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**NEC**

TFT COLOR LCD MODULE

Type No. NL10276BC28-08B

36cm (14.1 Type) . XGA

LVDS interface

## SPECIFICATIONS

First Edition

NEC Corporation  
 Display Device Operations Unit  
 Color LCD Division  
 Application Engineering Department

Approved	<i>W. Falw</i>	May. 11. 1998
Checked		May. 11. 1998
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## 1. DESCRIPTION

NL10276BC28-08B is a TFT(thin film transistor) active matrix color liquid crystal display (LCD) comprising amorphous silicon TFT attached to each signal electrode, a driving circuit and a backlight. NL10276BC28-08B has a built-in backlight.

The 36cm(14.1 Type) diagonal display area contains 1024×768 pixels and can display 262,144 colors simultaneously.

## 2. FEATURES

- LVDS interface (adapted for SN75LVDS84, Texas Instruments )  
LVDS:Low Voltage Differential Signal
- Supply voltage: 5V
- High contrast, Low reflection
- Low power consumption
- Thin and light weight
- Expanded screen size without increasing the frame area
- Incorporated edge-light type backlight (one lamp, inverter-less)
- Mounting structure of edge holding type (no mounting holes exist)

## 3. APPLICATIONS

- Engineering workstation (EWS), Personal computer (PC)
- Monitor

## 4. STRUCTURE AND FUNCTIONS

A color TFT (thin film transistor) LCD module is comprised of a TFT liquid crystal panel structure, LSIs for driving the TFT array, and a backlight assembly. The TFT panel structure is created by sandwiching liquid crystal material in the narrow gap between a TFT array glass substrate and a color filter glass substrate. After the driver LSIs are connected to the panel, the backlight assembly is attached to the backside of the panel.

RGB (red, green, blue) data signals from a source system is modulated into a form suitable for active matrix addressing by the onboard signal processor and sent to the driver LSIs which in turn addresses the individual TFT cells.

Acting as an electro-optical switch, each TFT cell regulates light transmission from the backlight assembly when activated by the data source. By regulating the amount of light passing through the array of red, green, and blue dots, color images are created with clarity.

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## 5. OUTLINE OF CHARACTERISTICS (at room temperature)

Display area 285.696(H) × 214.272(V)mm

Drive system a-Si TFT active matrix

Display colors 262144

Number of pixels 1024 × 768

Pixel arrangement RGB vertical stripe

Pixel pitch 0.279(H) × 0.279(V)mm

Module size 299.5(H) × 228.5(V) × 7.8typ. (D)mm

Weight 698g(typ.)

Contrast ratio 150:1(typ.)

Viewing angle (more than the contrast ratio of 10:1)

Horizontal: 45° (typ. left side, right side)

Vertical : 15° (typ. upper side), 35° (typ. lower side)

Designed viewing direction

- wider viewing angle with contrast ratio : down side (6 o'clock)
- wider viewing angle without image reversal : up side (12 o'clock)
- optimum grayscale ( $\gamma=2.2$ ) : perpendicular

Polarizer pencil-hardness 3H(min., at JIS K5400)

Color gamut 40%(typ., center to NTSC)

Response time 20ms(typ.), "white" to "black"

Luminance 90cd/m<sup>2</sup>(typ.)

Signal system 6-bit digital signal RGB signals, Synchronous signals(Hsync, Vsync) and Dot-clock(CLK) are adapted for SN75LVDS86 (Texas Instruments)

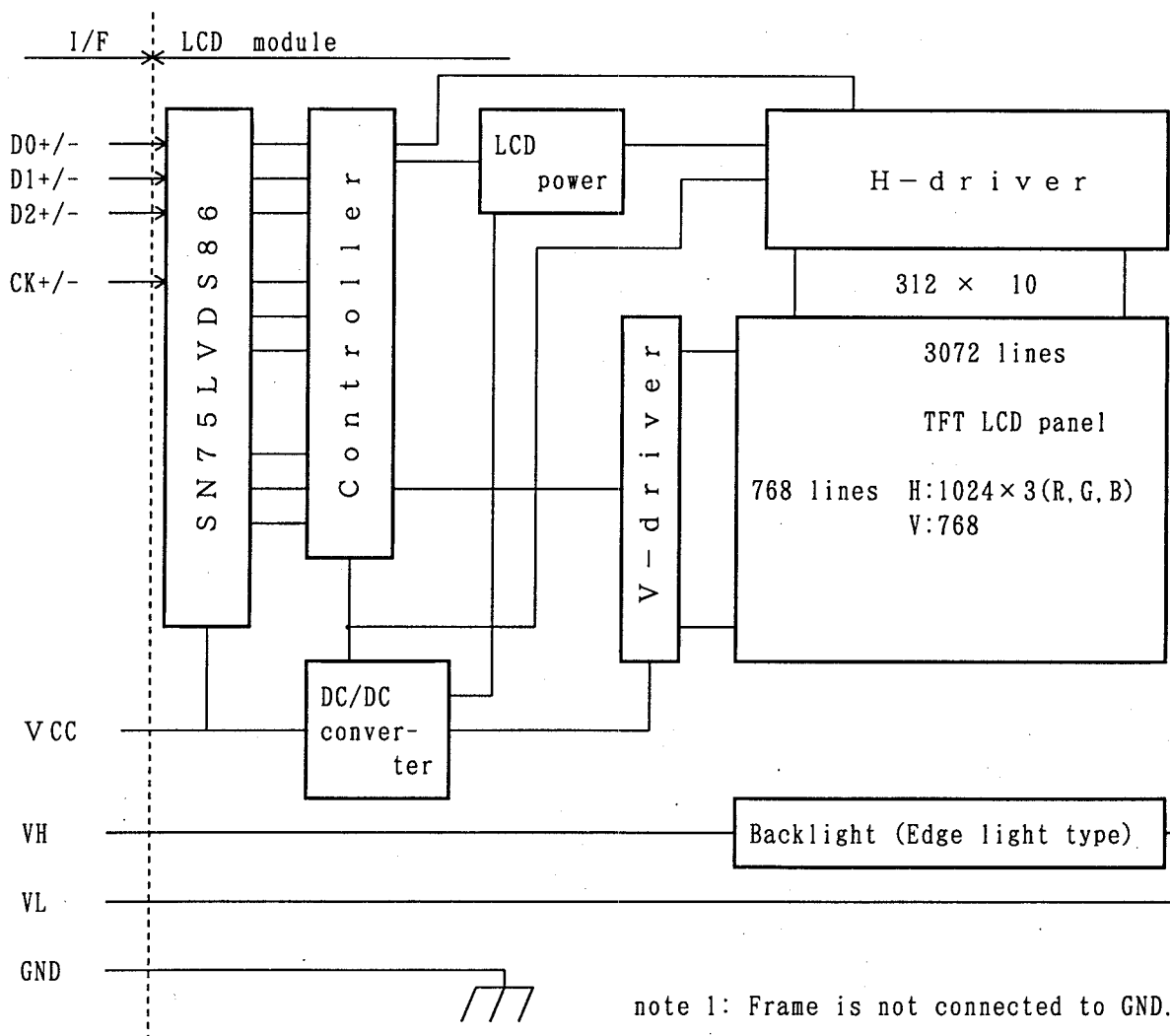
Supply voltage 5.0V

Backlight Edge light type, 1 CCF lamp, inverter-less

*(LIFETIME 10K hours)*Power consumption 4.2W(typ. at 90cd/m<sup>2</sup>)

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6. BLOCK DIAGRAM



7. GENERAL SPECIFICATIONS

Item	Specifications	Unit
Module size	299.5±0.5 (H) × 228.5±0.5 (V) × 8.3max. (D)	mm
Display area	285.696 (H) × 214.272 (V)	mm
Number of pixels	1024 (H) × 768 (V)	pixel
Dot pitch	0.093 (H) × 0.279 (V)	mm
Pixel pitch	0.279 (H) × 0.279 (V)	mm
Pixel arrangement	RGB (Red, Green, Blue) vertical stripe	-
Display colors	262,144	color
Weight	750 (max.)	g

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8. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit	Remarks
Supply voltage	VCC	-0.3 to +6.5	V	Ta = 25°C
Logic input voltage	VI	-0.5 to VCC+0.5	V	
Storage temp.	TST	-20 to +60	°C	-
Operating temp.	TOP	0 to +50	°C	Module surface *
Humidity (No condensation)		≦ 95% relative humidity		Ta ≦ 40°C
		≦ 85% relative humidity		40°C < Ta ≦ 50°C
		Absolute humidity shall not exceed Ta=50°C, 85% relative humidity level.		Ta > 50°C

\* Measured at the display area

9. ELECTRICAL CHARACTERISTICS

(1) Logic/ LCD driving

Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage	VCC	4.75	5.0	5.25	V	-
LVDS signal input "L" voltage	VTL	-100	-	-	mV	VCM=1.2V
LVDS signal input "H" voltage	VTH	-	-	+100	mV	VCM: Common mode voltage in LVDS driver
Supply current	ICC	-	330 note 1	700	mA	VCC=5.0V

note 1: Checker flag pattern (in EIAJ ED-2522)

(2) Backlight

Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lamp current	IL	2.0	3.7	5.5	mArms	3.7mArms: 90 cd/cm <sup>2</sup> (Typ) 5.5mArms: 120cd/cm <sup>2</sup> (Typ)
Lamp voltage	VL	-	680	-	Vrms	IL=3.7mArms
Lamp turn on voltage	VS	-	1200	1500	Vrms	Ta= 0°C
		-	850	1500	Vrms	Ta=25°C
Oscillator frequency	Ft	50	60	-	KHz	-

note 1: Recommended value of "Ft"

·Ft is within the specification.

and

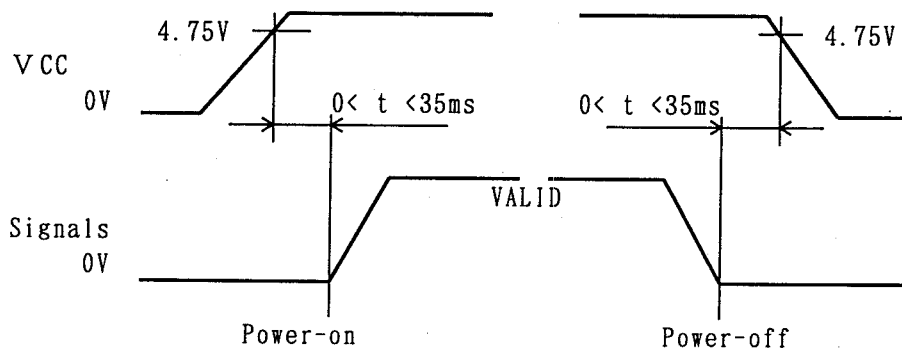
$$Ft = \frac{1}{4th} \times (2n-1)$$

t h: Hsync period

n: a natural number (1,2,3,.....)

If Ft is out of the recommended value, interference between Ft frequency and Hsync frequency may cause beat on the display.

### 10. SUPPLY VOLTAGE SEQUENCE



- \*1 The supply voltage for input signals should be the same as VCC.
- \*2 Apply VH within the LCD operation period. When the backlight turns on before LCD operation or the LCD operation turns off before the backlight turns off, the display may momentarily become white.
- \*3 When the power is off, please keep whole signals(Hsync, Vsync, CLK, DE, MODE, DATA) low level or high impedance.

11. INTERFACE PIN CONNECTION

(1) Interface connector for signal and power

Part No. : FI-SEB20P-HF

Adaptable socket: FI-S20S

Supplier : Japan Aviation Electronics Industry limited (JAE)

Pin No.	Symbol	Signal type	Function
1	GND	Ground	Connect system ground
2	GND		
3	N.C.	Non-connection	-
4	N.C.		
5	GND	Ground	Connect system ground
6	DCLKIN+	Pixel clock	CLK for pixel data f=65.0MHz (typ.) (LVDS level)
7	DCLKIN-		
8	GND	Ground	Connect system ground
9	DIN2+	Pixel data etc.	LVDS differential data input
10	DIN2-		
11	GND	Ground	Connect system ground
12	DIN1+	Pixel data etc.	LVDS differential data input
13	DIN1-		
14	GND	Ground	Connect system ground
15	DINO+	Pixel data etc.	LVDS differential data input
16	DINO-		
17	GND	Ground	Connect system ground
18	GND		
19	VCC	+5.0V power supply	Supply +5V±5%
20	VCC		

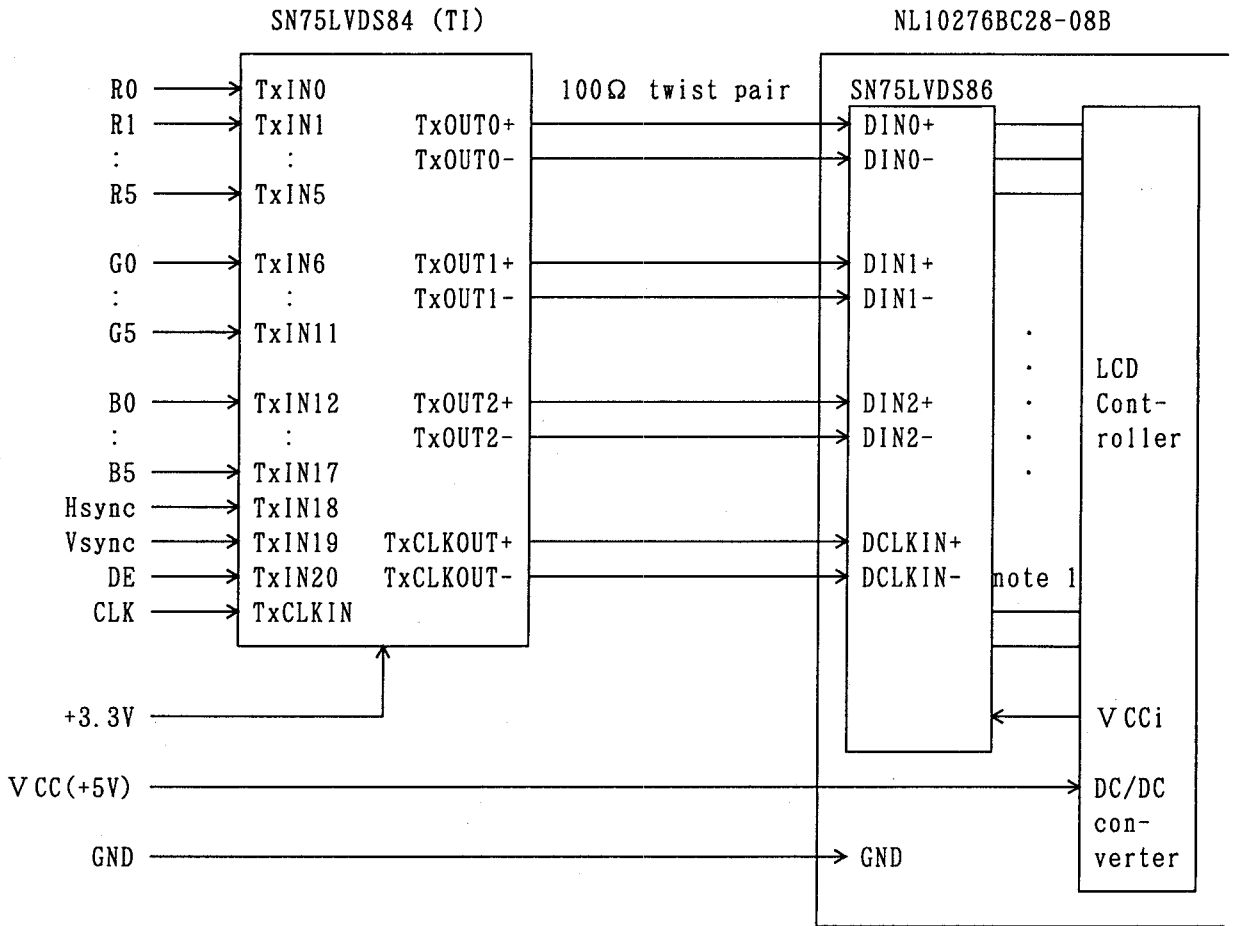


(2) Connector for backlight unit

Part No. : BHR-03VS-1  
 Adaptable socket: SM02(8.0)B-BHS-TB  
 Supplier : J.S.T TRADING COMPANY, LTD.

Pin No.	Symbol	Function
1	VH	High voltage terminal(The cable color is white.)
2	N.C.	Non-connection
3	VL	Low voltage terminal(The cable color is brown.)

12. METHOD OF CONNECTION FOR SN75LVDS84



note 1: These timing should be kept in the specified range of 14. INPUT SIGNAL TIMING.

13. DISPLAY COLORS vs. INPUT DATA SIGNALS

Display colors		Data signal(0: Low level, 1: High level)																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic colors	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
	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
	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
	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 grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	↑																		
	↓																		
	bright	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	↑																		
	↓																		
	bright	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	↑																		
	↓																		
	bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

note: Colors are developed in combination with 6 bit signals (64 steps in grayscale) of each primary red, green, and blue color.

This process can result in up to 262,144 (64×64×64) colors.

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14. INPUT SIGNAL TIMINGS

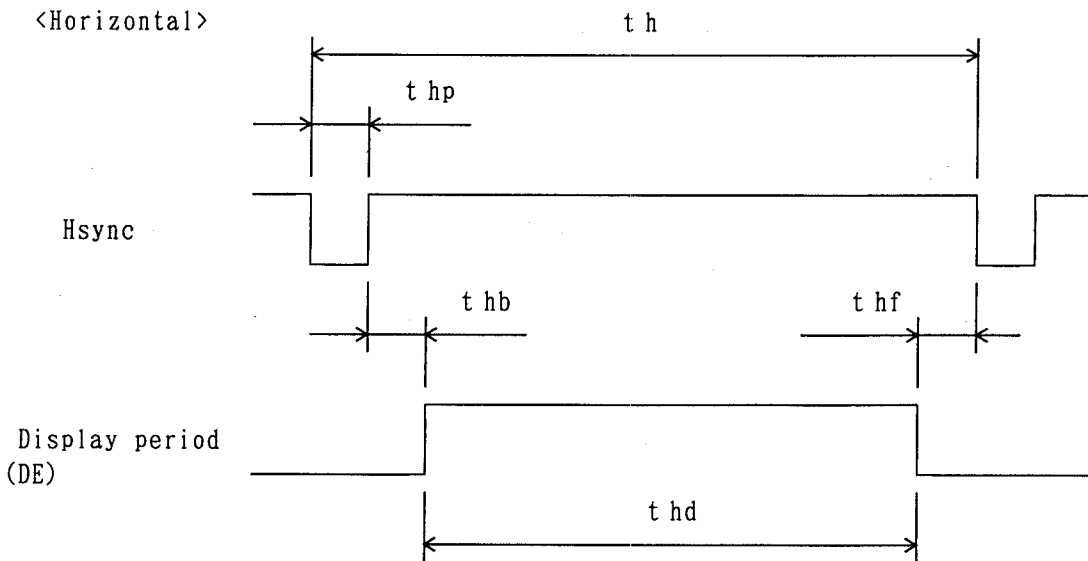
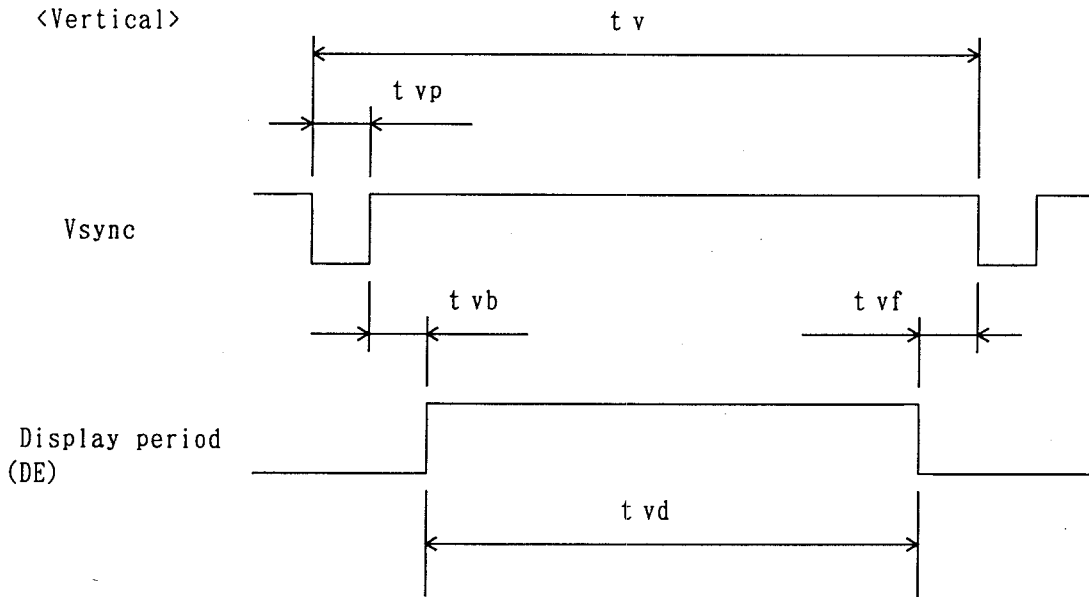
14.1 FOR LCD CONTROLLER

(1) Input signal specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks	
CLK	Frequency	1/t <sub>c</sub>	60	65.0	68	MHz	15.384ns(typ.)	
	Duty	t <sub>ch</sub> /t <sub>c</sub>	0.4	0.5	0.6	-		
	Rise,fall	t <sub>crf</sub>	-	-	10	ns		
Hsync	Period	t <sub>h</sub>	-	20.676	-	μs	48.363kHz(typ.)	
			-	1344	-	CLK		
	Display period	t <sub>hd</sub>	1024			CLK		
	Front-porch	t <sub>hf</sub>	2	40	-	CLK		
	Pulse width	t <sub>hp</sub>	2	208	-	CLK		
	Back-porch	t <sub>hb</sub>	2	72	-	CLK		
	t <sub>hf</sub> +t <sub>hp</sub> +t <sub>hb</sub>			81	320	1023	CLK	
	CLK-Hsync timing	t <sub>hh</sub>	2.5	-	-	ns		
	Hsync-CLK timing	t <sub>hs</sub>	2.5	-	-	ns		
	Hsync-Vsync timing	t <sub>vh</sub>	2.5	-	-	ns		
	Vsync-Hsync timing	t <sub>vs</sub>	2.5	-	-	ns		
	Rise,fall	t <sub>hrf</sub>	-	-	10	ns		
	Vsync	Period	t <sub>v</sub>	-	16.666	-	ms	60.004Hz(typ.)
-				806	-	H		
Display period		t <sub>vd</sub>	768			H		
Front-porch		t <sub>vf</sub>	1	3	-	H		
Pulse width		t <sub>vp</sub>	2	-	-	H		
Back-porch		t <sub>vb</sub>	1	33	-	H		
t <sub>vf</sub> +t <sub>vp</sub> +t <sub>vb</sub>			4	38	-	H		
Rise,fall	t <sub>vrf</sub>	-	-	10	ns			
DATA R0-R5 G0-G5 B0-B5	CLK-DATA timing	t <sub>ds</sub>	2.5	-	-	ns		
	DATA-CLK timing	t <sub>dh</sub>	2.5	-	-	ns		
	Rise,fall	t <sub>drf</sub>	-	-	10	ns		
DE	DE-CLK timing	t <sub>es</sub>	2.5	-	-	ns		
	CLK-DE timing	t <sub>eh</sub>	2.5	-	-	ns		
	Rise,fall	t <sub>erf</sub>	-	-	10	ns		

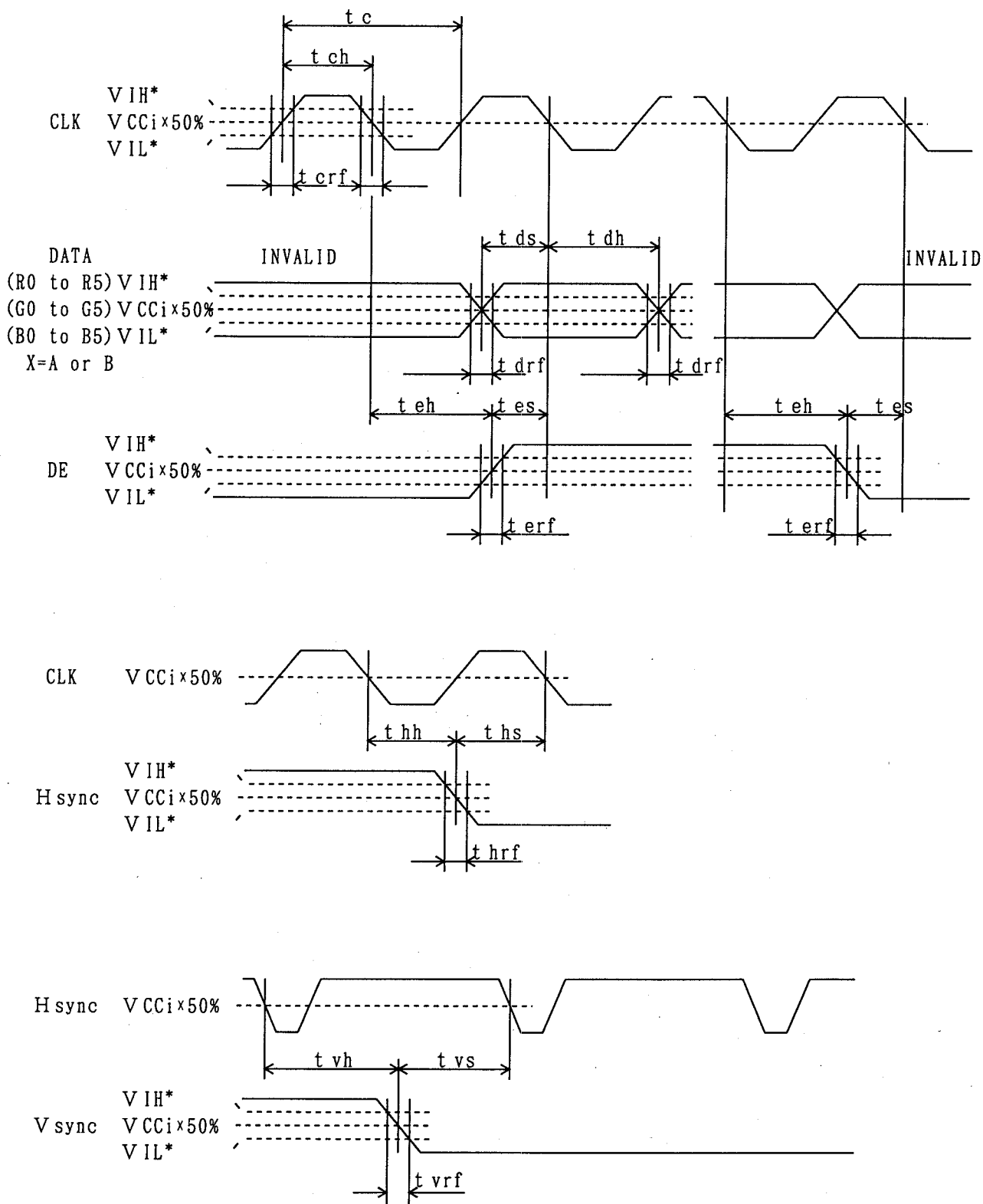
note 1: These value are in output of SN75LVDS86 (Refer to 12.METHOD OF CONNECTION FOR SN75LVDS84).

(2) Definition of input signal timings



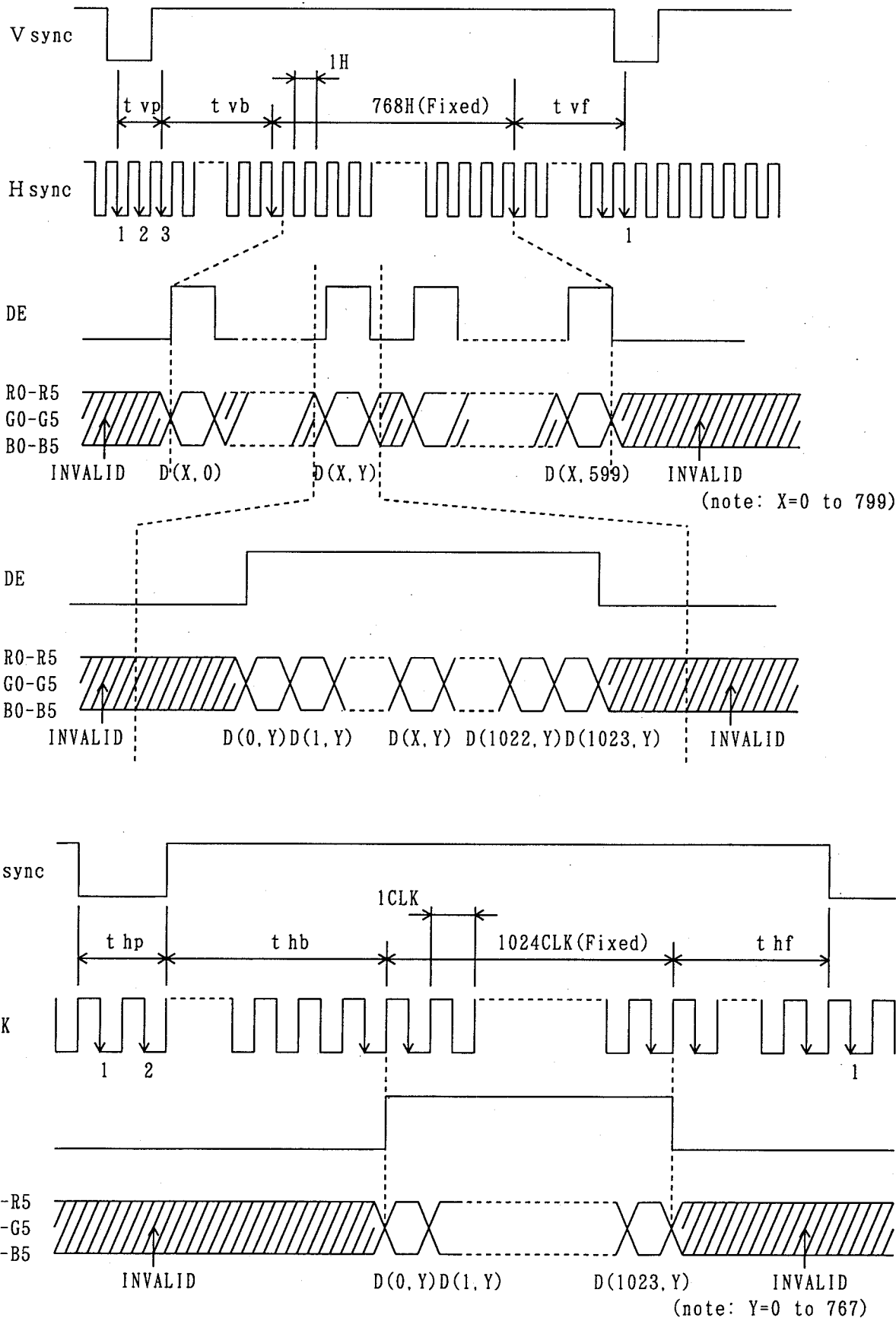
note 1: Display periods do not exist as signals.

note 2: These value are in the output of SN75LVDS86 (Refer to 12.METHOD OF CONNECTION FOR SN75LVDS84).



\*  $V_{IH} = V_{CCi} \times 0.7$  (Min.)  
 $V_{IL} = V_{CCi} \times 0.3$  (Max.)  
 $V_{CCi} = 3.3$  V:  $V_{CCi}$  is given by DC/DC converter in the LCD module.

(3) Input signal timing chart



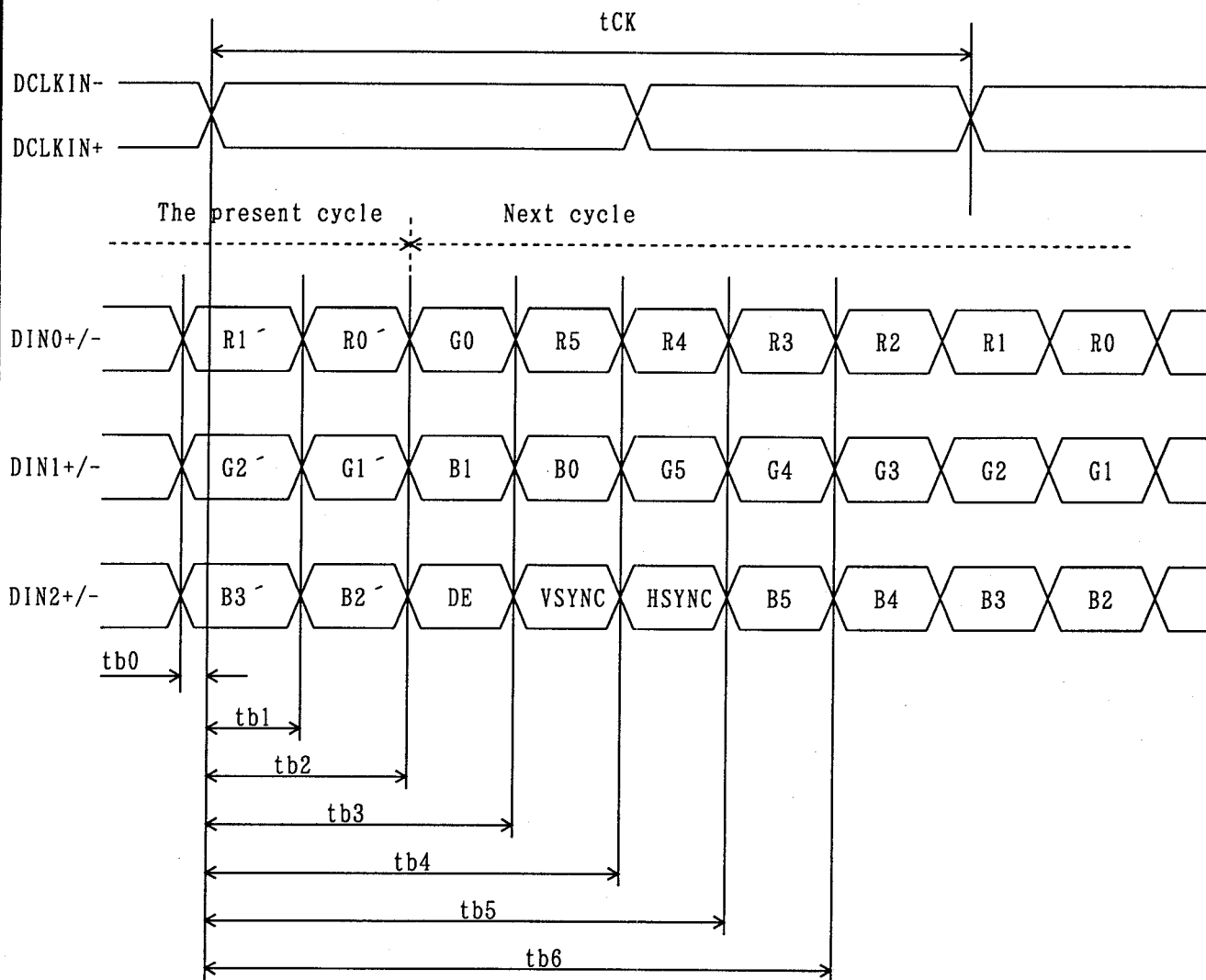
14.2 FOR LVDS RECEIVER

(1) Input signal specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
CLK Frequency	tCK	14.71	15.38	16.66	ns	-
Bit0 position	tb0	-	0	-	ns	-
Bit1 position	tb1	-	1/7tck	-	ns	-
Bit2 position	tb2	-	2/7tck	-	ns	-
Bit3 position	tb3	-	3/7tck	-	ns	-
Bit4 position	tb4	-	4/7tck	-	ns	-
Bit5 position	tb5	-	5/7tck	-	ns	-
Bit6 position	tb6	-	6/7tck	-	ns	-
-	SKRM	490	-	-	ps	-

note 1: See the specifications of LVDS manufactures for detailed design.

(2) Input signal timing chart



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## 15. DISPLAY POSITION

D(0,0)	D(1,0)	-----	D(X,0)	-----	D(1022,0)	D(1023,0)
D(0,1)	D(1,1)	-----	D(X,1)	-----	D(1022,1)	D(1023,1)
⋮	⋮	+	⋮	+	⋮	⋮
D(0,Y)	D(1,Y)	-----	D(X,Y)	-----	D(1022,Y)	D(1023,Y)
⋮	⋮	+	⋮	+	⋮	⋮
D(0,766)	D(1,766)	-----	D(X,766)	-----	D(1022,766)	D(1023,766)
D(0,767)	D(1,767)	-----	D(X,767)	-----	D(1022,767)	D(1023,767)

## 16. OPTICAL CHARACTERISTICS

Ta = 25 °C note 1

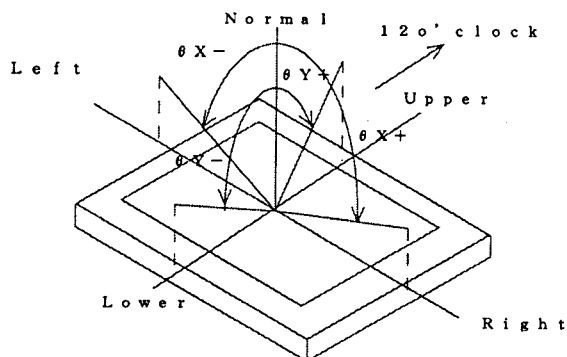
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	$\theta x+$	CR>10, $\theta y = \pm 0^\circ$	30	45	—	deg.	note 2
		$\theta x-$	CR>10, $\theta y = \pm 0^\circ$	30	45	—	deg.	
	Vertical	$\theta y+$	CR>10, $\theta x = \pm 0^\circ$	10	15	—	deg.	
		$\theta y-$	CR>10, $\theta x = \pm 0^\circ$	30	35	—	deg.	
Contrast ratio		CR	$\theta x = \pm 0^\circ, \theta y = -5^\circ$	—	200	—	—	note 4
			note 3	80	120	—		
Response time		t on	white to black	—	20	30	ms	note 5
		t off	black to white	—	53	70	ms	
Color gamut		C	at center, to NTSC	35	40	—	%	—
Luminance		Lu	note 3	70	90	—	cd/m <sup>2</sup>	note 6
Brightness uniformity		—	max./min.	—	—	1.33	—	note 7

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note 1: VCC = 5.0V. IL = 4.4mA rms

note 2: Definitions of viewing angle are as follows.



note 3: Viewing angle is  $\theta x = \pm 0^\circ$ ,  $\theta y = \pm 0^\circ$ . At center.

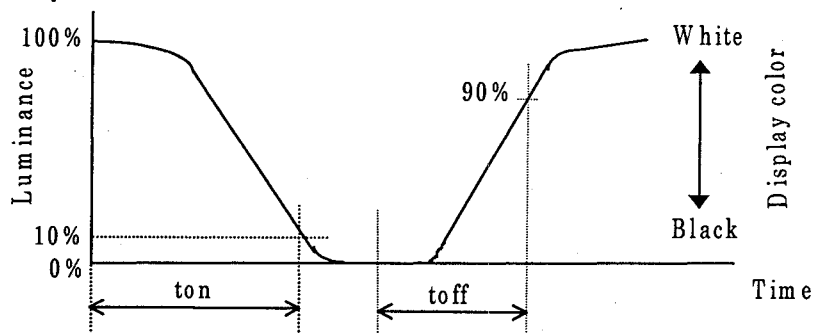
note 4: The contrast ratio is calculated by using the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance with all pixels in "white"}}{\text{Luminance with all pixels in "black"}}$$

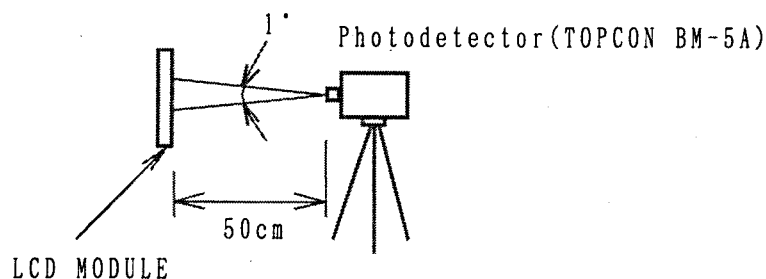
The luminance is measured in darkroom.

note 5: Definition of response time is as follows.

Photodetector output signal is measured when the brightness changes "white" to "black". Response time is the time between 10% and 100% of the photodetector output amplitude.



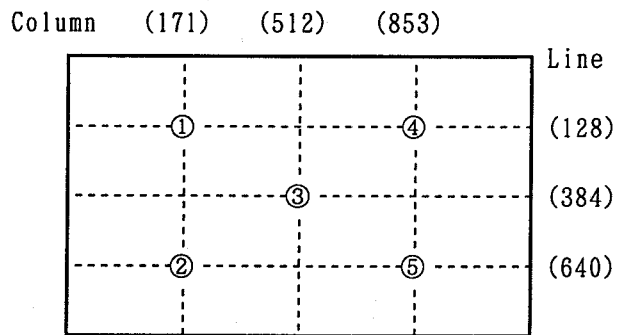
note 6: The luminance is measured with all pixels in "white" after the module runs 20 minutes.



note 7: The luminance uniformity is calculated by using following formula.

$$\text{Luminance uniformity} = \frac{\text{Maximum Luminance}}{\text{Minimum Luminance}}$$

The luminance is measured at near the five points shown below.



17. DEFECT SPECIFICATIONS

a) Inspection conditions

Distance : The distance between the inspector's eye and the LCD panel is 20cm.







Temperature : Room temperature is 25°C ± 5°C.

Viewing angle and illumination:

Display specifications :  $-20^\circ \leq \theta x \leq +20^\circ$ ,  $0^\circ \leq \phi y \leq +20^\circ$   
60 lux at a LCD surface

Appearance specifications:  $-45^\circ \leq \theta x \leq +45^\circ$ ,  $-45^\circ \leq \phi y \leq +45^\circ$   
700 lux at a operation table

b) Display specifications

Item	Specifications	
Line defect	Serious one is no good.	
Dot defect	Sub-item	Quantity
	Luminous dots note 2 or Dark dots note 3	One dot $\leq 9$ (Green dot $\leq 5$ ) note 4 linked two dots $\leq 2$ note 5 Linked three or more dots $\leq 0$ note 5 Neighboring minimum distance = 15 mm
	note 1	Luminous dots + Dark dots $\leq 12$
	 RGB Pixel	 R, G or B Dot
	   e.g., Linkage	 e.g., Neighboring

- note 1) Dot defect : Defect area > 1/3 dot
- note 2) Luminous dots : Luminous dots are measured while the screen is black.
- note 3) Dark dots : Dark dots are measured while the screen is illuminated with Red, Green and Blue.
- note 4) One dot : Defect dot is isolated, not attached to other defect dots.
- note 5) Linkage : linked dots are consecutive.

c) Appearance specifications

Item	Specifications		Quantity
	Measurement criteria		
Other objects Stains Dust  (dot shape)	Average diameter( $\phi$ ) mm		Allowed value
	$\phi \leq 0.2$		all allowed
	$0.2 < \phi < 0.3$		$\leq 10$ points
	$0.3 \leq \phi \leq 0.5$		$\leq 3$ points
	$0.5 < \phi$		0 point
	Linked other objects		
Other objects Stains Dust  (line shape)	Width(W) mm	Length(L) mm	all allowed
	$W < 0.05$	-	
	$0.05 \leq W \leq 0.1$	$L < 0.7$	$\leq 4$ points
		$0.7 \leq L \leq 1.0$	0 point
	$0.1 < W$	-	
Polarizer Bubbles Wrinkles Dent	Average diameter( $\phi$ ) mm		$\leq 2$ points
	$\phi \leq 0.5$		
	$0.5 < \phi$		0 point
Panel dent			
Polarizer scratch	Area(S) mm <sup>2</sup>		all allowed
	$S \leq 0.2$		
	$0.2 < S$		0 point
Form	Specified labels and parts are put.		

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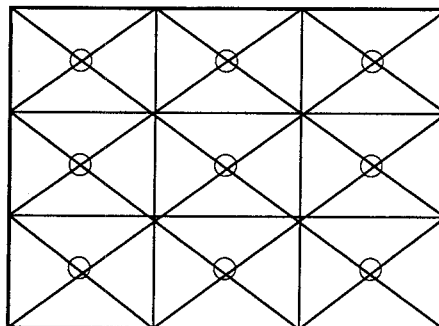
## 18. RELIABILITY TEST

No.	Test item	Test condition	Judgement
1.	High temperature/humidity operation	50±2℃, 85% relative humidity 240 hours Display data is black.	note 1
2.	Heat cycle (operation)	① 0℃±3℃...1 hour 55℃±3℃...1 hour ② 50 cycles, 4 hours/cycle ③ Display data is black.	note 1
3.	Thermal shock (non-operation)	① -20℃±3℃...30 minutes 60℃±3℃...30 minutes ② 100 cycles ③ Temperature transition time within 5 minutes	note 1
4.	Vibration (non-operation)	① 5 - 22Hz, amplitude 1.0mm ② 22 - 500Hz, 1.5G 1 hour/cycle, X, Y, Z direction ③ Once each direction	note 1 note 2
5.	Mechanical shock (non-operation)	① 50G, 11ms 5 times/direction ② Once each direction	note 1 note 2
6.	ESD (operation)	150pF, 150Ω, ±10KV 9 places on a panel note 3 10 times each place at one-second intervals	note 1
7.	Dust (operation)	15 kinds of dust (JIS-Z 8901) Hourly 15 seconds stir, 8 times repeat	note 1

note 1: Display function is checked by the same condition as LCD module out-going inspection.

note 2: Physical damage.

note 3: Discharge points are shown in the figure.



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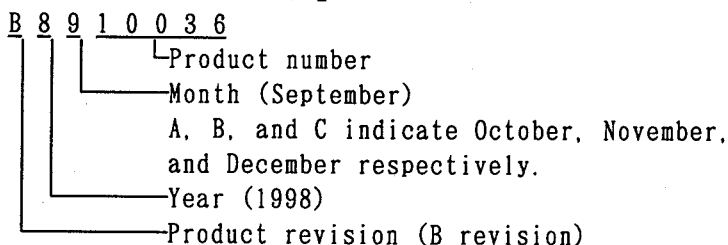
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19. MARKINGS

A nameplate bearing the following information is affixed to a shipped product at the specified location on each product (see outline drawing.).

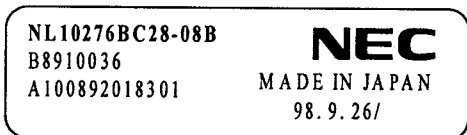
- (1) Parts number : NL10276BC28-08B
- (2) Lot number : Express in figures and alphabetical order.
  - Revision : One letter
  - Manufacturing time : Express in 1 figure or in alphabetical order.

Example 【Lot number: B8910036】



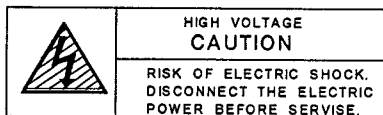
(3) Indication examples

Nameplate

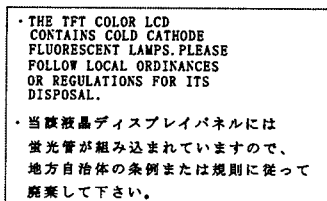


Parts name  
 Lot number  
 Panel number, Inspection date

High voltage caution label



Disposal method label



## 20. PACKING, TRANSPORTATION, AND DELIVERY

Supplier will pack products to be delivered to customer in accordance with supplier's packing specifications, and will deliver them to customer in such a state that they will not suffer damage during transportation. The delivery conditions are as follows.

### (1) Outer box

As shown in the figure, one or two inner boxes are packed in an outer box.

There is a risk of damage to the products if the outer box is dropped from a height of 60 cm or more, and therefore care should be taken in handling the box during transportation.

When a box is stored in a warehouse, etc., care should be taken to ensure that the storage temperature is not exceeded.

### (2) Inner box

The parts number and quantity are shown on the inner box, either printed directly or on a label.

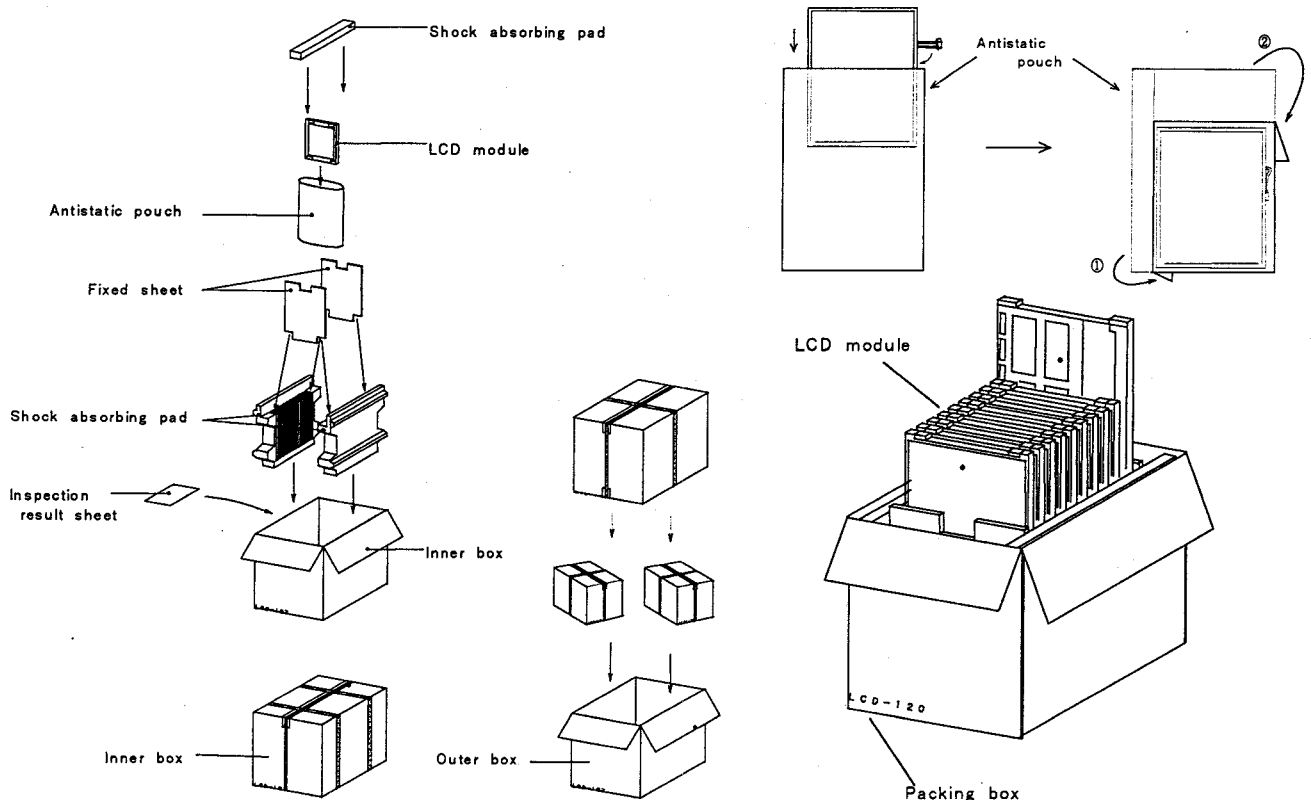
Products should not be transported in the inner box alone, since there is a risk of damage. Moisture-proofing material silicagel is to be placed on the inner boxes, and they are then to be covered in moisture-proof vinyl sheet.

### (3) Inspection result sheet

An inspection result sheet is included for delivered products with each inner box. The inspection result sheet should summarize a number of products for which pass/fail assessment has been performed.

### (4) Means of transportation

Products are to be transported by hand, light van, truck, by air, or by sea.



## 21. PRODUCT INSPECTION

When products are shipped, the following inspections are to be carried out for all products or sampling products.

- (1) 100% inspection:  Supply current  
 Display appearance  
 Outside appearance
- (2) Sampling inspection:  White luminance  
 Contrast  
 Luminous uniformity

## 22. CHANGE CONTROL

Design changes may be made for this product relating to the specifications, appearance, parts used, circuits, and etc., for the purpose of product improvement.

If a design change is judged to affect the specifications of this product, supplier shall inform customer of the change in advance.

## 23. QUALITY CONTROL

In the event of a product failure under normal operating conditions, and in the event of product trouble or a functional disorder that can be deemed to be the responsibility of supplier, supplier shall repair the fault or replace the product free of charge within one year from the date of product delivery.

However, supplier shall not bear responsibility for the quality of a product in the case of modifications other than those specified by supplier.

The repair of the product that has been passed one year from the date of shipment shall be chargeable on customers. The parts that has been replaced with charge shall be warranted for the period of six months from the date of replacement.

After the product discontinuation, we might replace the product instead of repairment.

## 24. MAINTENANCE

The specifications of the functions of maintenance parts may be partially changed with in a range which provides for equivalent or better quality. Maintenance parts shall in principle be product units.

If the product discontinuation is planned, supplier shall notify customer in six months before.

## 25. HANDLING OF DOUBTFUL POINTS

If any doubt arises concerning a matter not stipulated in this specification, the matter is to be resolved by mutual agreement between customer and supplier, and supplier shall make efforts for improvement in good faith.





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## 26. GENERAL CAUTIONS

Next figures and sentence are very important, please understand these contents as follows.

 CAUTION	This figure is a mark that you will get hurt and/or the module will have damages when you make a mistake to operate.
---	--

	This figure is a mark that the LCD module will give out smoke or catch fire when you make a mistake to operate
---	--


	This figure is a mark that you will get hurt when you make a mistake to operate
---	---

 CAUTION


## (1) Caution when taking out the module

- ① Pick the pouch only, in taking out module from a carrier box.

## (2) Caution for handling the module

- ① As the electrostatic discharges may break the LCD module, handle the LCD module with care against electrostatic discharges. Peel protection sheet out from the LCD panel surface as slowly as possible.
- ②  As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- ③ As the surface of polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- ④ Do not pull the interface connectors in or out while the LCD module is operating.
- ⑤ Put the module display side down on a flat horizontal plane.
- ⑥ Handle connectors and cables with care.
- ⑦ When the module is operating, do not lose CLK, Hsync, or Vsync signal. If any one of these signals is lost, the LCD panel would be damaged.
- ⑧ The torque to mounting screw should never exceed 0.294 N·m (3 Kgf·cm).

## (3) Caution for the atmosphere

- ① Dew drop atmosphere should be avoided.
- ② Do not store and/or operate the LCD module in a high temperature and/or high humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.
- ③ This module uses cold cathod fluorescent lamp. Therefore, The life time of lamp becomes short conspicuously at low temperature.
- ④  Do not operate the LCD module in a high magnetic field.

## (4) Caution for the module characteristics

- ① Do not apply fixed pattern data signal to the LCD module at product aging. Applying fixed pattern for a long time may cause image sticking.

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## (5) Other cautions

- ① Do not disassemble and/or reassemble LCD module.
- ② Do not readjust variable resistor or switch etc.
- ③ When returning the module for repair or etc. please pack the module not to be broken.  
We recommend to the original shipping packages.

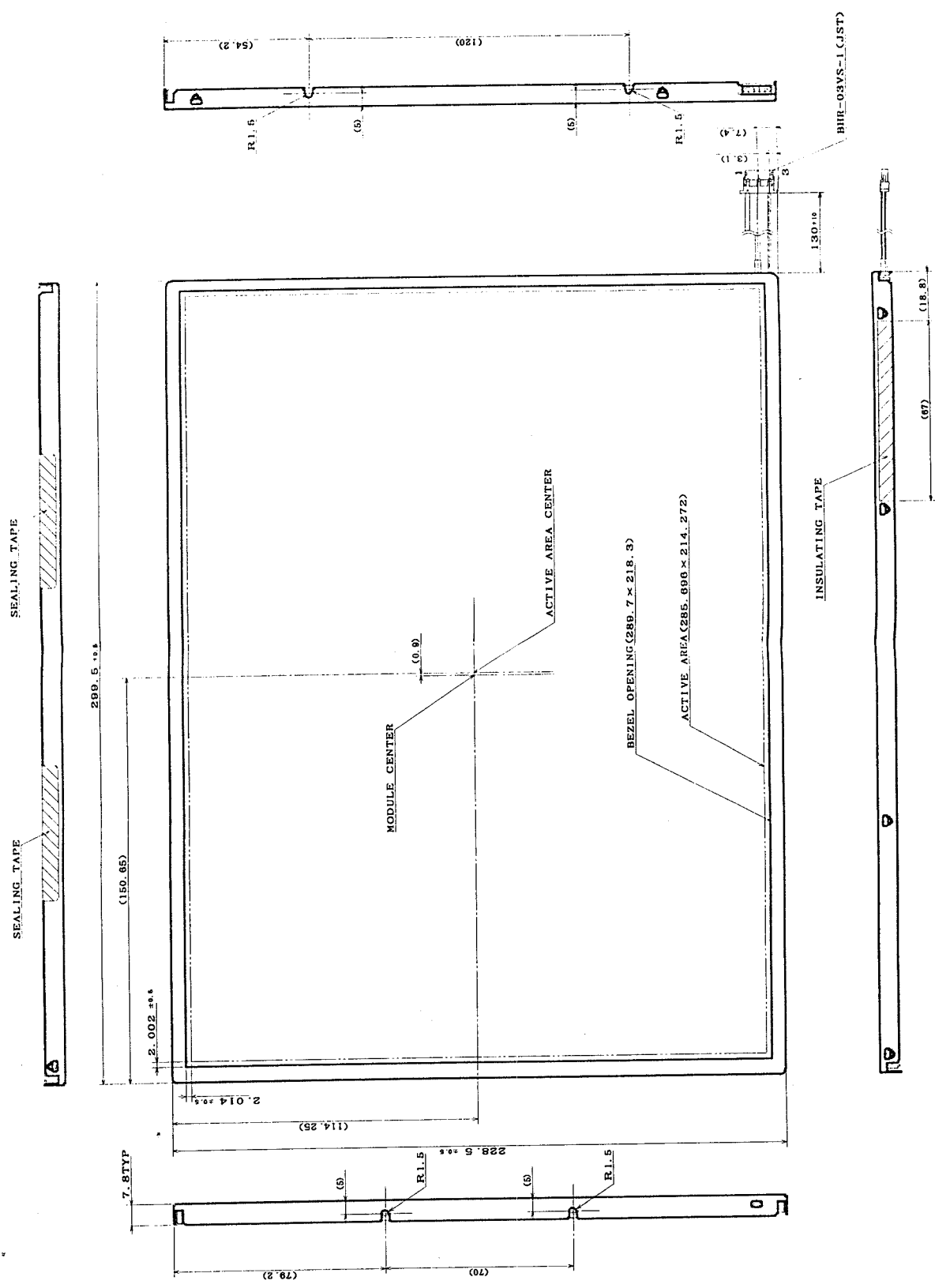
Liquid Crystal Display has the following specific characteristics. There are not defects or malfunctions.

The display condition of LCD module may be affected by the ambient temperature. The LCD module uses cold cathode tube for backlighting. Optical characteristics, like luminance or uniformity, will change during time.

Uneven brightness and/or small spots may be noticed depending on different display patterns.

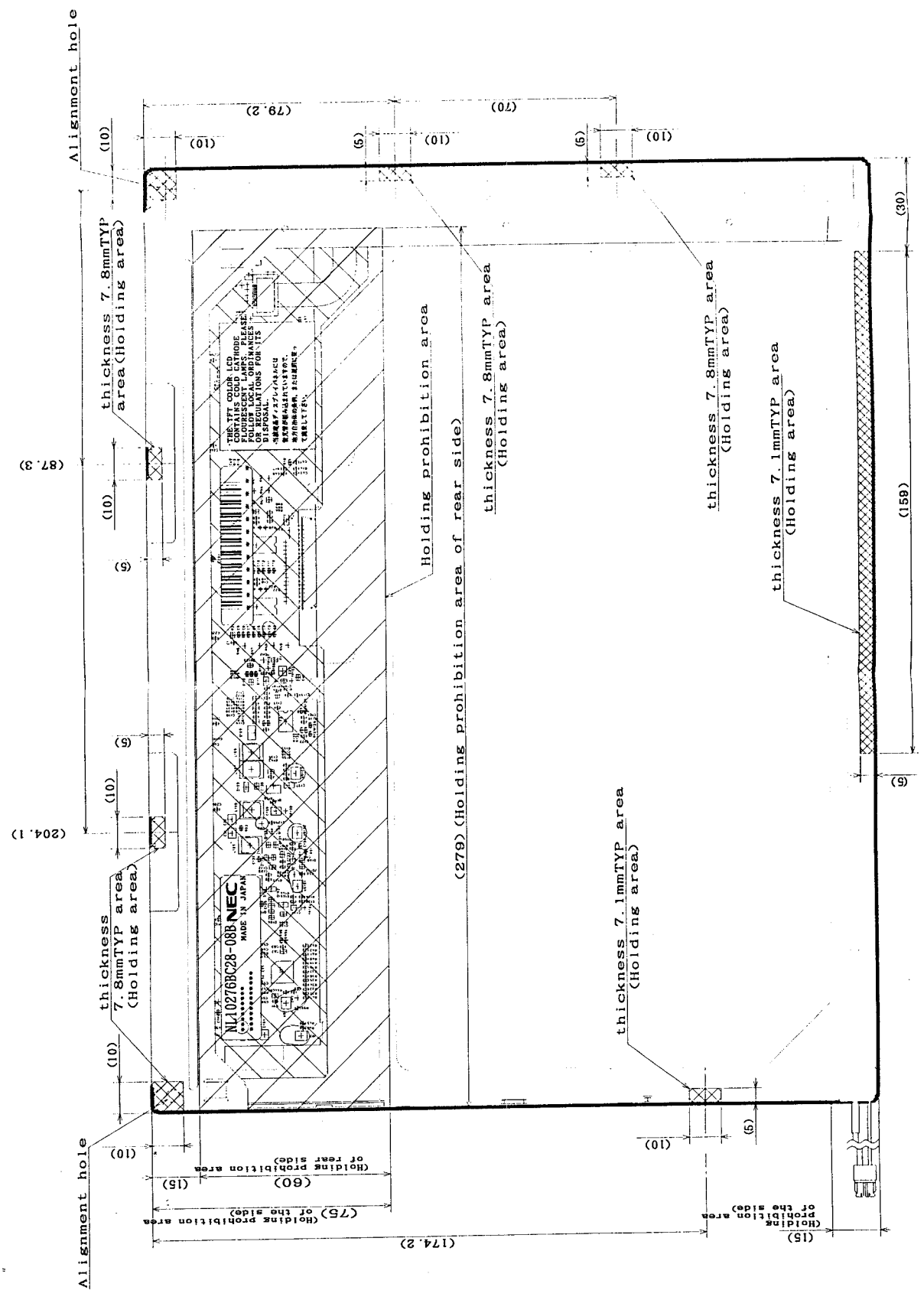
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27. OUTLINE DRAWINGS  
27.1 Front View (Unit in mm)



※THE VALUE IN PARENTHESES ARE FOR REFERENCE

27.3 Module holding position (Unit in mm)





Revision History			DDS - SA 10258		30/30	
No.	Prepared Date	Revision Contents	Approved	Checked	Prepared	Issued Date
1	May. 11, 1998	Planning Department <u>D. Kimura</u> Reliability and QC Department QA: <u>Junji Takahashi</u> QC: <u>J. Yamamoto</u> Circuit and Assembly Technologies Department <u>K. Matsumoto</u> Application Engineering Department <u>H. Moriyama</u>	<u>T. Falw</u>	-	<u>J. Kusnagi</u>	