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* Revision History

Date	Rev. No	Page	Summary												
Mar. 2 2012	000	-	First Issued												
Apr. 27, 2012	001	-	<ul style="list-style-type: none"> Improved Dr-IC Application - AS IS : MT3196B, TO BE : MT3196C - Model Code Changed : LTY[Z]320AN05-A01 → LTY[Z]320AN05-A02 												
Oct. 17, 2012	002	-	<ul style="list-style-type: none"> LCM site multiplication <table border="1" data-bbox="382 531 1115 666"> <thead> <tr> <th colspan="2">As Is.</th> <th colspan="2">To be.</th> </tr> </thead> <tbody> <tr> <td>LTY320AN05-A02</td> <td>DS</td> <td>LTY320AN05-A02</td> <td>DS</td> </tr> <tr> <td></td> <td></td> <td>LTY320AN05-A03</td> <td>SDSZ</td> </tr> </tbody> </table>	As Is.		To be.		LTY320AN05-A02	DS	LTY320AN05-A02	DS			LTY320AN05-A03	SDSZ
As Is.		To be.													
LTY320AN05-A02	DS	LTY320AN05-A02	DS												
		LTY320AN05-A03	SDSZ												

General Description

Description

LTY[Z]320AN05 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 32.0" is 1366 x 768 and this model can display up to 16.7 million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide an excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV, Display terminals for AV application products, and High Definition TV (HDTV).

Features

- RoHS compliance (Pb-free)
- High contrast ratio, high aperture ratio, fast response time
- PVA mode
- Wide viewing angle ($\pm 89^\circ$)
- WXGA (1366 x 768 pixels) resolution (16:9)
- Low Power consumption
- WLED (White Light Emitting Diode) Backlight
- LVDS (Low Voltage Differential Signaling) interface

General Information

Items	Specification	Unit	Note
Module Size	727.6(H _{TYP}) x 424.0(V _{TYP})	mm	± 1.0 mm
	24.8(D _{MAX})		
Weight	5500(Max)	g	
Pixel Pitch	0.51075(H) × 0.17025 (V) * 3	mm	
Active Display Area	697.6845(H) x 392.256(V)	mm	
Surface Treatment	Haze 0.8%, Hard-coating (2H)		
Display Colors	8 bit- 16.7M	colors	
Number of Pixels	1366 x 768	pixel	
Pixel Arrangement	RGB Horizontal stripe		
Display Mode	Normally Black		
Luminance of White	430	cd/m ²	Typ.

1. Absolute Maximum Ratings

1-1 Operating Condition

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	GND-0.5	13	V	(1)
Module Storage Temperature	T_{STG}	-20	65	°C	(2)
Operating Temperature	T_{OPR}	0	50	°C	(2)
Panel surface Temperature	T_{SUR}	0	65	°C	(3)
Shock (non – operating)	S_{NOP}	-	50	G	(4)
Vibration (non – operating)	V_{NOP}	-	1.5	G	(5)

Note (1) $T_a = 25 \pm 2 \text{ }^\circ\text{C}$

(2) Temperature and relative humidity range are shown in the figure below.

a. 93.8 % RH Max. ($T_a \leq 40 \text{ }^\circ\text{C}$)

b. Maximum wet-bulb temperature at $40 \text{ }^\circ\text{C}$ or less. ($T_a \leq 40 \text{ }^\circ\text{C}$)

c. No condensation

(3) Polarizer will not be damaged in this range, even though abnormal visual problems occur in T_{SUR} range.

(4) 11ms, sine wave, one time for $\pm X, \pm Y, \pm Z$ axis

(5) 10-300 Hz, Sweep rate 10min, 30min for X, Y, Z axis

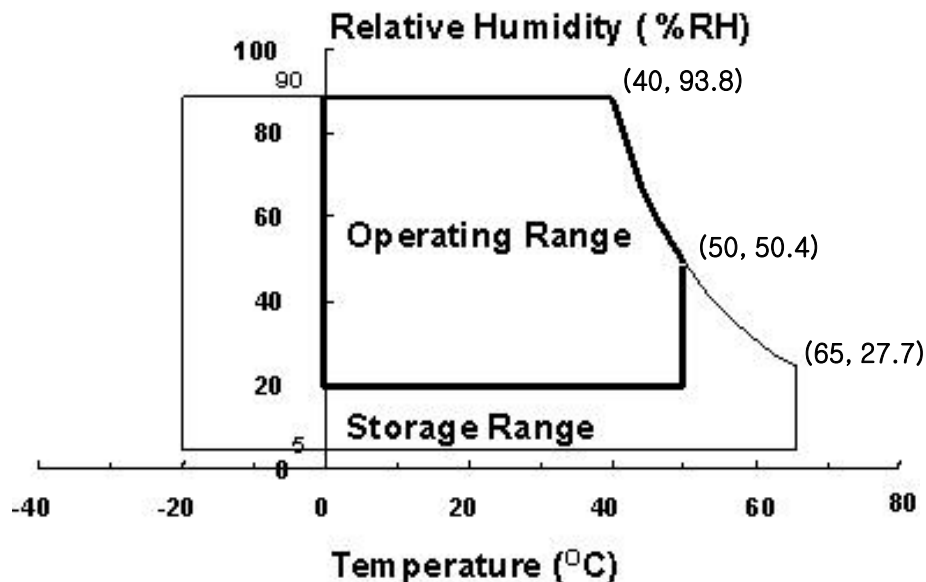


Fig. Temperature and Relative humidity range

1-2 Pallet Storage Condition (Not Included Transportation)

※ except for service Panel

ITEM	Unit	Min.	Max.
Storage Temperature	(°C)	<p>Relative Humidity (%RH)</p> <p>Temperature (°C)</p> <p>Pallet Storage Condition</p> <p>Coordinates: (5, 20), (5, 75), (45, 75), (50, 59), (50, 20)</p>	
Storage Humidity	(%rH)		
Storage life from S2-In	12 months		
Storage Condition	<ul style="list-style-type: none"> - The storage room should provide good ventilation and temperature control. - Products should not be placed on the floor, but on the Pallet away from a wall. - Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation. - Avoid other hazardous environment while storing goods. - If products delivered or kept in conditions of over the storage period of 3 months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20°C and a humidity of 50% for 24 hours. 		

2. Optical Characteristics

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

Measuring equipment : TOPCON BM-7,SPECTRORADIOMETER SR-3

(LED Input Current = 110mA, Ta = 25 ± 2°C, VDD=12V, fv= 60Hz, f_{DCLK}=80MHz, Dim = 100%)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio (Center of screen)	C/R	Normal $\theta_L, R=0$ $\theta_U, D=0$ Viewing Angle	*3000	5000	-		(3) SR-3A	
Response Time	G-to-G [AVE]		Tg	-	8	18	msec	(5) RD-80S
Luminance of White (Center of screen)	Y _L			360	430	-	cd/m ²	(6) SR-3A
Color Chromaticity (CIE 1931)	Red		Rx	TYP. -0.03	0.645	TYP. +0.03		(7),(8) SR-3A
			Ry		0.331			
	Green		Gx		0.315			
			Gy		0.616			
	Blue		Bx		0.156			
			By		0.048			
	White		Wx		0.280			
		Wy	0.285					
Color Gamut	-		-	72	-	%	(7) SR-3A	
Color Temperature	-		-	10000	-	K	(9)	
2Point Gamma	γ	7G ~ 57G (Full = 64G)	1.7	2.2	2.7			
Viewing Angle	Hor.	θ _L	C/R≥10	79	89	-	Degree	(8) EZ-Contrast
		θ _R		79	89	-		
	Ver.	θ _U		79	89	-		
		θ _D		79	89	-		
Brightness Uniformity (9 Points)	B _{uni}		-	-	30	%	(4) SR-3	

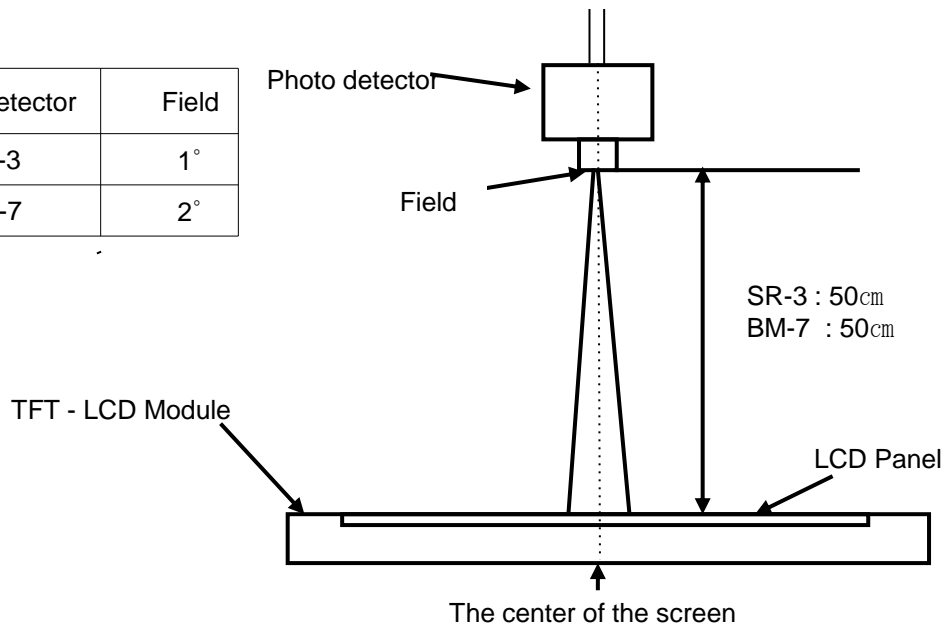
* CR = (White at point ⑤ of Note 2) / (Most Dark Point of Black Pattern at area ① of Note 2)

Note (1) Test Equipment Setup

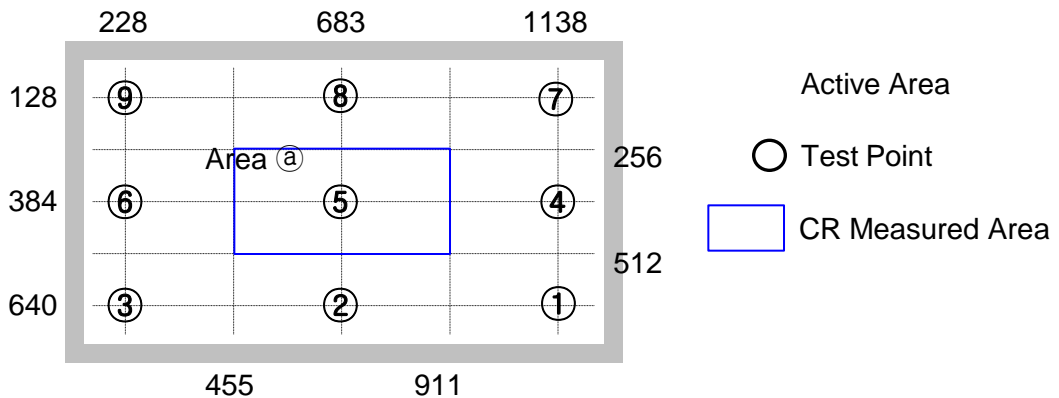
The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

Single lamp current @ Vdim = 100%
Environment condition : Ta = 25 ± 2 °C

Photo detector	Field
SR-3	1°
BM-7	2°



Note (2) Definition of test point



Note (3) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G_{\max}}{G_{\min}}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

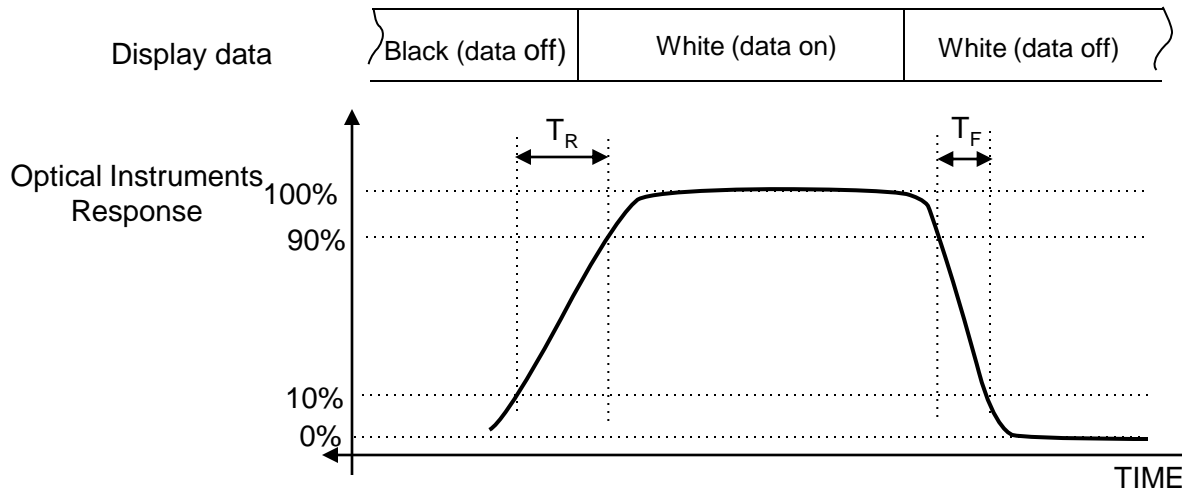
Note (4) Definition of 9 points brightness uniformity

$$B_{uni} = 100 * \frac{(B_{max} - B_{min})}{B_{max}}$$

B_{max} : Maximum brightness

B_{min} : Minimum brightness

Note (5) Definition of Response time : Sum of Tr, Tf



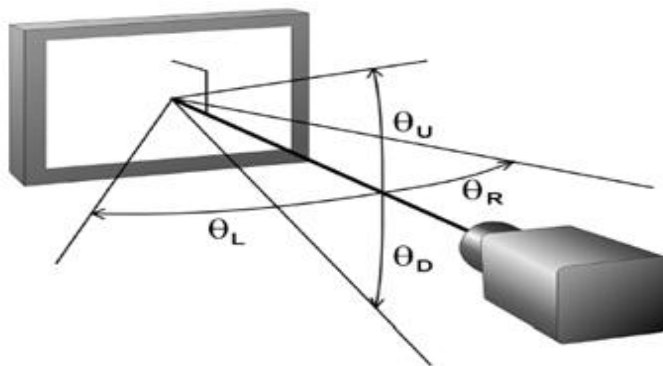
Note (6) Definition of Luminance of White : Luminance of white at center point ⑤

Note (7) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (8) Definition of Viewing Angle

: Viewing angle range (C/R ≥ 10)



Note (9) Definition of 2 point Gamma

$$\text{Gamma} = \log(X_{lum}/100) / \log(Y/100)$$

$$X_{lum} = (Z - B_{min}) / (B_{max} - B_{min}) \times 100$$

Y: Measurement Level / Z: Measurement Brightness

B_{max}: Maximum Brightness / B_{min}: Minimum Brightness

3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

$T_a = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}$

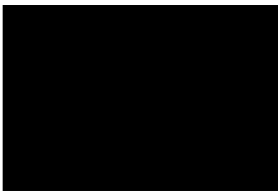
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply	V_{DD}	11	12	13	V	(1)
Current of Power Supply	(a) Black	-	375	-	mA	(2),(3)
	(b) White	-	350	450		
	(c) Mosaic	-	365	-		
	(4) Max Pattern	-	670	770		
Vsync Frequency	f_V	47	60	63	Hz	
Hsync Frequency	f_H	45	48.6	53	kHz	
Main Frequency	f_{DCLK}	65	80	86	MHz	
Rush Current	I_{RUSH}	-	-	3	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD} .

(2) $f_V=60\text{Hz}$, $f_{DCLK} = 80\text{MHz}$, $V_{DD} = 12.0\text{V}$, DC Current.

(3) Power dissipation check pattern (LCD Module only)

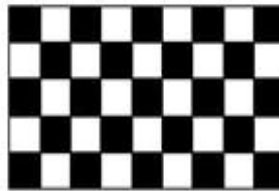
a) Black Pattern



b) White Pattern



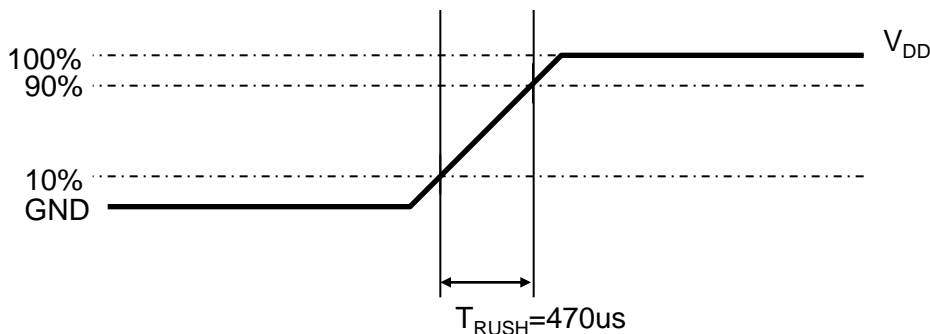
c) Mosaic



d) Max. Pattern



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is 1ms

3.2 Back Light Unit

The back light contains 60 LEDs.

The characteristics of lamps are shown in the following tables.

$T_a = 25 \pm 2^\circ\text{C}$

Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Operating Life Time	Hr	30,000	-	-	Hour	(1)	
Operating Current	Continuous	I _{op}	-	110	200	mA	-
Operating Voltage	Continuous	V _{op}	171	-	194	V	@110mA / 30LEDs @T _j 25°C
Range of Voltage	ΔV _f	-	-	11.5	V	@140mA(/String)	
(Power Consumption)	-	(18.8)	-	(21.3)	-	I _{op} =110mA @T _j 25°C	

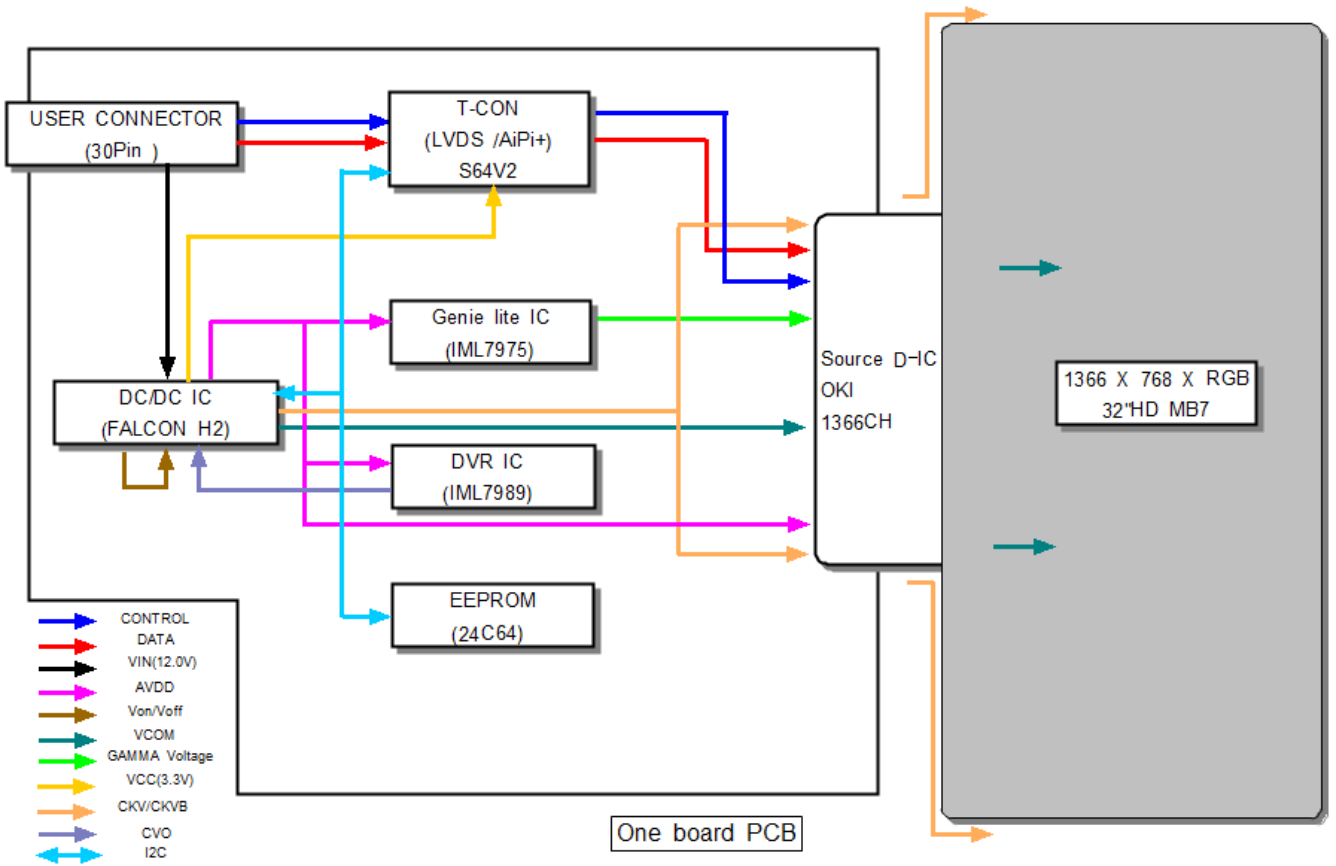
Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value at each String, I_{op}=110.0mA

[Definition of Operating Voltage : At each Strings, I_{op} = 140.0 mA (typ.)]

3.2.1 Review and Update for Electrical Specification

According to the improvement of efficiency for devices, the electrical specification would be reviewed and revised after initial values had been established. This revision mentioned above should be discussed at appropriate time.

4. Block Diagram



5. Input Terminal Pin Assignment

5.1. Input Signal & Power of Control Board

Connector : 196260-30041 (P-TWO Industries)

PIN No.	Signal	Description	PIN No.	Signal	Description
1	N.C.	No Connection	16	GND	GND
2	SCL_I	I2C Clock	17	LV3_NI	LVDS Signal -
3	SDA_I	I2C Data	18	LV3_PI	LVDS Signal +
4	GND	GND	19	GND	GND
5	LV0_NI	LVDS Signal -	20	N.C.	No Connection
6	LV0_PI	LVDS Signal +	21	LVDS_SEL	LVDS Selection
7	GND	GND	22	WPN	Bus Release
8	LV1_NI	LVDS Signal -	23	GND	GND
9	LV1_PI	LVDS Signal +	24	GND	GND
10	GND	GND	25	N.C.	No Connection
11	LV2_NI	LVDS Signal -	26	Power	V _{DD}
12	LV2_PI	LVDS Signal +	27	Power	V _{DD}
13	GND	GND	28	Power	V _{DD}
14	LVCLK_NI	LVDS Clock -	29	Power	V _{DD}
15	LVCLK_PI	LVDS Clock +	30	Power	V _{DD}

■ Option Pin Description

These pins are CMOS interface.

Please use within the range of the following restriction.

V_{IH} : 2.4V(min) / 3.5V(max)

V_{IL} : 0.0V(min) / 0.4V(max)

■SCL : Pull up 22Ω/ 4.7kΩ

■SDA : Pull up 22Ω/ 4.7kΩ

Note(1) Pin number starts from Right side

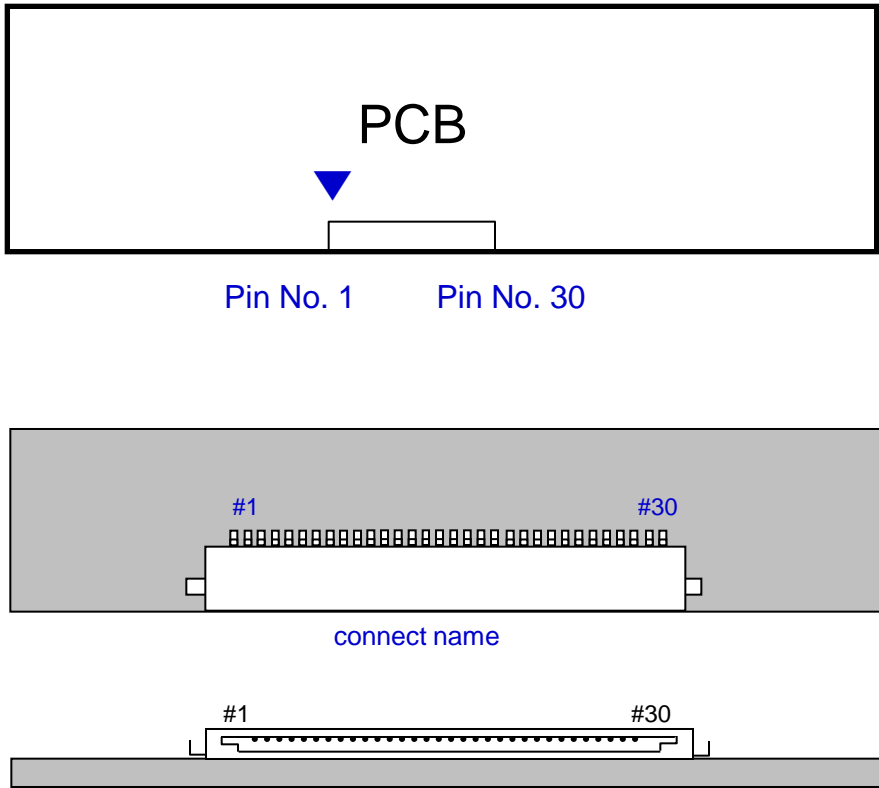


Fig. Connector diagram

- a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
- b. All power input pins should be connected together.
- c. All NC pins should be separated from other signal or power.

5.2. LS Bar Input Pin Configuration

1. CONNECTOR : Morex/51103-040

Pin	Pin Configuration (Function)
1	DC Voltage (+)
2	N.C.
3	N.C.
4	DC Voltage (+)

2. CONNECTOR : Morex/51103-0500

Pin	Pin Configuration (Function)
1	Feedback
2	N.C.
3	N.C.
4	Feedback
5	N.C.

5.3 LVDS Interface

	LVDS pin	JEIDA - Data	Normal Data
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

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

COLOR	DISPLAY (10bit)	DATA SIGNAL																											GRAY SCALE LEVEL		
		RED									GREEN									BLUE											
		R 0	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	G 0	G 1	G 2	G 3	G 4	G 5	G 6	G 7	G 8	G 9	B 0	B 1	B 2	B 3	B 4	B 5	B 6		B 7	B 8
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	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	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0	
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1	
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R1020	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓ LIGHT	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1021	
		0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1022	
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1023	
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0	
	DARK ↑	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1	
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G1020	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	G1021	
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	G1022	
	GREEN	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G1023	
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0	
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B1020	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B1021	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B1022	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B1023	

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

6. EDID Information

6.1 EEPROM Data

EEPROM Data					
No	Item	Spec	Address	Data	Remark
1	Panel Product Vender	HDLCD	00	00	SONY Choice - Note 1
2	Screen Size	32	01	20	16進
3	H-Resolution	1366	02,03	05,56	16進
4	V-Resolution	768	04,05	03,00	16進
5	Vertical Frequency	50/60Hz	06	00	- Note 2
6	Data Format	8bit	07	01	- Note 3
7	FRC Revision Information	1st	ED	00	ASCII - Note 4
8	Part Number	LTY320AN0501	E0-EB	4C,54,59,33,32,30, 41,4E,30,35,30,31	ASCII - Note 5, 6

※ Note 1.

Data	Panel Vender Code
00	HDLCD(SDC)
01	Others
02	Others
03	Others
04	Others
05	Others

※ Note 2.

Data	V-Frequency
00	50/60Hz
01	100/120HZ
02	200/240Hz

※ Note 3.

Data	Data Format
00	6Bit
01	8Bit
02	10Bit

※ Note 4.

- FRC Revision Code will be Changed from "00" to "41" (A)
When FRC IC is changed. At First MP. This Code will be "00"

※ Note 5.

- LTY[Z]XXXXXXX Only for SDC Model

※ Note 6.

- Rest of them must be "00" (Null)

6.2 EEPROM Data Map

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	20	05	56	03	00	00	01	00	00	00	00	00	00	00	00
1	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
2	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
3	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
4	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
5	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
6	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
7	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
8	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
9	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
A	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
B	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
C	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
D	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
E	4C	54	59	33	32	30	41	4E	30	35	30	31	00	00	00	00
F	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

7. Interface Timing

7.1 Timing Parameters (DE only mode)

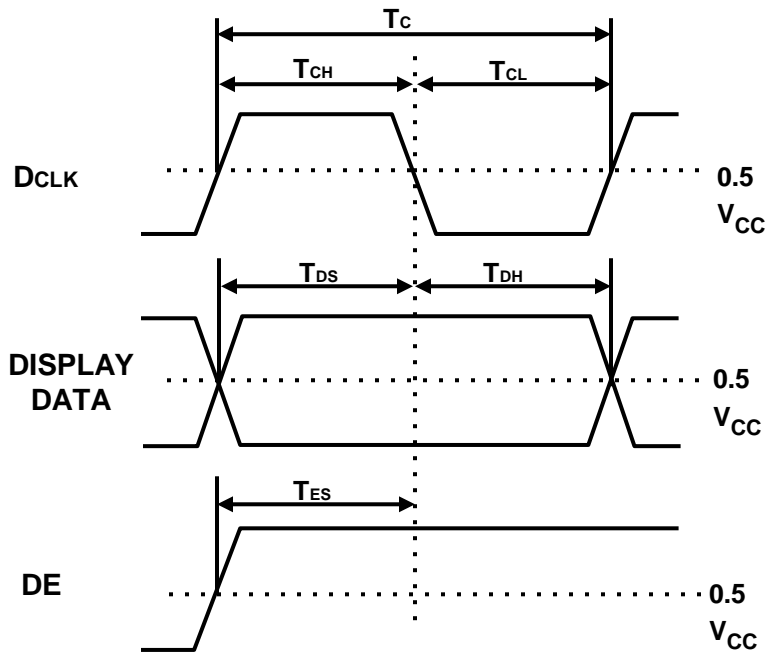
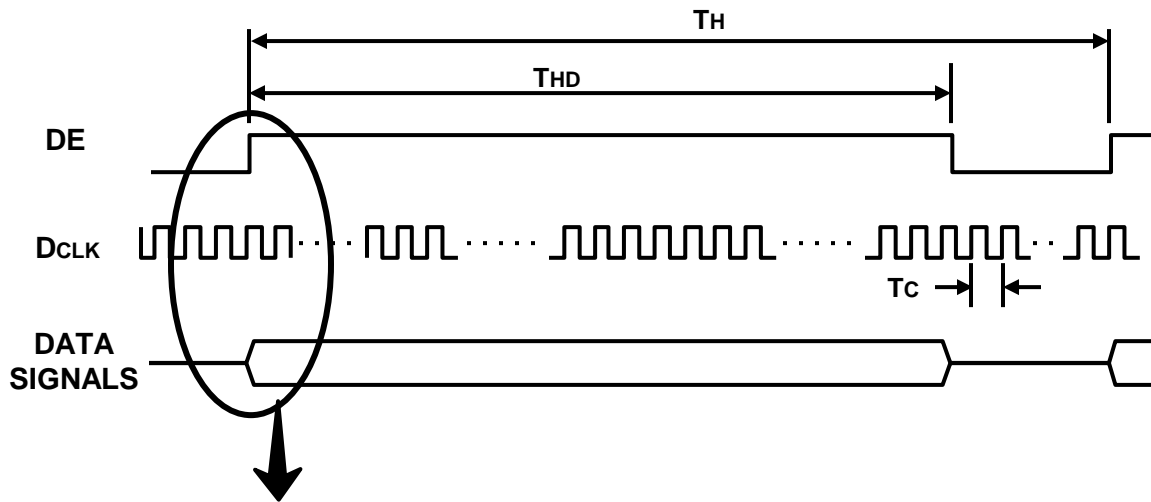
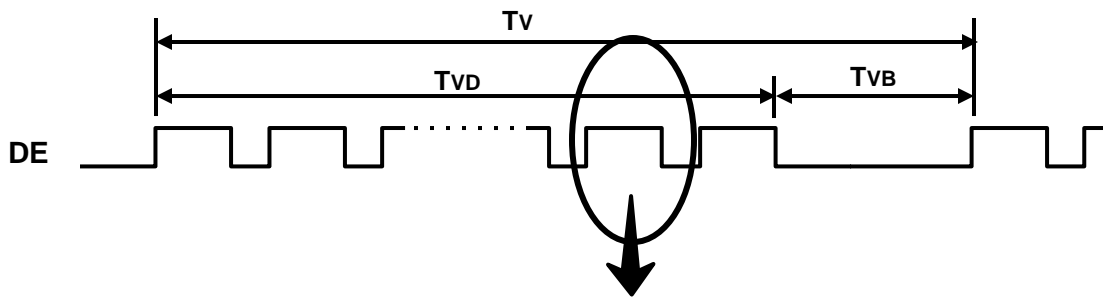
SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	65	80	86	MHz	-
Hsync		F_H	45	48.6	53	KHz	-
Vsync		F_V	47	60	63	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	768	768	768	lines	-
	Vertical Total	T_{VB}	775	810	1300	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	1366	1366	1366	clocks	-
	Horizontal Total	T_H	1450	1648	2000	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system

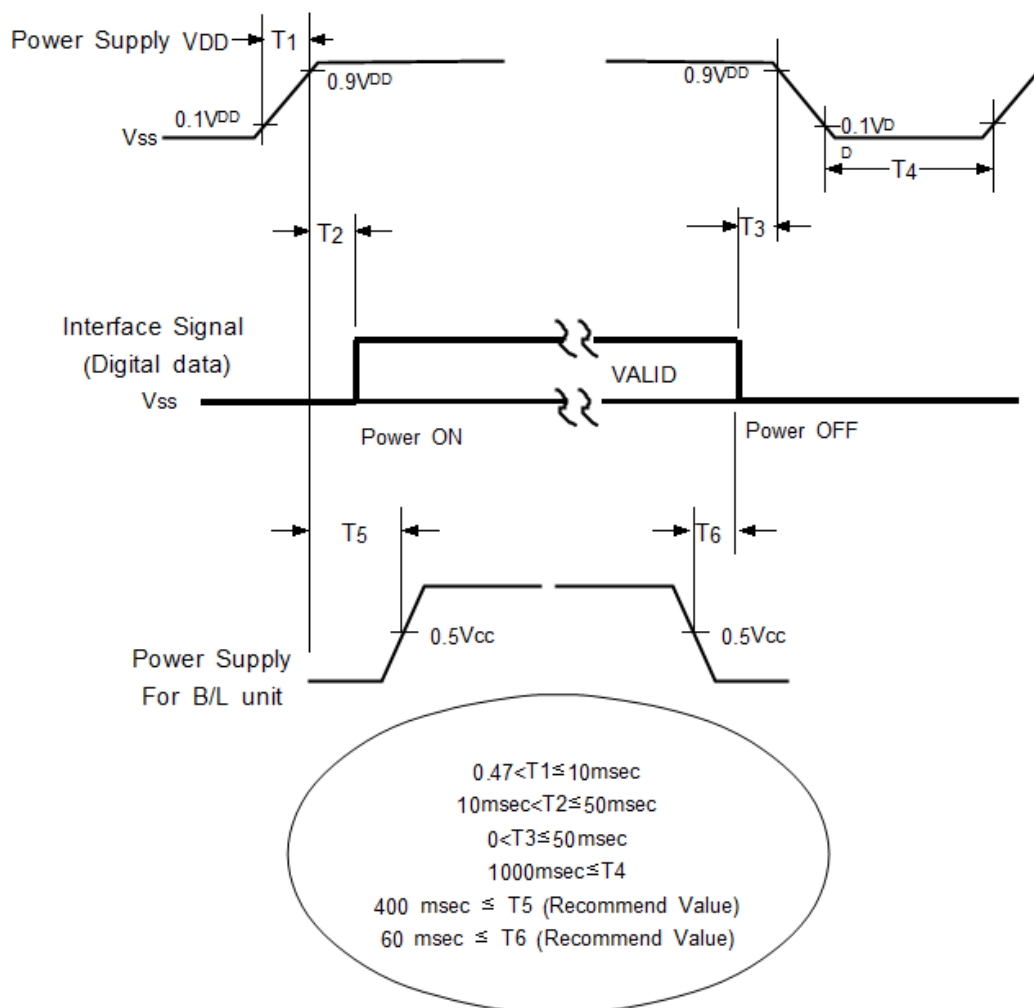
(2) Internal $V_{DD} = 3.3V$

7.2 Timing diagrams of interface signal (DE only mode)



7.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.

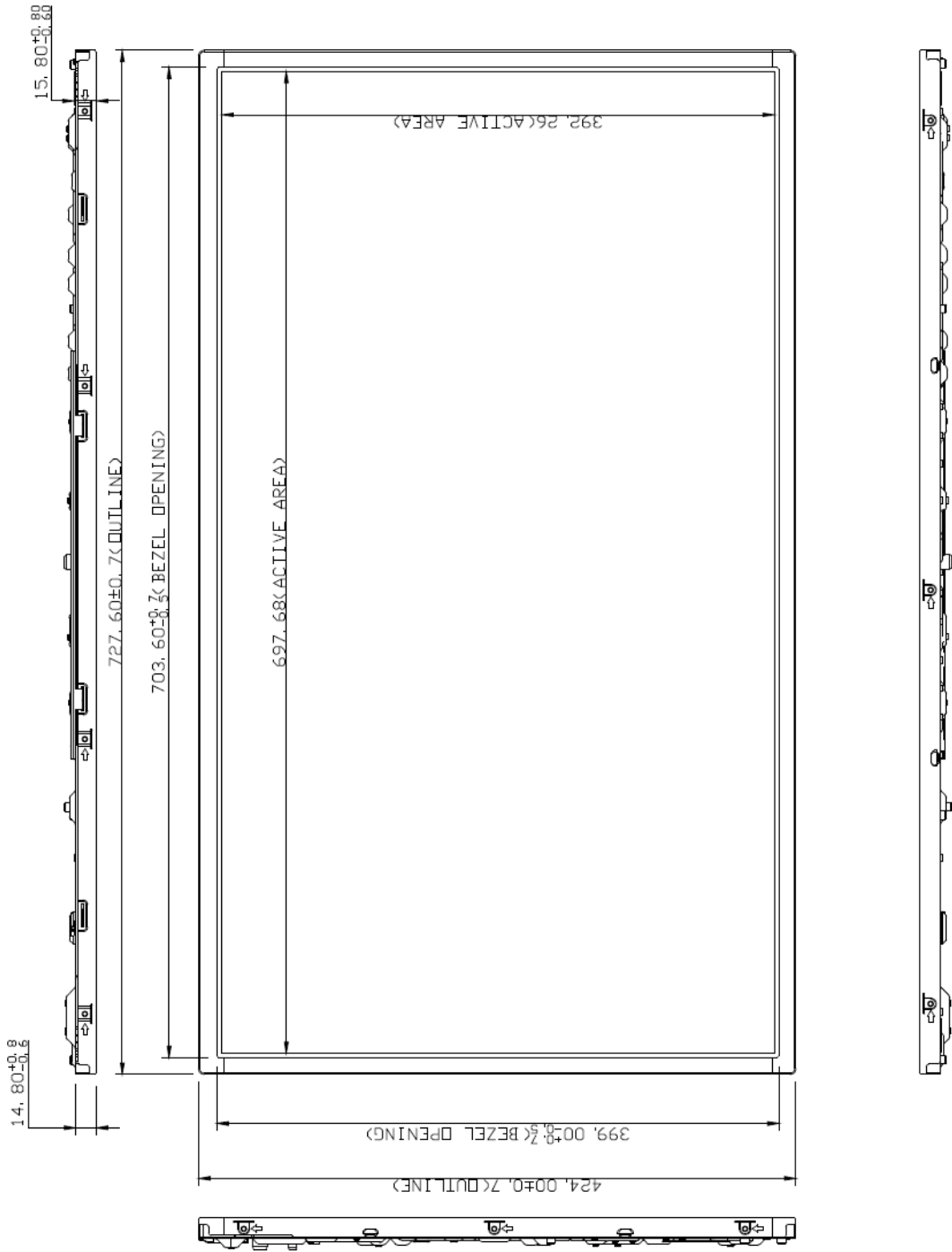


- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD} .
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of $V_{DD} = \text{off level}$, please keep the level of input signals low or keep a high impedance.
- T_4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

8.1 Outline Dimension

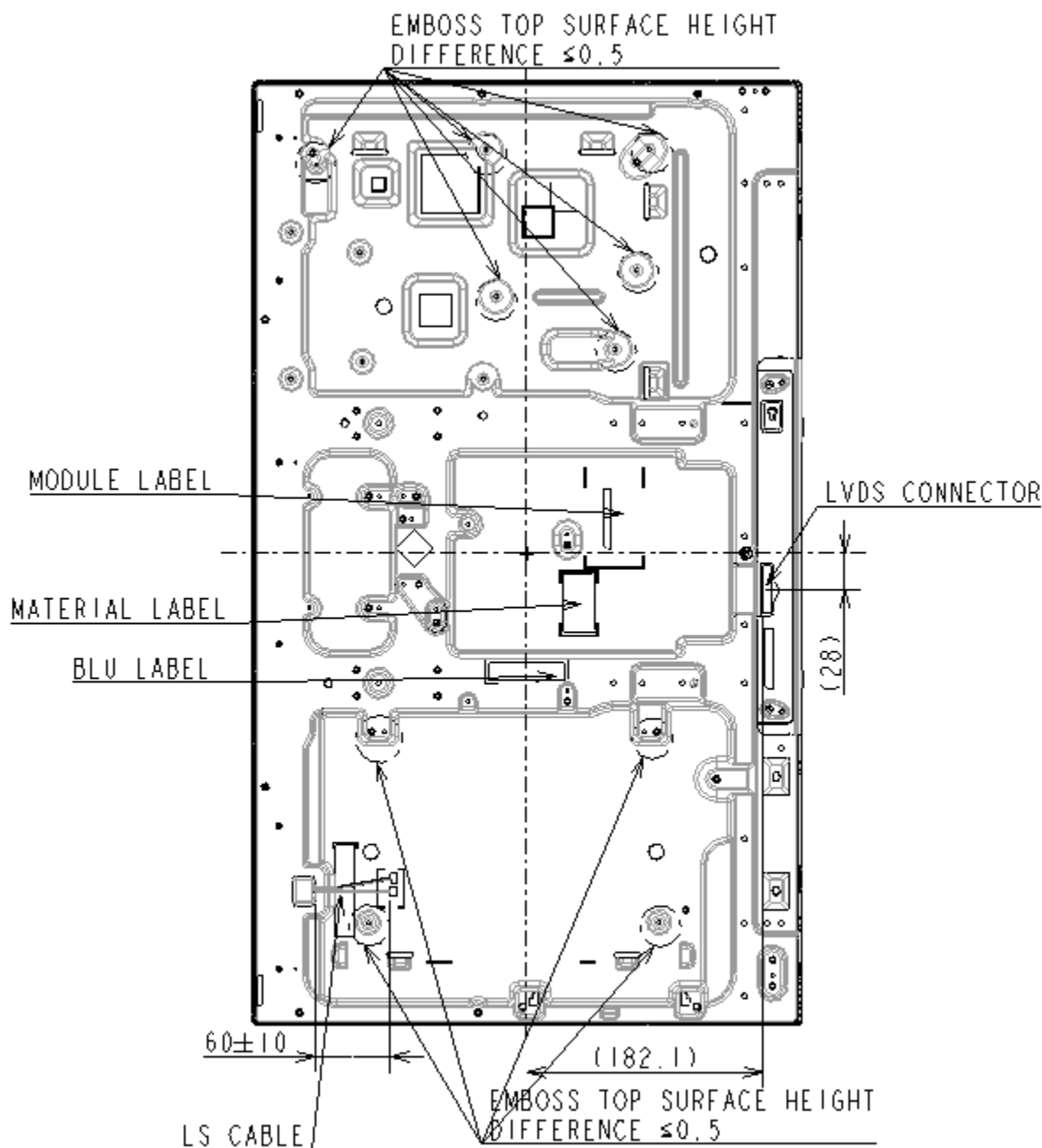
a. Front View

[WARP SPEC ± 1.5]



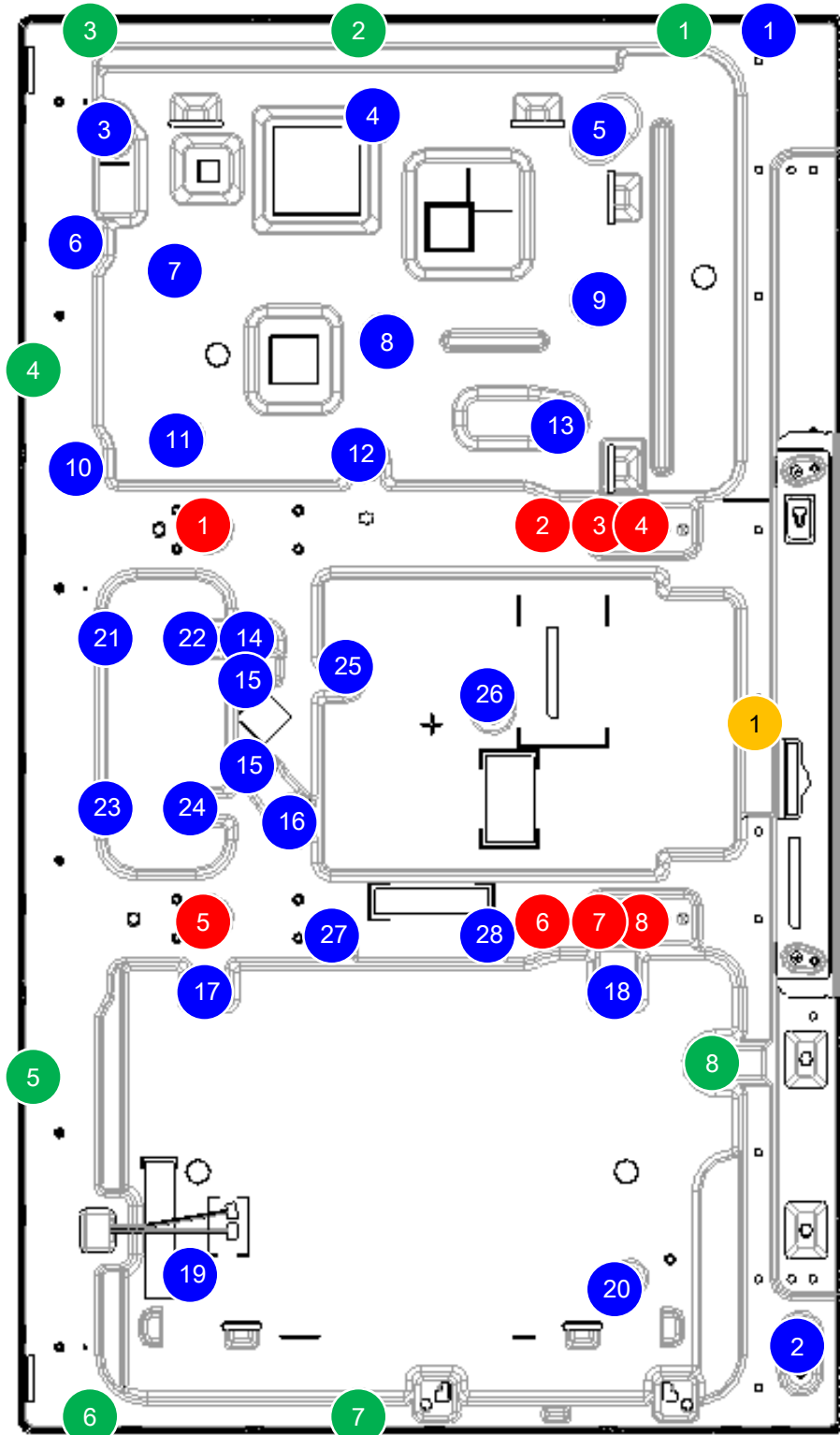
8.1 Outline Dimension

b. Rear View



*TAPE TO HOLD LS CABLE SHALL BE FOLDED TO ENABLE TAPE TO BE REMOVED EASILY.

8.1 Outline dimension (Stud and Tap Type)



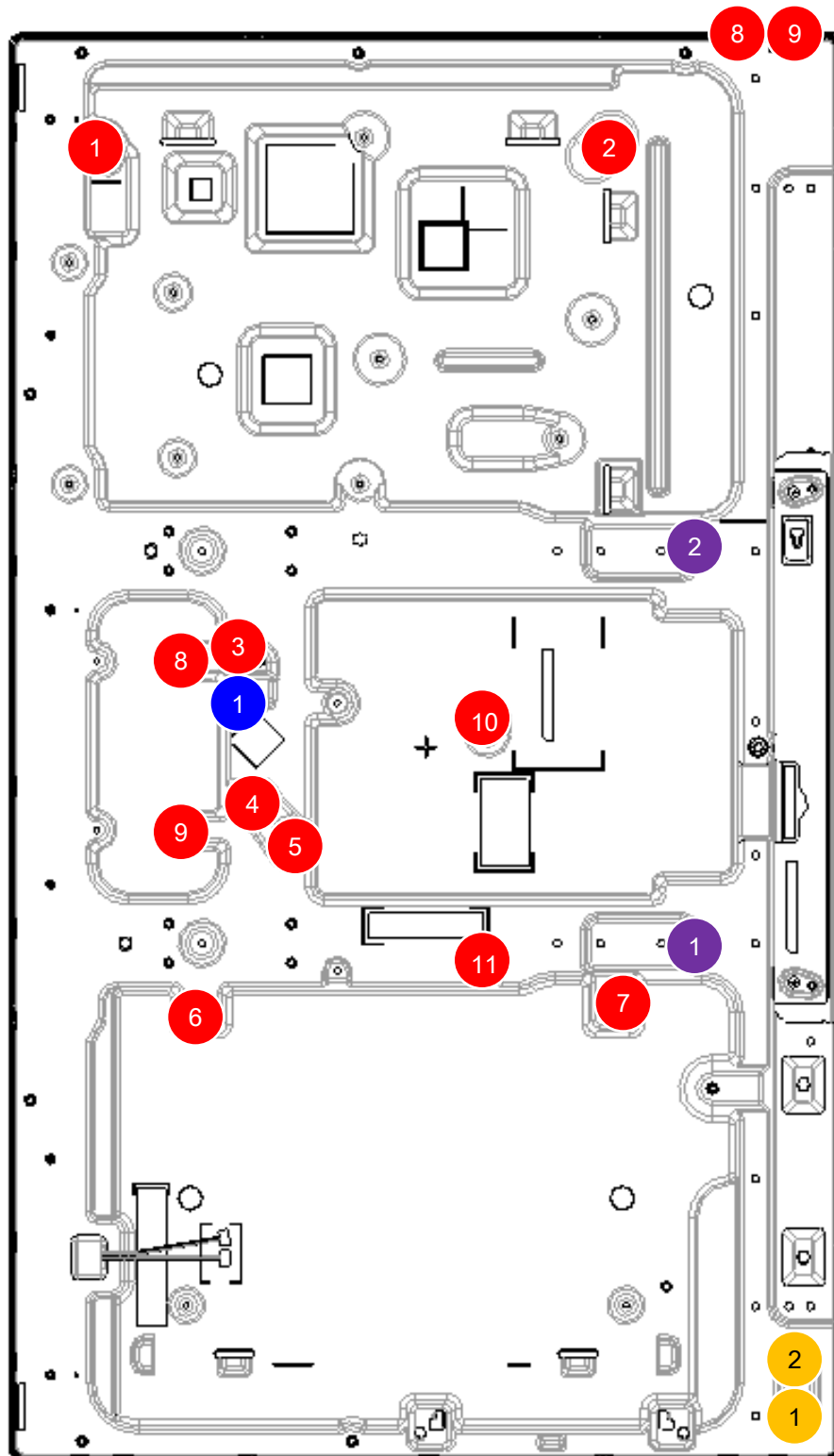
● :M4 tap (8 pcs)

● :M3 stud (8 pcs)

● :M3 tap (28 pcs)

● :M4 stud (1 pc)

8.1 Outline dimension (Dowel Type)



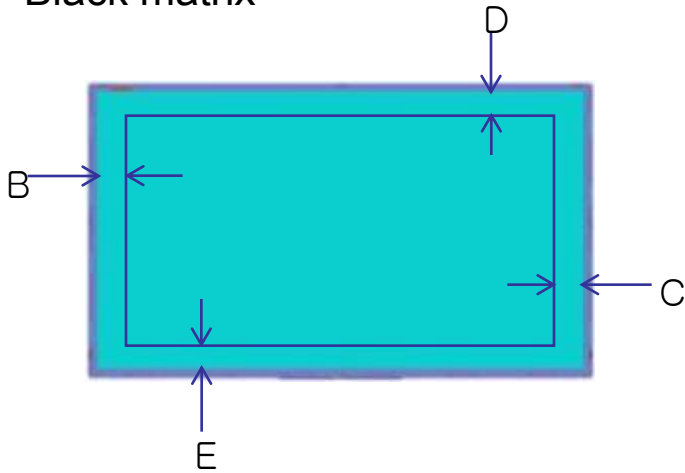
- :Type B1 (11 pcs)
- :Type B3 (2 pcs)
- :Type B2 (1 pc)
- :Type S1 (2 pcs)

8.2 General item

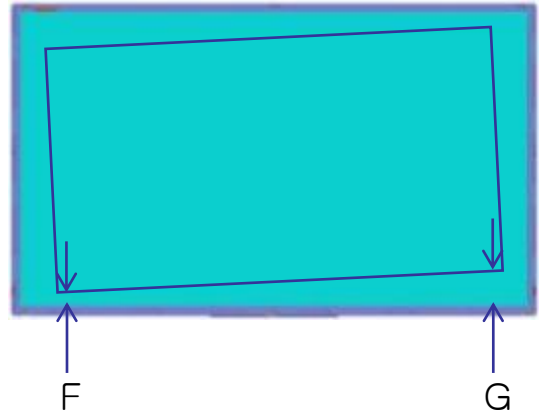
•General tolerance

Distance (mm)	$X \leq 16$	$16 < X \leq 64$	$64 < X \leq 256$	$256 < X \leq 512$	$512 < X \leq 1024$	$1024 < X$	Bending Angle
Tolerance	± 0.1	± 0.2	± 0.3	± 0.45	± 0.6	± 0.8	$\pm 1^\circ$

•Black matrix



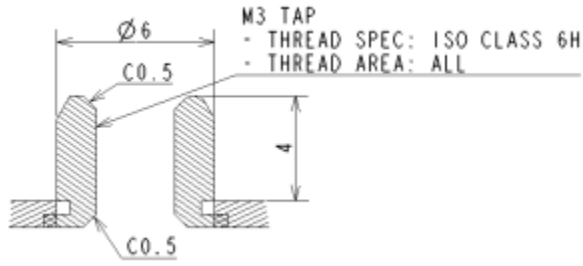
$ B-C $	① Max 2
$ D-E $	② Max 2



$ F-G $	③ Max 2
---------	---------

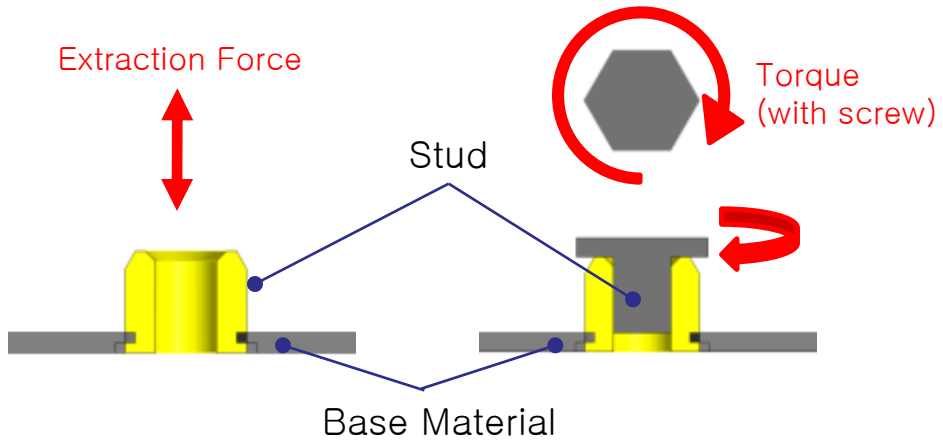
8.3 Stud

- Stud dimension
- M3 stud

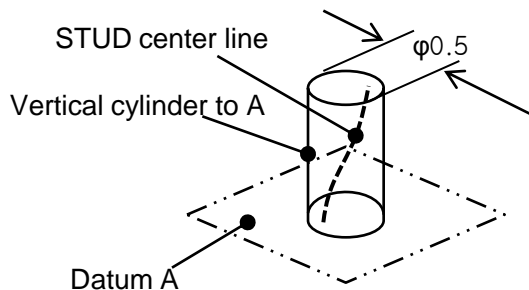
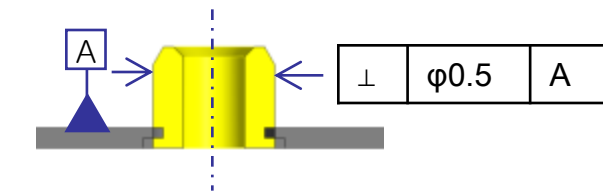


- Stud durability

Stud Type	Base Material	Extraction Force kN(kgf)	Torque N · m(kgf · cm)
		Min	Min
M3	Al	0.25(25)	2.1(21)
M4		0.42(43)	2.9(30)
M5	SECC	0.42(43)	5.9(60)
M6		0.84(86)	5.9(60)



- Stud squareness tolerance

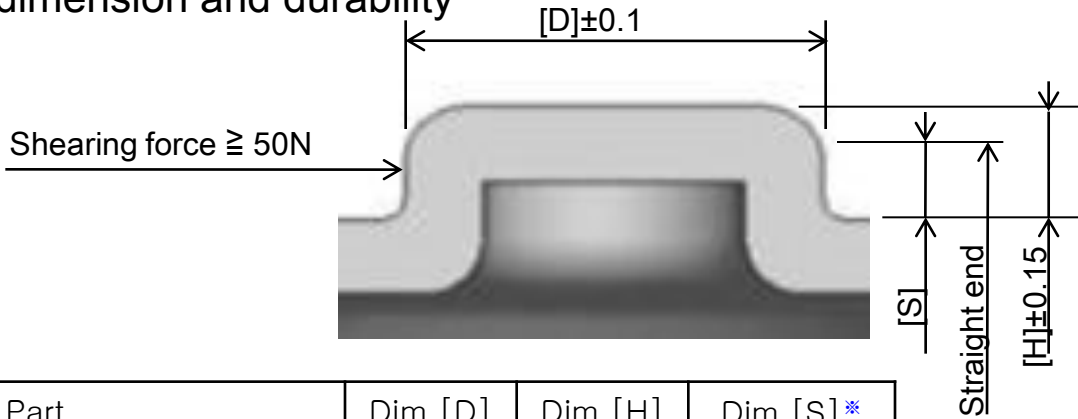


*) STUD center line should be in the vertical cylinder of $\phi 0.5$ to A.

Squareness definition

8.4 Dowel and Tap

•Dowel dimension and durability



[mm]

Type	Part	Dim [D]	Dim [H]	Dim [S]*
B1	BACK CHASSIS	4.2	1.5	0.5
B2	BACK CHASSIS	3.7	1.5	0.5
B3	BACK CHASSIS	6.0	3.0	1.0
S1	SOURCE SHIELD (R)	4.2	0.7	0.3
S2	SOURCE SHIELD (L)	4.2	0.9	0.3

•Tap dimension ^{*}[S] is guaranteed by JIG inspection presented by MIF, not by value.

- Thread compliant to ISO class 6H

•Tap durability

- The screw torque must satisfy the following.

M3 : 0.7N· m X 10 times

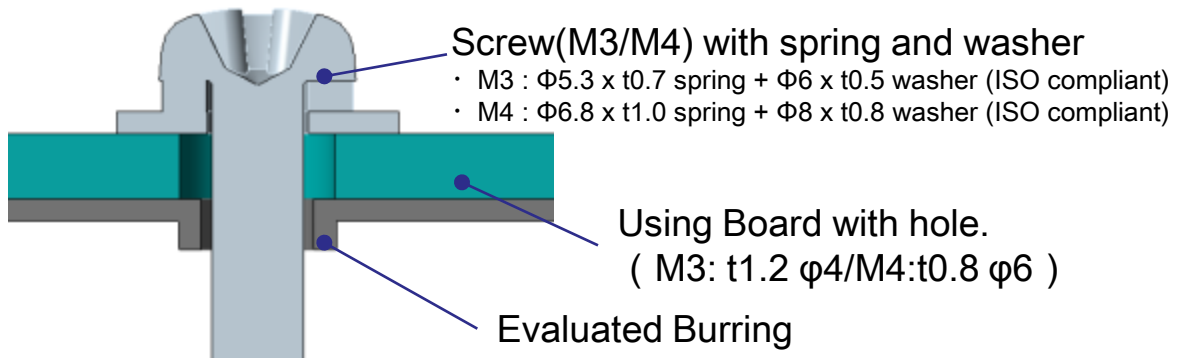
M4 : 1.0N· m X 10 times

※Standard driver : Nitto Kohki / Delvo DLV8231-EJN

- Evaluate all of burring tap using following board.

M3 Burring : Board thickness t1.2 / Hole size φ4

M4 Burring : Board thickness t0.8 / Hole size φ6



9. EMI Specification

: -3dB at CISPR22 Class B

This EMI Recommendation is recommended to be measured as SET Condition.

10. UL Approval

11. Reliability Test

Item	Test condition	Quantity
Temperature Step Stress	0 ~ 50℃, 439Cycle determination	4EA
HTOL	50℃, 1000hr (500hr determination)	8EA
LTOL	0℃, 1000hr (500hr determination)	4EA
RTOL	20℃, continue ~	4EA
HTS	70℃, 1000hr (500hr determination)	4EA
LTS	-30℃, 1000hr (500hr determination)	4EA
THB	40℃ / 95%RH, 1000hr (500hr determination)	4EA
WHTS	60℃ / 75%RH, 1000hr (500hr determination)	4EA
T/C	-20℃ ~ 60℃, 200cycle (100cycle determination)	4EA
ESD (non-operation)	± 10 kV, 200pF/100Ω, 9Point, 3times/Point	3EA
ESD(operation)	contact : ± 8 kV, 150pF/330Ω, 210Point, 1 time/Point non-contact : ± 15 kV, 150pF/330Ω, 100Point, 1 time/Point	3EA
Input Con. ESD	contact : ± 2kV, 200pF/100, Input Con.Pin, 3 times/Pin	3EA
POWER ON/OFF	30sec (on) / 30sec(off) : 12,000 times	4EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	Condition : 11msec, ± XY Z 1time/axis 50G	3EA
PALLET Vibration	1.05 Grms, 2~200Hz, Random, Z axis 1Hr	26EA (1BOX)
PALLET Drop	20cm, Bottom, Front, Rear 1times	26EA (1BOX)

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

HTOL/ LTOL : High/Low Temperature Operating Life,
 THB : Temperature Humidity Bias
 HTS/LTS : High/Low Temperature Storage
 WHTS : Wet High Temperature Storage

[Moving Distance Assurance]

This test is assumed that ground moving distance is 1000km.

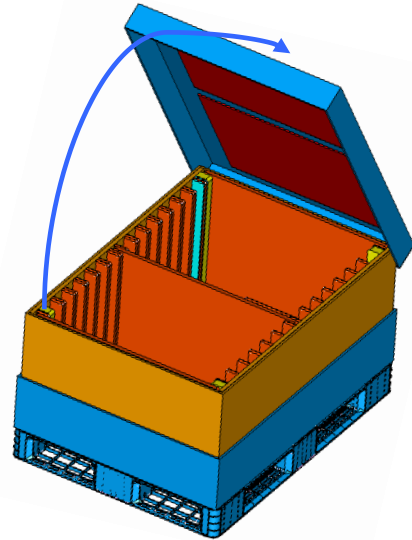
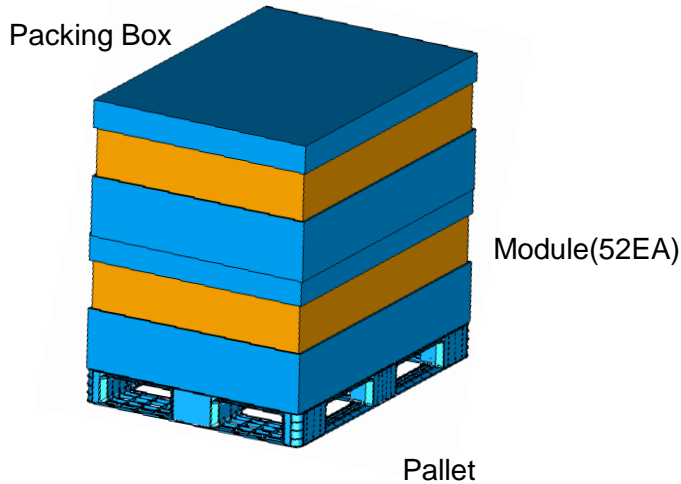
12. PACKING

12.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



→ Direction be able to Open

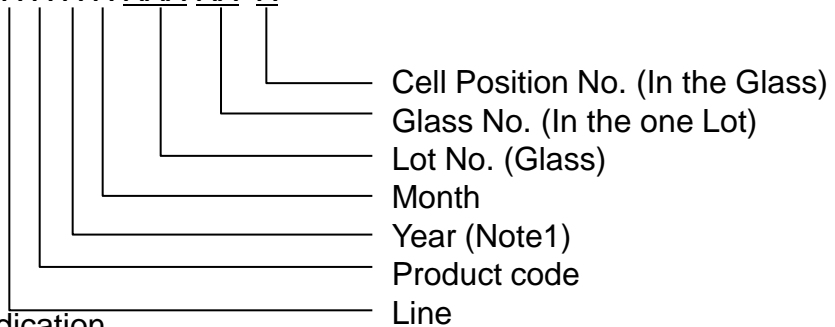
12.2 Packing Specification

Item	Specification	Remark
LCD Packing	26ea / (Packing Box)	1. 260kg/LCD(52ea) 2. 30kg/Packing Box(2set) 3. Packing Box Material : Paper
Desiccant (Drier)	4ea / LCD	10g/ea, Cobalt-dichloride-free
Pallet	2Box / Pallet	Pallet weight : 5.3kg
Packing Direction	Vertical	-
Total Pallet Size	L x W x Height	1150mm x 850mm x 1085mm
Total Pallet Weight	297kg	Pallet(5.3kg) + Module(52 x 5kg = 260kg) + Packing BOX(15 x 2 = 30kg) + Desiccant(0.03kg x 52 = 1.56kg)
Stack Layer	3 layer in warehouse. 2 layer in container.	
Shielding Bag	Compound PE / Sealing / 70 μ m	Material / Adhesive tape / Thickness
POL Protection Film	PET / 0.125mm	Material / Thickness

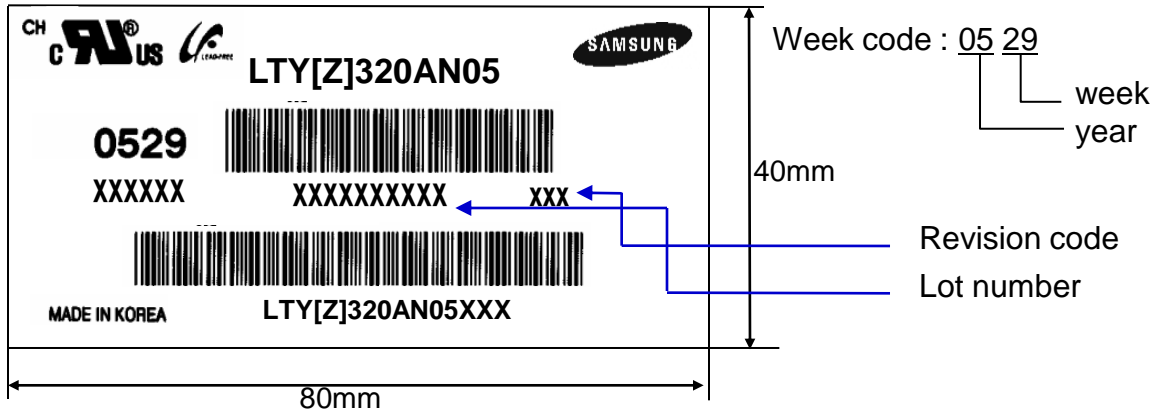
13. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

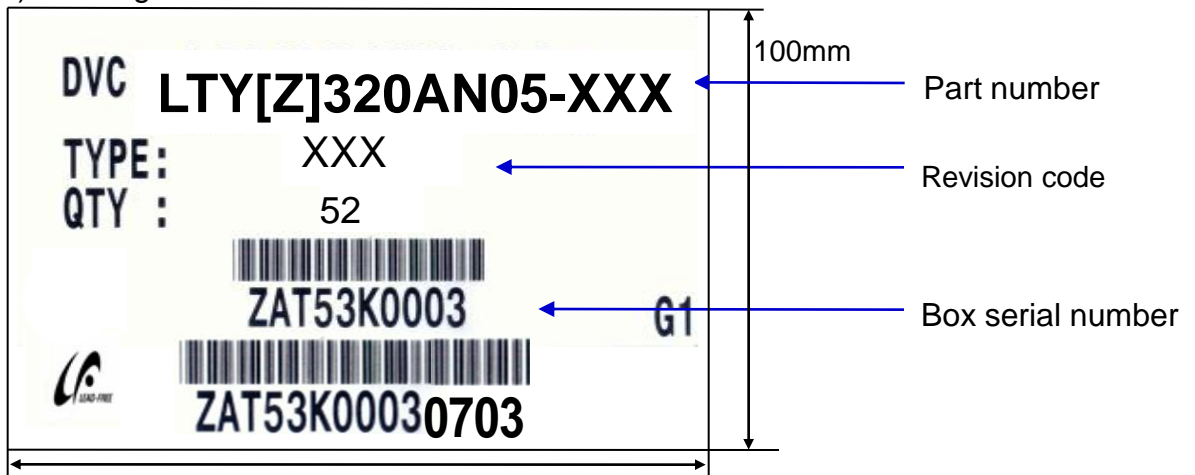
- (1) Parts number : LTY[Z]320AN05-XXX
- (2) Revision: One letters
- (3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



(6) Others

- 1. After service part
 Lamps cannot be replaced because of the narrow bezel structure.

14. General Precautions

14.1 Handling

- (a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.
- (b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.
- (c) Refrain from strong mechanical shock and / or any force to the Module.
In addition to damage, this may cause improper operation or damage to the Module and back light.
- (d) Note that polarizers are very fragile and could be damage easily.
Do not press or scratch the surface harder than a HB pencil lead.
- (e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.
- (f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.
- (g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.
- (i) Protect the Module from static, or the CMOS Gate Array IC would be damaged.
- (j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (k) Do not disassemble the Module.
- (l) Do not pull or fold the LED FFC.
- (m) Do not adjust the variable resistor located on the Module.
- (n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (o) Pins of I/F connector should not be touched directly with bare hands.

14.2 Storage

- (a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 5 to 40 °C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD Module in direct sunlight.
- (c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.
- (d) Storage period is recommended not to exceed 1 year.

14.3 Operation

- (a) No Connection or disconnect the Module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the "Power on/off sequence"
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back light connector and its Converter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of LED and may require higher startup voltage(Vs).

14.4 Operation Condition Guide

- (a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
 - Temperature : 20 ± 15 °C
 - Humidity : 55 ± 20 %
 - Display pattern : continually changing pattern (Not stationary)
- (b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc., It is strongly recommended to contact SDC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

14.5 Others

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.
- (d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.
- (e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.
- (f) Please contact SDC in advance when you display the same pattern for a long time.