ┌──────────────────────┐
                              │                            │ r │          │     Drain Driver     │
                              │                            └───┘          └──────────────────────┘
```
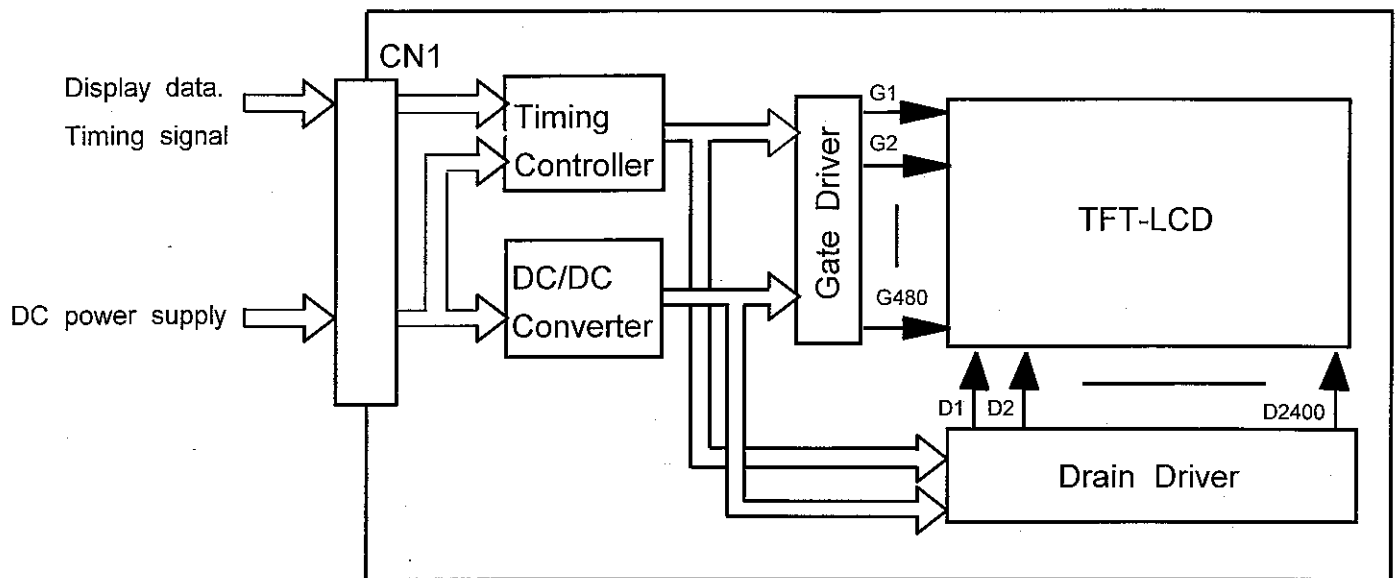
7.2 BACK LIGHT UNIT

```
          CN2
          ┌───┐
GND ━━▶   │ 3 │━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┓
          │ 2 │                               ┃
          │   │                        ┌─────────────────┐
VL  ━━▶   │ 1 │━━━━━━━━━━━━━━━━━━━━━━━━│      Lamp        │
          └───┘                        └─────────────────┘
```
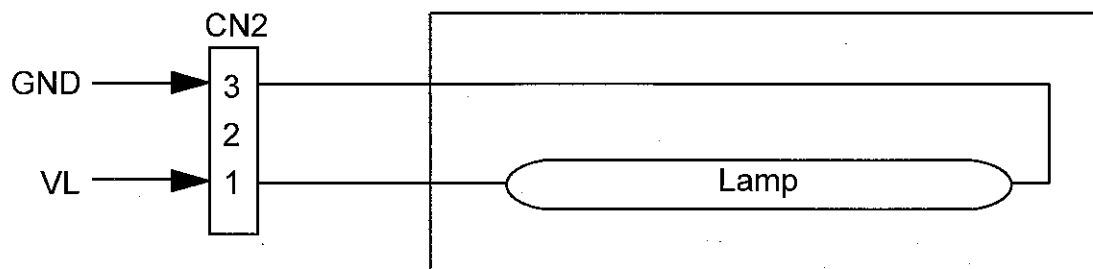
3 (GND) : White
1 (VL)   : Pink

7.3 Touch Panel

```
X2 ━━━━┓
       ┗━━━━┓            ┌──────────────────────────────┐
Y1 ━━━━━━━━━┫            │              Y1              │
            ┃            │                              │
            ┗━━━━━━━━━━━━┥ X1                        X2 │
X1 ━━━━┓                 │                              │
       ┗━━━━━━━━━━━━━━━━━┥                              │
Y2 ━━━━━━━━━┛            │              Y2              │
                         └──────────────────────────────┘
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| KAOHSIUNG HITACHI ELECTRONICS CO.,LTD. | DATE | Apr.01,'08 | Sh. No. | 7B64PS 2707- TX23D12VM0CBA-2 | PAGE | 7-1/1 |
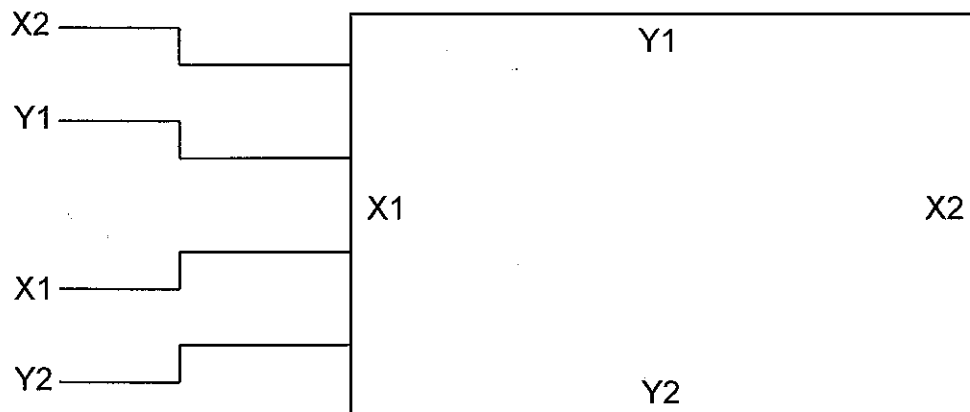
8. INTERFACE PIN CONNECTION

8.1 TFT-LCD MODULE
CN1 《JAE ; FA5B040HP 1R3000》

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VDD	Power Supply (typ.(+3.3V))	1)
2	VDD		
3	VDD		
4	VDD		
5	(IC)		3)
6	DTMG	Display Timing Data	
7	VSS	GND (0V)	2)
8	(NC)		4)
9	VSS	GND (0V)	2)
10	(NC)		4)
11	VSS	GND (0V)	2)
12	B5	B Data	
13	B4		
14	B3		
15	VSS	GND (0V)	2)
16	B2	B Data	
17	B1		
18	B0		
19	VSS	GND (0V)	2)
20	G5	G Data	
21	G4		
22	G3		
23	VSS	GND (0V)	2)
24	G2	G Data	
25	G1		
26	G0		
27	VSS	GND (0V)	2)
28	R5	R Data	
29	R4		
30	R3		
31	VSS	GND (0V)	2)
32	R2	R Data	
33	R1		
34	R0		
35	(IC)		3)
36	VSS	GND (0V)	2)
37	VSS	GND (0V)	2)
38	DCLK	Dot Clock	
39	VSS	GND (0V)	2)
40	VSS		

Note 1) All VDD pins shall be connected to (+3.3V)(Typ.).
    2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.
    3) Please keep open electrically.
    4) Unconnected to the module

8.2 BACK-LIGHT UNIT
CN2 : BHR-03VS-1 (JST)

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VL	Power Supply	
2	NC		
3	GND	GND (0V)	

8.3 T/P UNIT

PIN NO.	SYMBOL	DESCRIPTION
1	X2	Analog signal digitizer (Right)
2	Y1	Analog signal digitizer (Up)
3	X1	Analog signal digitizer (Left)
4	Y2	Analog signal digitizer (Down)

8.4 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNAIS

color	Input	Red Data R5 MSB	R4	R3	R2	R1	R0 LSB	Green Data G5 MSB	G4	G3	G2	G1	G0 LSB	Blue Data B5 MSB	B4	B3	B2	B1	B0 LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	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
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note 1) Definition of gray scale :
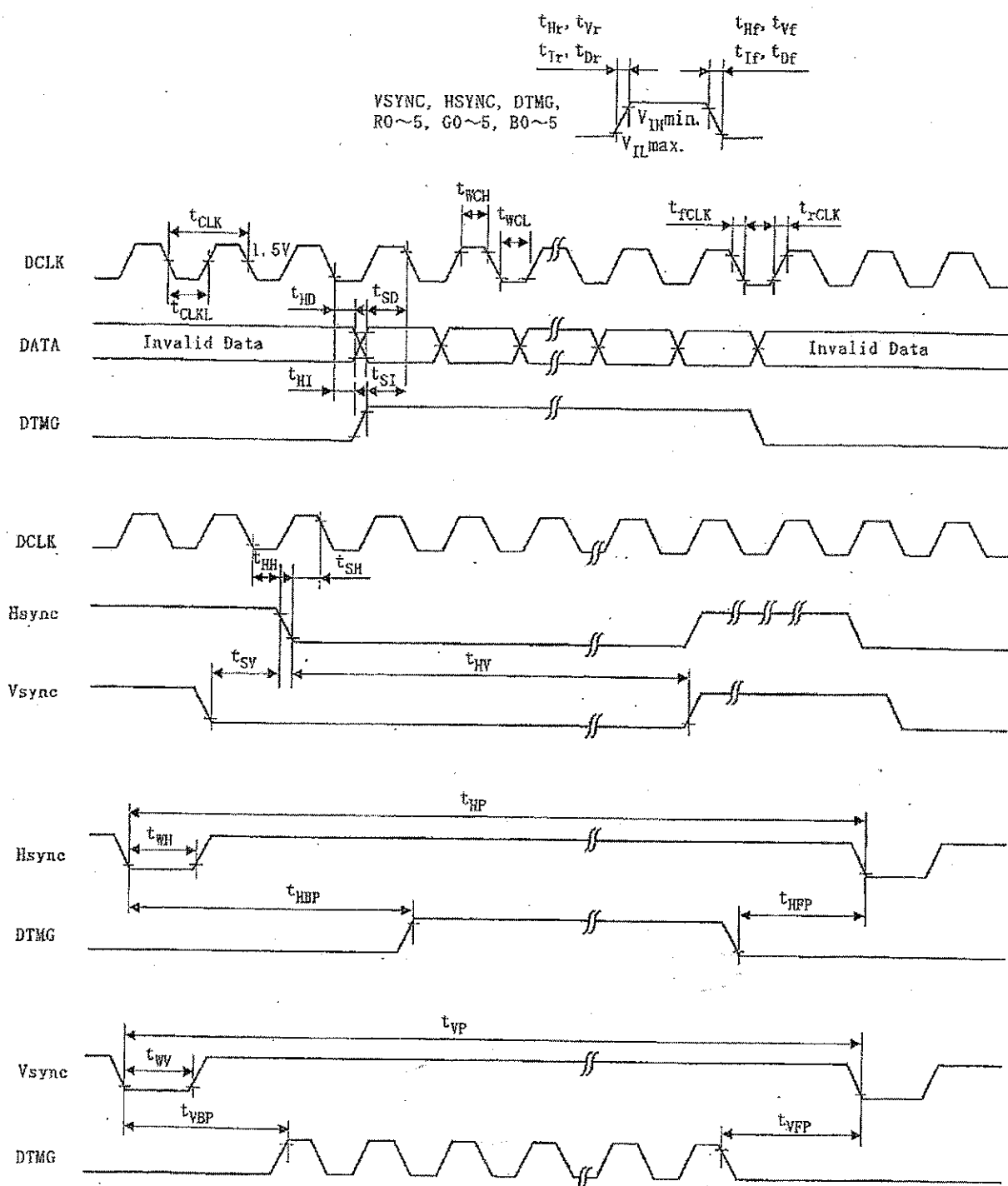 Color(n)···Number in parenthesis indicates gray scale level.
  Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

9. INTERFACE TIMING
9.1 TIMING CHART

Note 1) The DTMG signal for the module is defined as above-mentioned timings for Vsync and Hsync signals.
This Module synchronizes with only DTMG , and don't require inputting Vsync and Hsync.
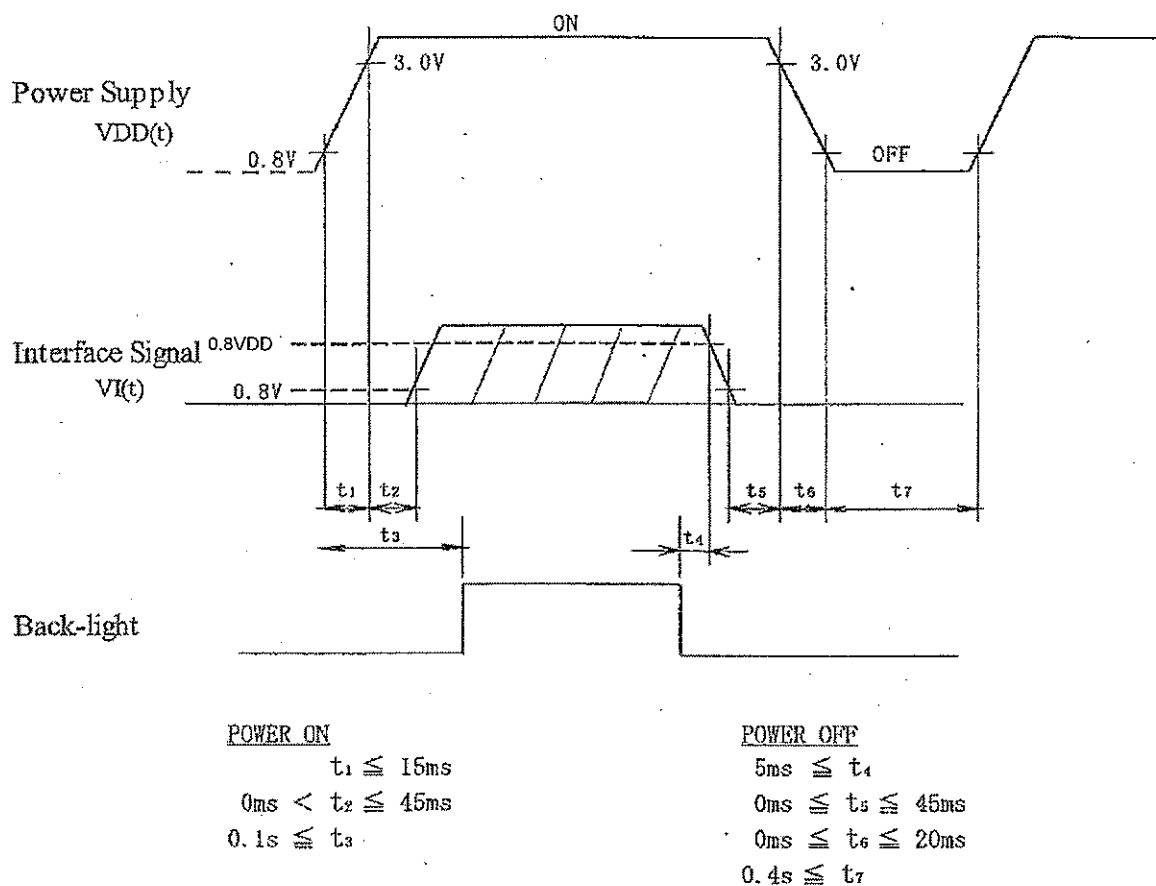DTMG shall be Low level , while data is invalid (blanking period).
The total number of Vsync shall be odd numbers.

9.2 INTERFACE TIMING SPECIFICATIONS

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
DCLK	Period	t_{CLK}	25	30	33	ns	
	Width-Low	t_{WCL}	12	-	-		
	Width-High	t_{WCH}	12	-	-		
	Rise time	t_{rCLK}	-	-	4		
	Fall time	t_{fCLK}	-	-	4		
	Duty	D	0.45	0.5	0.55	-	$D= t_{CLKL}/ t_{CLK}$
Hsync	Set up time	t_{SH}	5	-	-	ns	for DCLK
	Hold time	t_{HH}	10	-	-		
	Period	t_{HP}	944	1056	1088	tCLK	
	Width-Active	t_{WH}	4	128	-		
	Rise/Fall time	t_{Hr},t_{Hf}	-	-	10	ns	
Vsync	Set up time	t_{SV}	0	-	-	tCLK	for Hsync
	Hold time	t_{HV}	2	-	-		
	Period	t_{VP}	515	525	610	tHP	
	Width-Active	t_{WV}	1	2	-		
	Rise/Fall time	t_{Vr},t_{Vf}	-	-	10	ns	
DTMG	Set up time	t_{SI}	5	-	-	ns	for DCLK
	Hold time	t_{HI}	10	-	-		
	Rise/Fall time	t_{Ir},t_{If}	-	-	10	ns	
	Horizontal Back Porch	t_{HBP}	7	88	-	tCLK	
	Horizontal Front Porch	t_{HFP}	-	40	-		
	Vertical Back Porch	t_{VBP}	4	32	-	tHP	
	Vertical Front Porch	T_{VFP}	-	11	-		
Data	Set up time	T_{SD}	5	-	-	ns	for DCLK
	Hold time	T_{HD}	10	-	-		
	Rise/Fall time	t_{Dr},t_{Df}	-	-	4	ns	

9.3 TIMING BETWEEN INTERFACE SIGNALS AND POWER SUPPLY

POWER ON
$$t_1 \leqq 15ms$$
$$0ms < t_2 \leqq 45ms$$
$$0.1s \leqq t_3$$

POWER OFF
$$5ms \leqq t_4$$
$$0ms \leqq t_5 \leqq 45ms$$
$$0ms \leqq t_6 \leqq 20ms$$
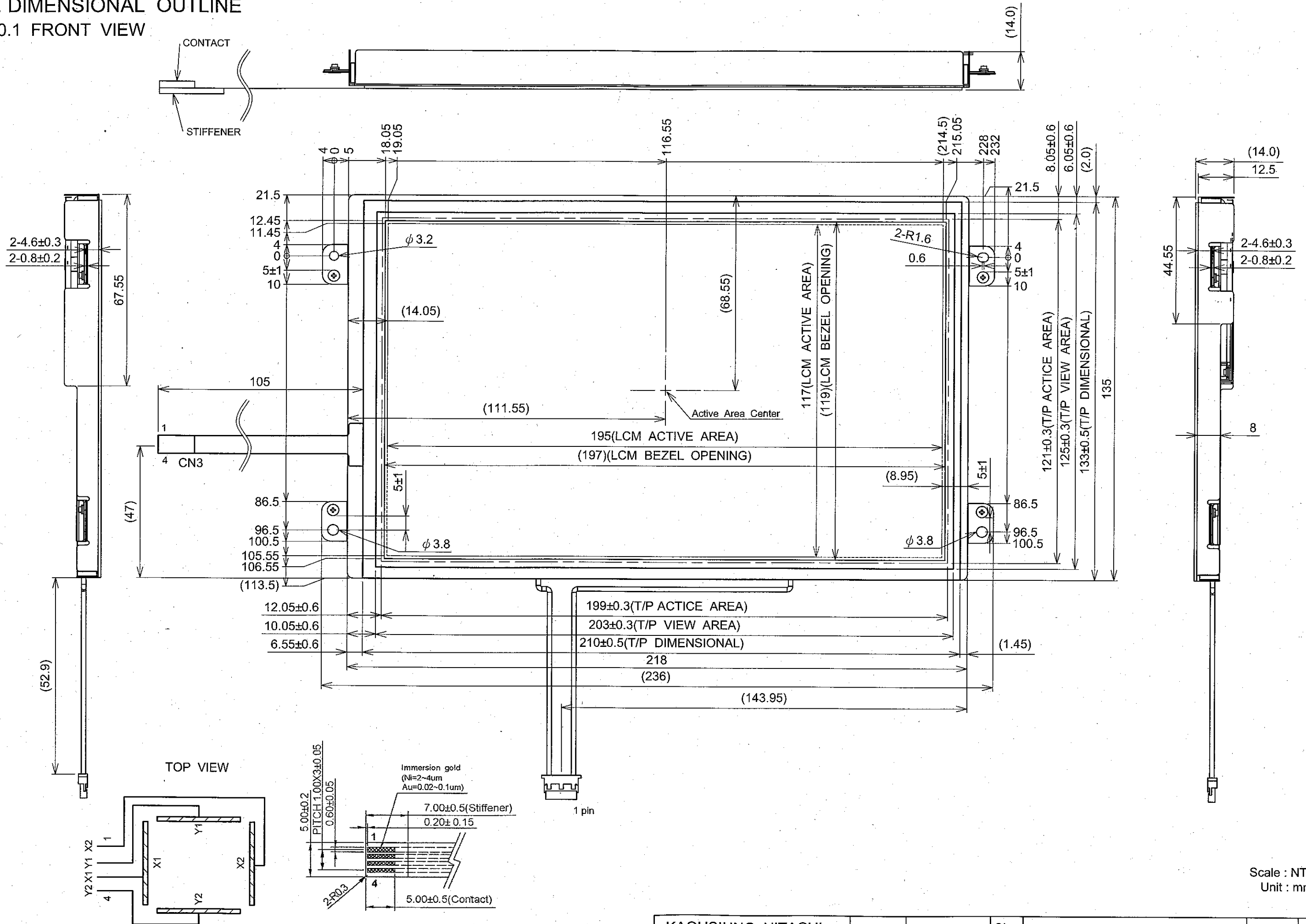$$0.4s \leqq t_7$$

Note 1) Set $0V \leqq VI(t) \leqq VDD(t)$.

VI(t), VDD(t) mean the transient state of VI, VDD when the power supply is turned ON or OFF.

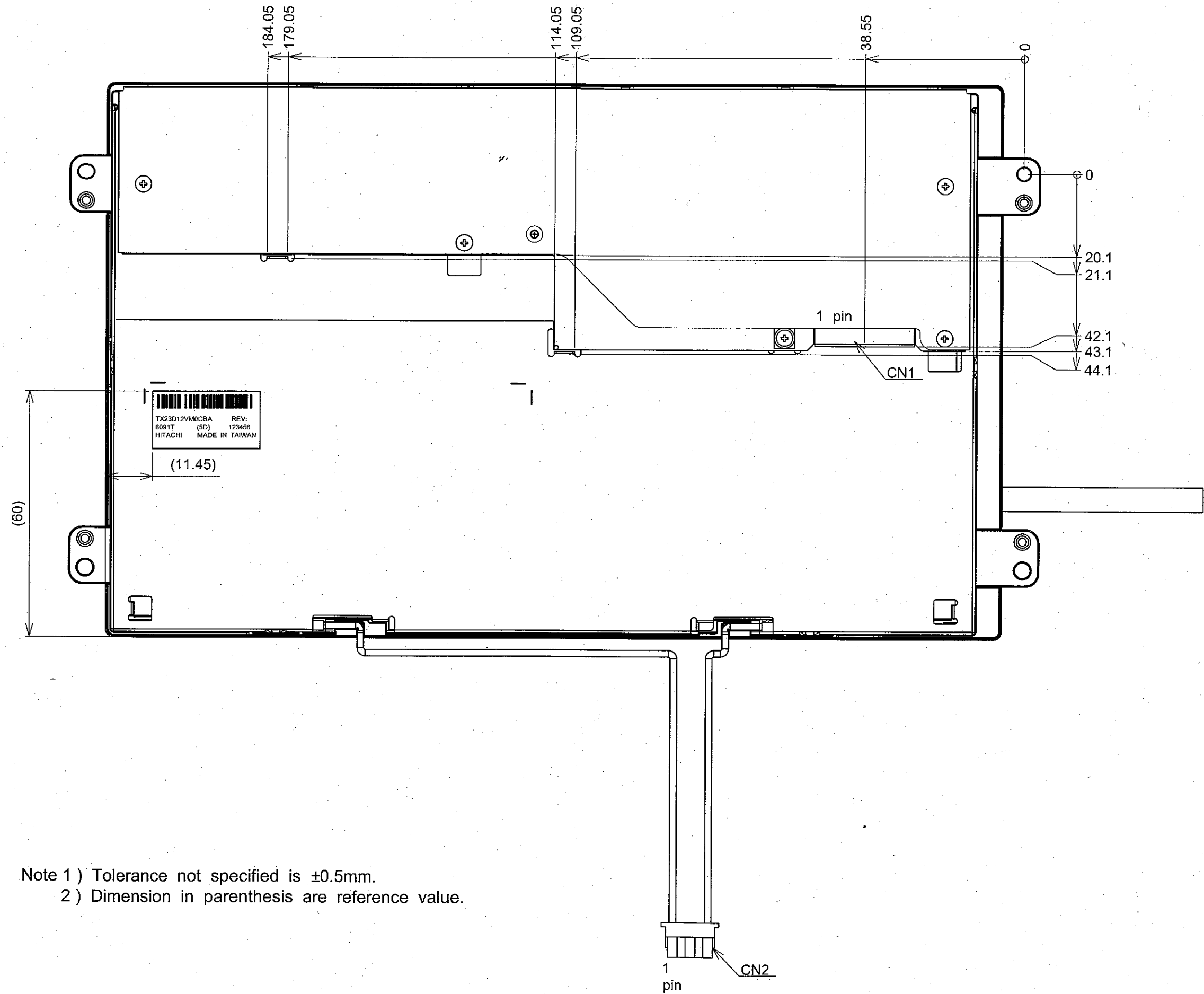2) Do not keep interface signal high-impedance, while power is on.
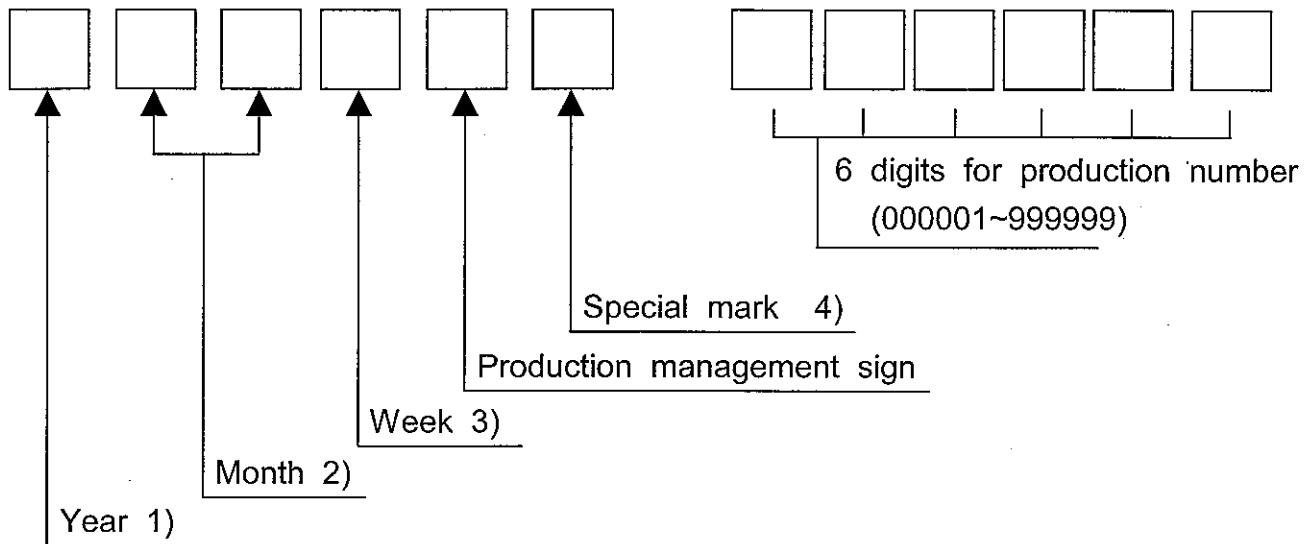
10. DIMENSIONAL OUTLINE
10.1 FRONT VIEW

CONTACT

STIFFENER

(14.0)

18.05
19.05

116.55

(214.5)
215.05

228
232

8.05±0.6
6.05±0.6
(2.0)

(14.0)
12.5

44.55

2-4.6±0.3
2-0.8±0.2

21.5

12.45
11.45
4
0
5±1
10

φ3.2

2-R1.6

21.5
4
0
5±1
10

0.6

2-4.6±0.3
2-0.8±0.2

8

67.55

(14.05)

(68.55)

117(LCM ACTIVE AREA)
(119)(LCM BEZEL OPENING)

121±0.3(T/P ACTICE AREA)
125±0.3(T/P VIEW AREA)
133±0.5(T/P DIMENSIONAL)
135

105

(111.55)

Active Area Center

1

195(LCM ACTIVE AREA)
(197)(LCM BEZEL OPENING)

4 CN3

(47)

5±1

(8.95)

5±1

86.5

96.5
100.5
105.55
106.55

86.5

96.5
100.5

(113.5)

φ3.8

φ3.8

(52.9)

12.05±0.6
10.05±0.6
6.55±0.6

199±0.3(T/P ACTICE AREA)
203±0.3(T/P VIEW AREA)
210±0.5(T/P DIMENSIONAL)
218
(236)

(1.45)

(143.95)

TOP VIEW

5.00±0.2
PITCH 1.00X3±0.05
0.60±0.05

Immersion gold
(Ni=2~4um
Au=0.02~0.1um)

7.00±0.5(Stiffener)
0.20± 0.15

1 pin

Y2 X1 Y1 X2
1

X1
Y1

X2

4

Y2

2-R0.3

5.00±0.5(Contact)

Scale : NTS
Unit : mm

Detail CN3

10.2 BACK VIEW

Note 1) Tolerance not specified is ±0.5mm.
   2) Dimension in parenthesis are reference value.

Scale : NTS
Unit : mm

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11. DESIGNATION OF LOT MARK
11.1 LOT MARK

6 digits for production number
(000001~999999)

Special mark　4)

Production management sign

Week 3)

Month 2)

Year 1)

Note 1)

Year	Mark
2008	8
2009	9
2010	0
2011	1
2012	2

2)

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

3)

Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

4) It is the mark that was opened up by production person to take correspondence with production number.

11.2 REVISION(REV.) CONTROL
REV. is the column for manufacturing convenience. A-Z except I and O may be written on this column

11.3 LOCATION OF LOT MARK
Lot mark is printed on a label. The label is on the metallic bezel as shown in 10. External Dimensional.
The style of character will be changed without notice.

(26)

(14)

TX23D12VM0CBA　　　REV:
8041T　　　(5D)　　123456
HITACHI　　　MADE IN TAIWAN

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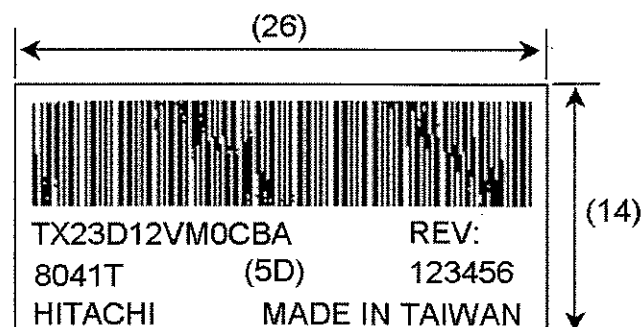
12. COSMETIC SPECIFICATIONS
12.1 CONDITION FOR COSMETIC INSPECTION

(1) Viewing zone
  a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

  $\theta \leqq 45°$: when non-operating inspection

  $\theta \leqq 5°$: when operating inspection

  b) Inspection should be executed only from front side and only A-zone.
  Cosmetic of B-zone and C-zone are ignored.
  (refer to 12.2 Definition of zone)
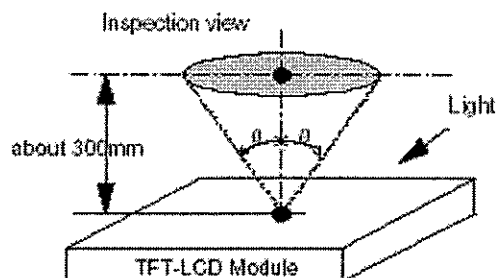
(2) Environmental
  a) Temperature : 25℃
  b) Ambient light : about 2000 [lx] and non-directive.
  c) Back-light : when non-operating inspection , Back-light should be off.

12.2 DEFINITION OF ZONE

A-zone : Display area (pixel area)

B-zone : Area between A-zone and C-zone

C-zone : Metallic bezel area (include I/F connector)

A-zone

B-zone

C-zone
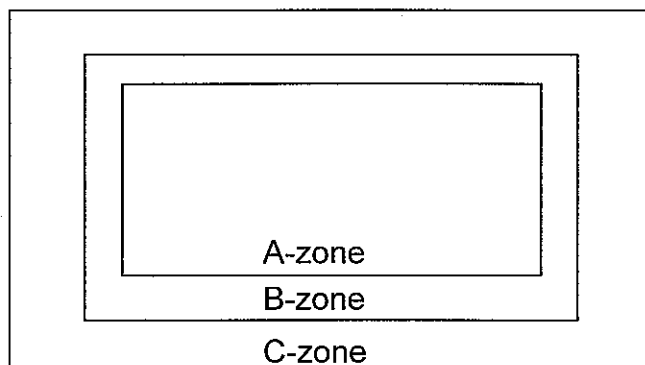
12.3 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

Operating inspection

No	ITEM			MAX. ACCEPTABLE NUMBER A-ZONE	UNIT	NOTE
1	Dot defect	Sparkle mode	1-dot	2	pcs	1),2),4)
			2-dots	1	Units	1),2),5)
			3-dots	0		
			Total	2	Units	1),2)
		Black mode	1-dot	3	pcs	1),3),4)
			2-dots	2	Units	1),3),5)
			3-dots	0		
			Total	3	Units	1),3)
		Total	Density	1	Units/ϕ80mm	1),2),3),6)
			Total	3	Units	1)
2	Line defect			Serious one is not allowed	-	-
3	Uneven brightness					
4	Stain inclusion ⌐ Line shape ⌐ W : width (mm) └ L : length (mm) ┘	W≦0.02	L : Ignore	Ignore	pcs	7)
		W≦0.03	L≦2.0	10		
			L>2.0	0		
		W≦0.06	L≦1.0	10		
			L>1.0	0		
		W>0.06	-	(See dot shape)		
5	Stain inclusion ⌐ Dot shape ⌐ D : ave. dia (mm)	D≦0.22		Ignore	pcs	7)
		D≦0.33		5		
		D>0.33		0		
6	Scratch on polarizer ⌐ Line shape ⌐ W : width (mm) └ L : length (mm) ┘	W≦0.01	L : Ignore	Ignore	pcs	8)
		W≦0.02	L≦40	10		
			L>40	0		
		W≦0.04	L≦20	10		
			L>20	0		
7	Scratch on polarizer ⌐ Dot shape ⌐ D : ave. dia (mm)	D≦0.2		Ignore	pcs	8)
		D≦0.4		10		
		D>0.4		0		

Non-operating inspection

No	ITEM			Max. acceptable number A-zone	Unit	Note
8	Bubbles, peeling In polarizer [D:ave.dia(mm)]	D≦0.3		Ignore	pcs	8)
		D≦0.5		10		
		D≦1.0		5		
		D>1.0		0		
9	Wrinkles on polarizer			Serious one is not allowed	-	-

Note 1) Dot defect : defect area > 1/2 dot
2) Sparkle mode : brightness of dot is more than 30% at black. (visible to eye)
3) Black mode : brightness of dot is less than 70% at white. (visible to eye)
4) 1 dot : defect dot is isolated, not attached to other defect dot.
5) N dots : N defect dots are consecutive. (N means the number of defects dots)
6) Density : number of defect dots inside 80mm ϕ.
7) Those stains which can be wiped out easily are acceptable.
8) Polarizer area inside of B-zone is not applied.
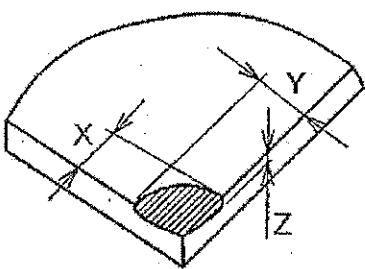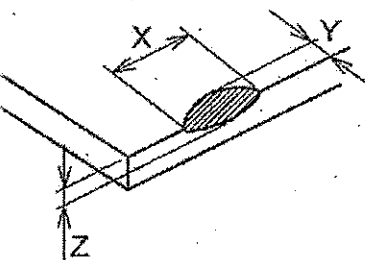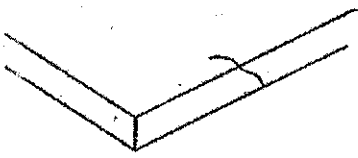
12.4 TOUCH PANEL APPEARANCE

ITEM	CRITERIA			APPLIED
	Lengh(mm)	Width(mm)	Determine	Zone
Line Defect	>3	>0.05	None	A
	≦3	≦0.05	Ignored	
Scratch	≧10	>0.10	None	
	<10	0.10≧W>0.05	(Note 1)	
	<10	≦0.05	Ignored	
Line defect can not across Active area, silver area and insulation area.				B
Foreign Material (Note 2)	Defect Type.		Determine	A
	D>0.35mm		None	
	0.35mm≧D>0.25mm		(Note 3)	
	0.25mm≧D		Ignored	

Note 1) To be max. 4 points in 5 mm φ, but none of other defect in this area.
    2) D=(Long φ + Short φ) / 2
    3) To be max. 6 points in 5 mm φ, but none of other defect in this area.

ITEM	CRITERIA		
Tip Corner		X	≦5.0mm
		Y	≦3.0mm
		Z	≦T
Tip Side		X	≦3.0mm
		Y	≦3.0mm
		Z	≦T
Crack		None allowed	

13. PRECAUTION

Please pay attention to the followings when a Super-TFT Module with a Back-light unit is used , handled and mounted.

13.1 PRECAUTION TO HANDLING AND MOUNTING

(1) Applying strong force to a part of the module may cause partial deformation of frame or mold , and cause damage to the display.
(2) The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage. Never push the exposed Touch panel.
(3) The module should be installed with mounting holes at each corner of a module.
(4) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.
(5) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.
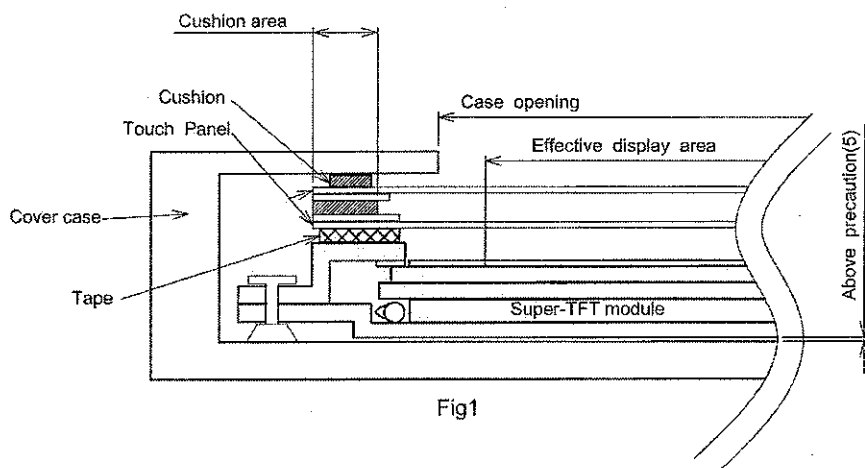

Fig1

(6) When assembling the Touch Panel and you case, please refer to the figure above.
(7) The clearance between the Touch Panel and case shall be designed so that the case edge never presses the input screen when it is deformed by heat or other causes.
(8) The case shall be designed not to touch the tail portion (FPC for Touch Panel).

(9) The boundary space between the effective area and the insulated area is unstable. Touching this area may effect the operation of the Touch Panel.
The case must be designed so that it does not touch the boundary space.

(10) Saliva or water drops should be immediately wiped off. Otherwise , the portion of a polarizer may be deformed and its color may be faded.
(11) The module should not be opened or modified. It may cause not to operate properly.
(12) Metallic bezel of a module should not be handled with bare hand or dirty gloves. Otherwise , color of a metallic frame may become dirty during its storage. It is recommended use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.
(13) Lamp(CCFL) cables should not be pulled and held.

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(14) Since the Touch Panel on the top, and the frame on the bottom tend to be easily damaged, they should be with full care so as not to get them touched, pushed or rubbed by a piece on glass, tweezers and anything else which are harder a pencil lead 2H.

(15) As the adhesives used for adhering upper/lower polarizer's and frame are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, toluene, ethanol and isopropyl alcohol. The following are recommended for use :
normal hexane
Please contact with us when it is necessary for you to use chemicals other than the above.

(16) Lightly wipe to clean the dirty surface with absorbent cotton or other soft material like chamois, soaked in the recommended chemicals without scrubbing it hardly. Always wipe the surface horizontally or vertically. Never give a wipe in a circle. To prevent the display surface from damage and keep the appearance in good state, it is sufficient, in general, to wipe it with absorbent cotton.

(17) Fogy dew deposited on the surface may cause a damage, stain or dirt to the polarizer.
When you need to take out the LCD module from some place at low temperature for test, etc.
It is required to be warmed them up to temperature higher than room temperature before taking them out.

(18) Touching the display area or I/F pins with bare hands or contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched with bare hands.
(Some cosmetics are detrimental to polarizer's.)

(19) In general, the glass is fragile so that, especially on its periphery, tends to be cracked or chipped in handling. Please not give the LCD module sharp shocks by falling, etc.

(20) Top sheets shall be cleaned gently using a soft cloth such as those used for glasses.
Hard wiping accumulated dust will leave scars on the surface even using a cloth.
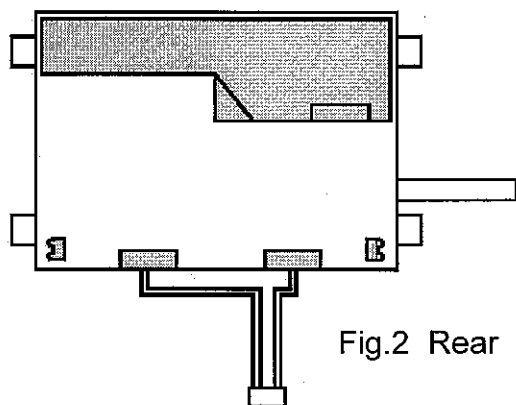
(21) Don't push the hatched area as shown in Fig.2.

Fig.2 Rear view of a TFT-LCD Module

13.2 PRECAUTION TO OPERATION

(1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications , sufficient cooling system should be adopted to system.

(2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows : $-500mV \leq$ over- and under- shoot of VDD $\leq +500mV$, $50nsec \leq$ width.

(3) Optical response time , luminance and chromaticity depend on the temperature of a Super-TFT module. (At lower temperature , it becomes longer.)

(4) Response time of CCFL luminance become longer at lower at lower temperature operation.

(5) Sudden temperature change may cause dew on and / or in a module. Dew makes damage to a polarizer and / or electrical contacting portion. Dew causes fading of display quality.

(6) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.

(7) A module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.

(8) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state. I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

(9) Resistance range : Your controller shall be set up to allow the resistance range of Touch Panel specified in our CAS.

(10) Pointed position of Touch Panel may shift owing to a change in resistance of Touch Panel depending on the operation condition . To compensate this shift, the set shall be given a calibration function.

(11) Input shall be made with a stylus pen (poly acetal , R0.8). Chances are very high that use of a metal piece including a ball point pen or sharp edge will impair accuracy.

(12) The Touch Panel is an auxiliary input device. The system shall be designed to have other input device.

13.3 ELECTROSTATIC DISCHARGE CONTROL

(1) Since a module consists of a Super-TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band.
I/F connector pins should not be touched directly with bare hands.

(2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

13.4 PRECAUTION TO STRONG LIGHT EXPOSURE

(1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

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13.5 PRECAUTION TO STORAGE

When modules for replacement are stored for a long time , following precautions should be taken care of :
(1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 5℃ to 35℃ at normal humidity (60%RH or less).
(2) The surface of Touch panel should not come in contact with any other object.
    It is recommended that modules should be stored in the HITACHI's shipping box.

13.6 PRECAUTION TO HANDLING PROTECTION FILM

(1) The protection film for Touch panel should be pealed off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band.
    Besides , ionized air should be blown over during peeling action. Dusts on a polarizer should be blown of by an ionized nitrogen gun and so on.
(2) The protection film should be peeling off without rubbing it to the Touch panel.
    Because , if the film is rubbed together with the Touch panel , since the film is attached to the Touch panel with a small amount of adhesive , the adhesive may remain on a polarizer.
(3) The module with protection film should be stored on the conditions explained in 10.5(1). However , in case that the storage time is too long , adhesive may remain on a polarizer even after a protection film is peeled off. Besides , in case that a module is stored at higher temperature and / or higher humidity , adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.
(4) The remained adhesive or its vestige on the Touch panel should be wiped off with absorbent cotton or other soft materials slightly contained isopropyl alcohol.

13.7 SAFETY

(1) Since a Super-TFT cell and lamps are made of glass , handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.
(2) The CCFL inverter should be designed to include the function of output shut down in case the output overcurrent happen due to any back-light trouble. The shut down function should be assured to work in abnormal condition at the actual systems.
(3) The module should not be taken apart and should not put conductive thing into the Module , so that back-light drives by high voltage.
(4) Wear figer cots or gloves whenever handling or assembling a Touch Panel its glass Edges are sharp.

13.8 ENVIROMENTAL PROTECTION

(1) This Super-TFT module contains cold cathode fluorescent lamps. Please follow local ordinance or regulations for it's disposal.

13.9 USE RESTRICTIONS AND LIMTATIONS

(1) This product is not authorized for use in life support devices or systems , military applications or other applications which pose a significant risk of personal injury.

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(2) In no event shall HITACHI, Ltd. , be liable for any incidental , indirect or consequential damages in connection with the installation or use of this product , even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate , including without limitation breach of contact , breach of warranty, negligence , strict liability , misrepresentation and other torts.

13.10 OTHERS

(1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.