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Chunghwa Picture Tubes, Ltd.
Technology Specification

To : Smarterglass
Date : 160629

TFT LCD

CLAA123FBA1 XN

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
V0.1	First revision (Tentative)	-	2014/06/09
V0.2	Revised(MECHANICAL DIMENSION)		2014/08/07
V0.3	Revised(Module Size &Reliability test)		2015/02/02
V0.4	Revised(MECHANICAL DIMENSION)		2015/04/13

CONTENTS

1. OVERVIEW

CLAA123FBA1XN is 12.3” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1920X720 images are displayed on the 12.3” diagonal screen. Display 16.7M colors by R.G.B signal input.

General specification are summarized in the following table:

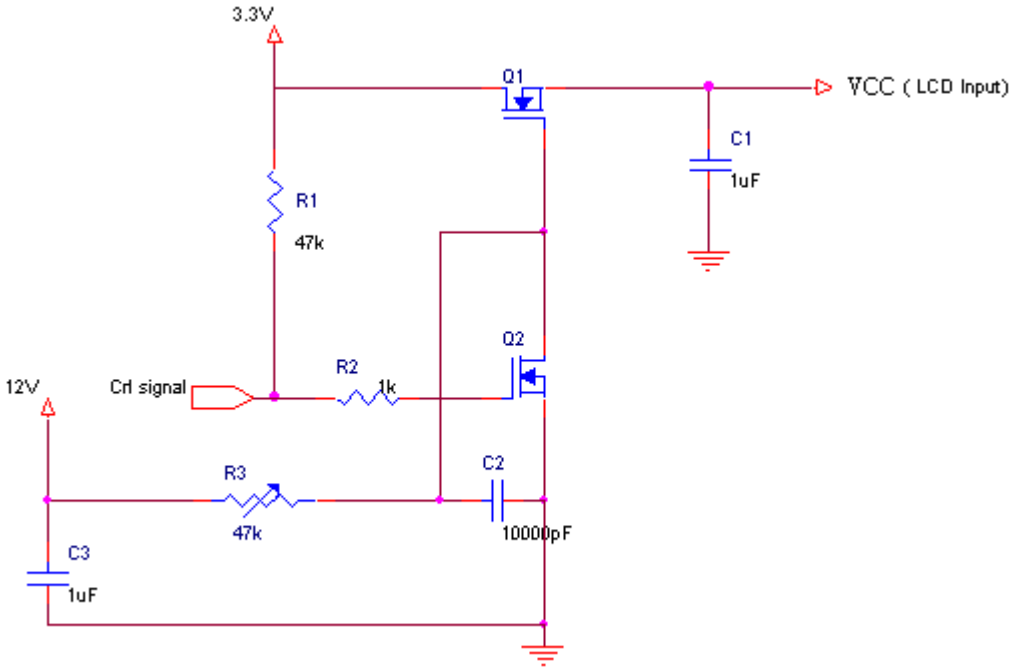
ITEM	SPECIFICATION			
Display Area (mm)	292.032 (H) x 109.512 (V)			
Number of Pixels	1920(H) × 3 (RGB) × 720(V)			
Pixel Pitch (mm)	0.1521(H) x 0.1521(V)			
Color Pixel Arrangement	RGB vertical stripe			
Display Mode	Normally Black			
Number of Colors	16.7M			
Brightness (cd/m^2)	700nit(typ)			
Response Time (ms)	25ms(Typ.)			
Contrast Ratio	1000:1(Typ.)/ 800:1(min)			
Viewing Angle (CR≧10)	170degree (Horizontal.)			
	170degree (Vertical)			
Power Consumption (W)	LCD:2W (TYP) LED：5.76W(TYP)			
Interface connection	LVDS			
Module Size (mm)		Min.	Typ.	Max.
	Horizontal(H)	313.5	313.8	314.1
	Vertical(V)	131.9	132.2	132.5
	Depth(D)	13.0	13.3	13.6
Module Weight (g)	540 (typ)			
Backlight Unit	LED			
Surface Treatment	Anti-Glare			

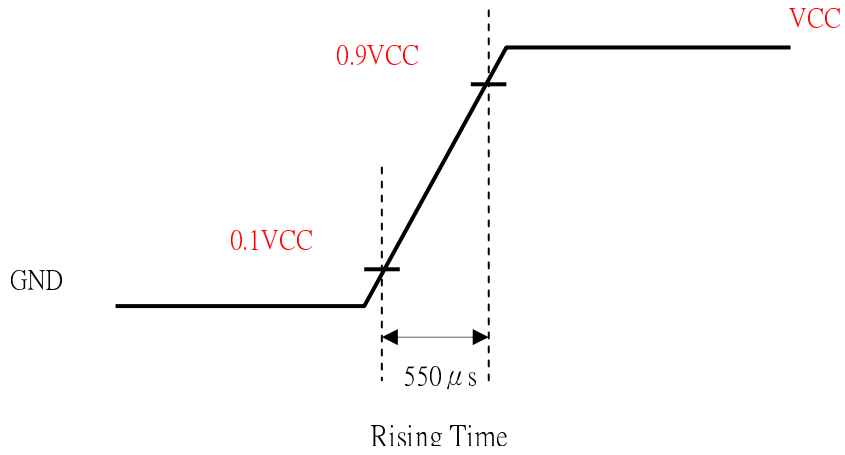
2. ABSOLUTE MAXIMUM RATINGS

The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
LCD Supply Voltage	VCC	-0.3	3.9	V	
Signal Input Voltage	RxIN0+ ~ RxIN3+ RxIN0- ~ RxIN3- Rx CLK IN +/-	-0.3	Vcc	V	
ICC Rush current	IRUSH	-	2	A	Note 1

Note 1:The input pulse-current measurement system is as below:
Control signal: High (+3.3V)→Low (GND)
Supply Voltage of rising time should be from R3 and C2 tune to 550 μs.





Rising Time

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

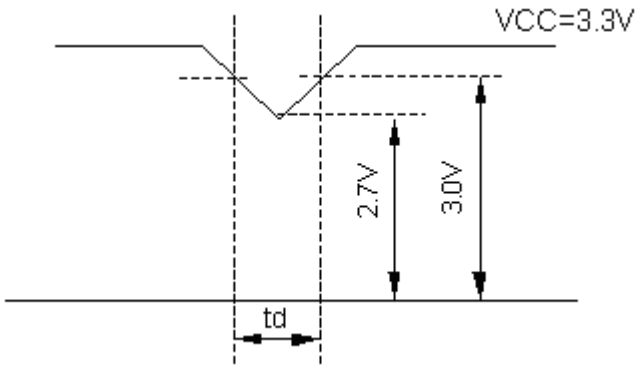
Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Supply Voltage	VCC	3.0	3.3	3.6	V	*1)
Logic Input Voltage (LVDS:IN+,IN-)	VCM	0.7	-	1.6	V	*2)
	| VID |	100	-	600	mV	*2)
	VTH	-	-	100	mV	*2)
	VTL	-100	-	-	mV	*2)

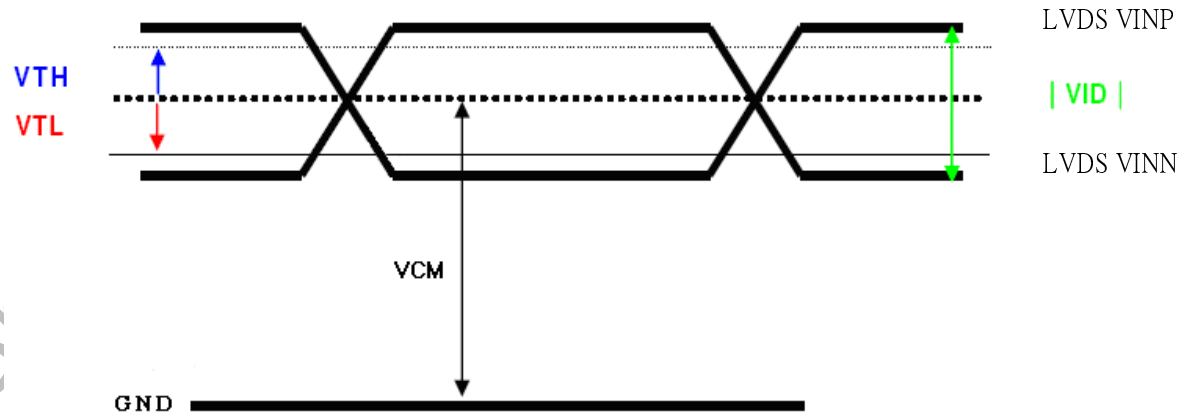
*1) VCC-dip state

(1)when 3.0V＞VCC≧2.7V，td≦10 ms.

(2)when VCC＜2.7V，VCC-dip condition should as the VCC-turn-off condition.



*2)LVDS signal



3.2 TFT-LCD Current Consumption

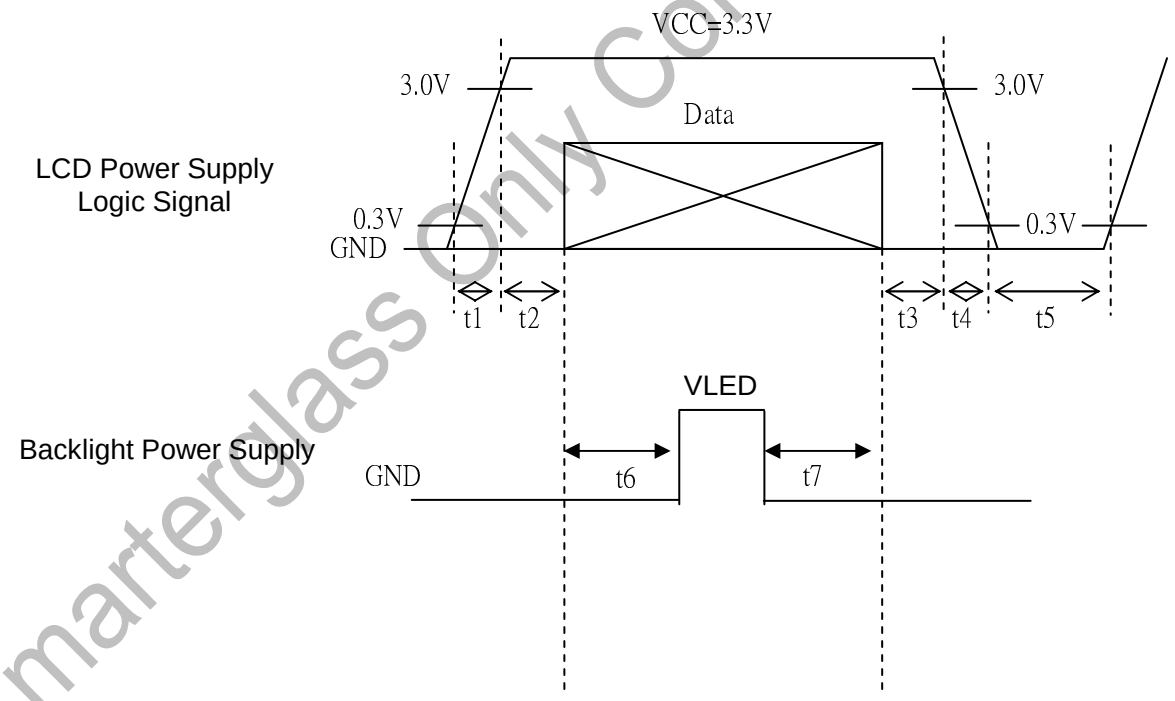
ITEM	SYMBOL	MIN	TYPE	MAX	UNIT	NOTE
LCD Supply current	ICC	--	600	1000	mA	*1)

Remarks:
*1)Typical: Under 256 gray pattern
Maximum: Under White pattern

256 gray pattern

White Pattern

3.3 Power and Signal sequence



Logical signal：RGB data, DCLK, DENA
Power ：VCC,VLED

0.5<t1≦10ms
0＜t2≦50ms
0＜t3≦50ms
0＜t4≦10ms
200ms≤t5
200ms≦t6
200ms≦t7

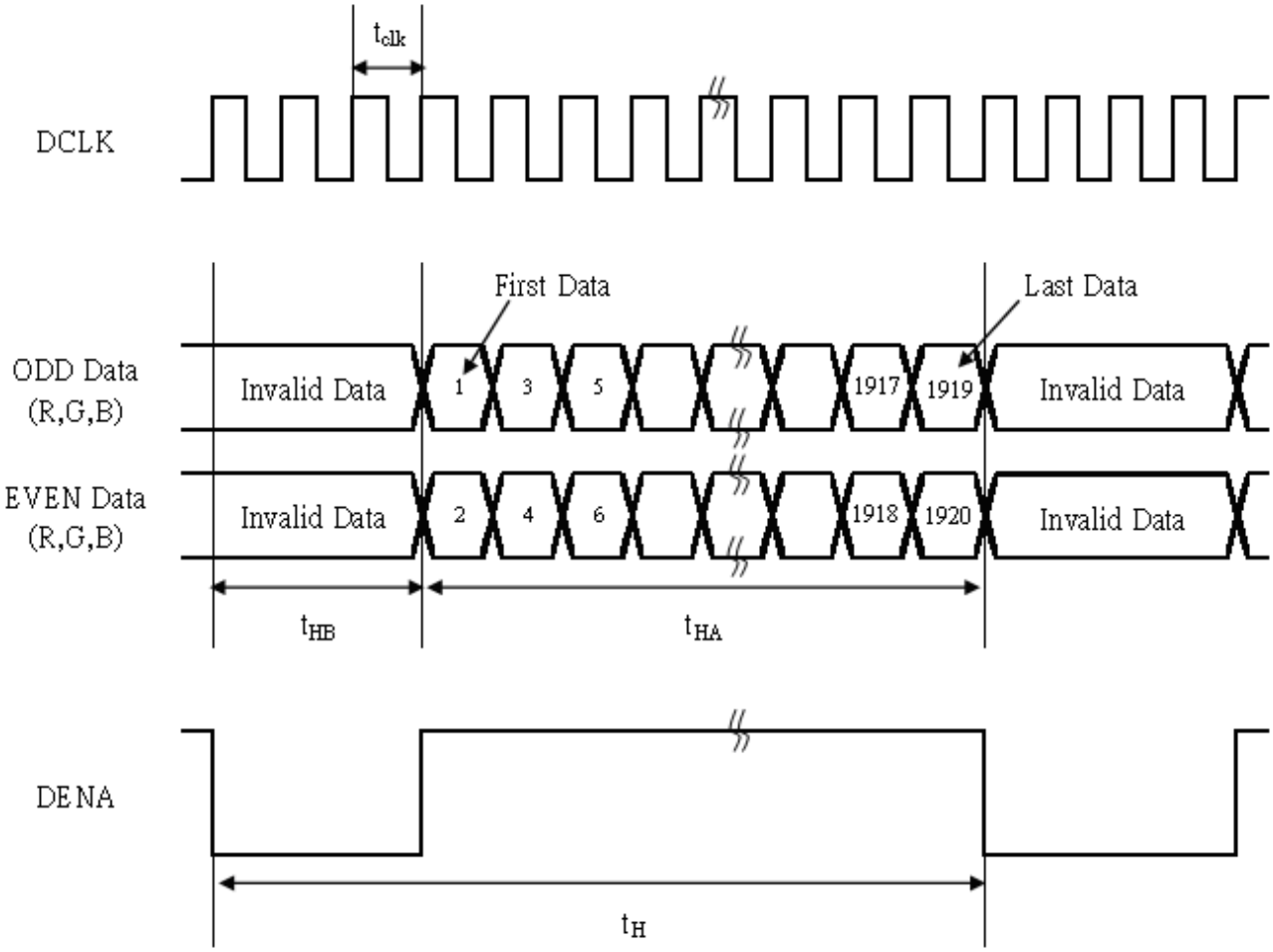
3.4. Input SIGNAL(DE only mode)

Timing Specification

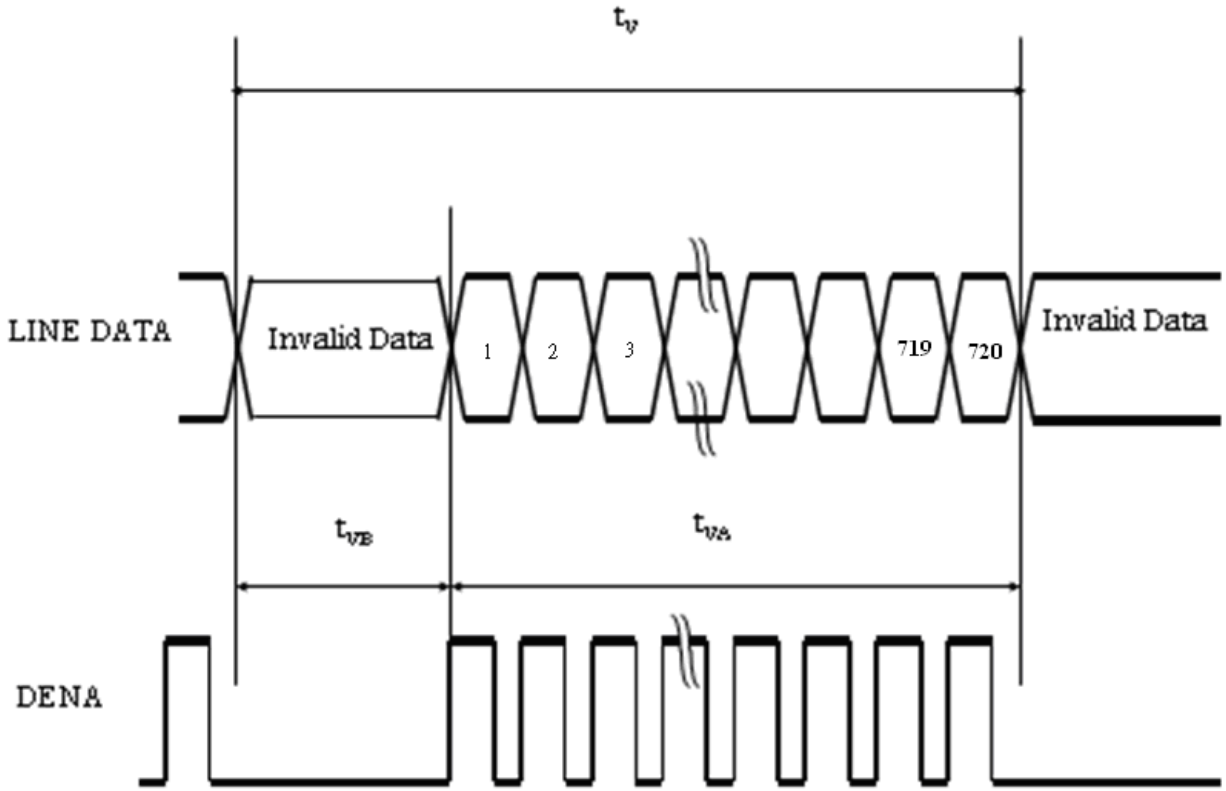
Item				Symbol	Min	Typ	Max	Unit
LVDS input signal sequence	CLK Frequency			fCLKin	40	52.3	66.12	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	1070	1150	1230	tCLK
			Horizontal effective Time	t_{HA}	960			tCLK
			Horizontal Blank Time	t_{HB}	110	190	270	tCLK
			Vertical total Time	t_V	748	758	768	t_H
			Vertical effectiveTime	t_{VA}	720			t_H
			Vertical Blank Time	t_{VB}	28	38	48	t_H

Timing sequence(Timing chart)

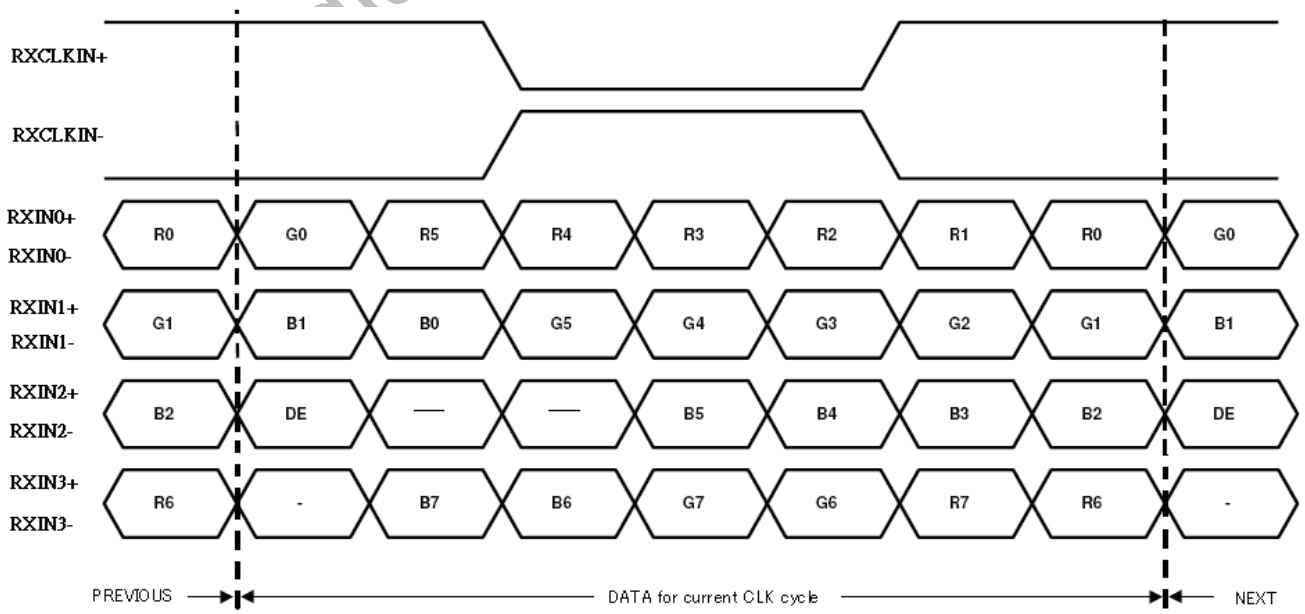
3.4.1 Horizontal Timing Sequence



3.4.2Vertical Timing Sequence



3.4.3 LVDS Input Data mapping



Color Data Reference

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
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
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	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	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
RED	RED(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
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(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
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(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(1)	0	0	0	0	0	0	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	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

【Note】

1) Gray level:
Color(n)：n is level order; higher n means brighter level.

2) DATA:
1: high，0: low

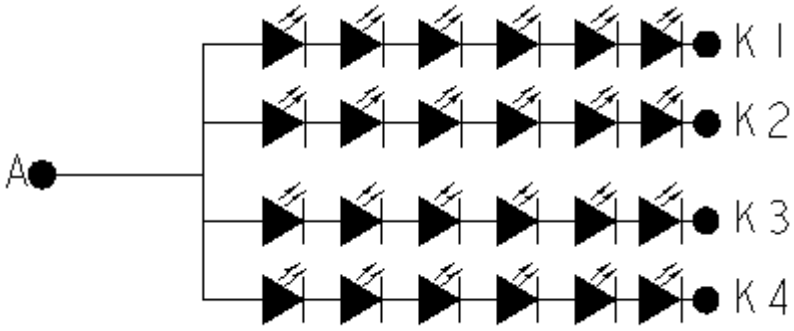
3.5 Backlight

Ta=25℃

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED current	IL	Ta=25℃ (80mA/serise)	--	320	--	mA	
LED voltage	VL	Ta=25℃ (80mA/serise)	15.9	18	20.7	V	
Power consumption	WL	Ta=25℃ (80mA/serise)	--	5.76	--	W	
LED Lifetime	-	Ta=60℃ IF=80mA		30000		Hr	

Remarks：

***1)LED Circuit Diagram**



*2) A：Anode(＋)，K：Cathode(－)

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) Definition of Led lifetime：Luminance < Initial luminance 70%..

4. INTERFACE CONNECTION

CN1：IPEX (20455-040E-12)

Pin NO.	SYMBOL	DESCRIPTION
1	GND	Power ground
2	NC	No connect
3	VCC	Digital power
4	VCC	Digital power
5	GND	Power ground
6	GND	Power ground
7	NC	No connect
8	NC	No connect
9	GND	Power ground
10	ORXIN0-	Odd pixel negative LVDS differential data inputs
11	ORXIN0+	Odd pixel positive LVDS differential data inputs
12	ORXIN1-	Odd pixel negative LVDS differential data inputs
13	ORXIN1+	Odd pixel positive LVDS differential data inputs
14	ORXIN2-	Odd pixel negative LVDS differential data inputs
15	ORXIN2+	Odd pixel positive LVDS differential data inputs
16	ORXCLKIN-	Odd pixel negative LVDS differential clock inputs
17	ORXCLKIN+	Odd pixel positive LVDS differential clock inputs
18	ORXIN3-	Odd pixel negative LVDS differential data inputs
19	ORXIN3+	Odd pixel positive LVDS differential data inputs
20	ERXIN0-	Even pixel negative LVDS differential data inputs
21	ERXIN0+	Even pixel positive LVDS differential data inputs
22	ERXIN1-	Even pixel negative LVDS differential data inputs
23	ERXIN1+	Even pixel positive LVDS differential data inputs
24	ERXIN2-	Even pixel negative LVDS differential data inputs
25	ERXIN2+	Even pixel positive LVDS differential data inputs
26	ERXCLKIN-	Even pixel negative LVDS differential clock inputs
27	ERXCLKIN+	Even pixel positive LVDS differential clock inputs
28	ERXIN3-	Even pixel negative LVDS differential data inputs
29	ERXIN3+	Even pixel positive LVDS differential data inputs
30	GND	Power ground
31	NC	No connect
32	NC	No connect
33	NC	No connect
34	NC	No connect
35	NC	No connect
36	NC	No connect
37	NC	No connect
38	GND	Power ground
39	GND	Power ground
40	GND	Power ground

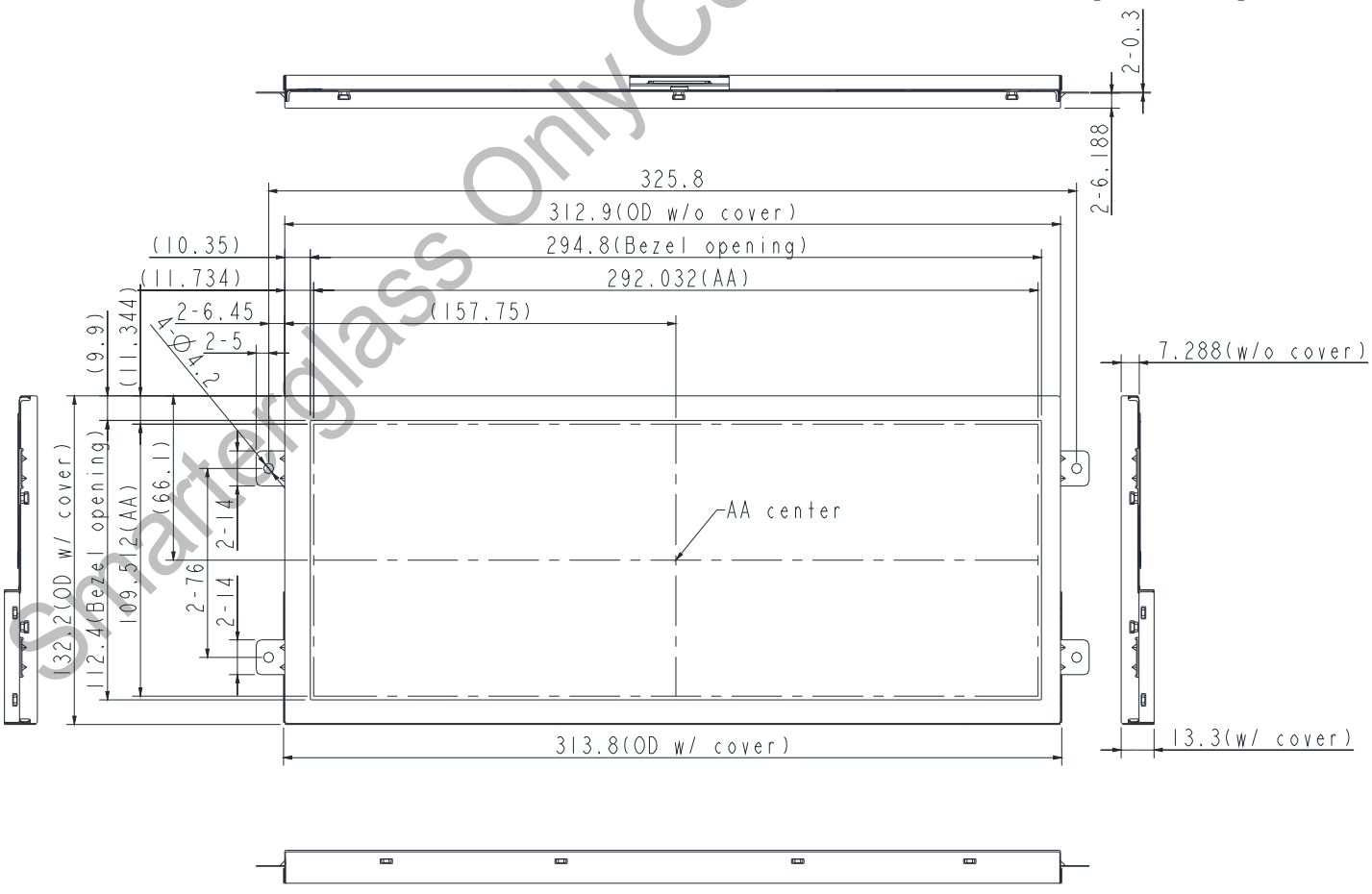
4.2 CN2 (Backlight)

Pin No.	Symbol	Function
1	A	Anode
2	A	Anode
3	A	Anode
4	K1	Cathode 1
5	K2	Cathode 2
6	K3	Cathode 3
7	K4	Cathode 4
8	NC	NC
9	NTC_A	NTC_Anode
10	NTC_K	NTC_Cathode

5. MECHANICAL DIMENSION

5.1 Front Side

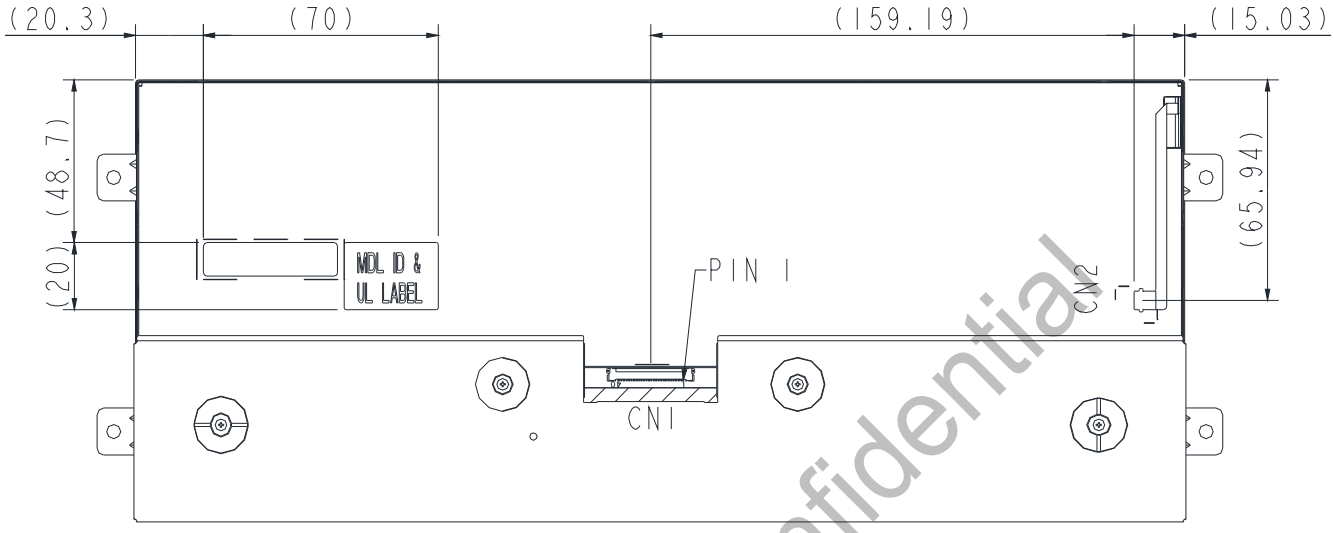
[Unit：mm]

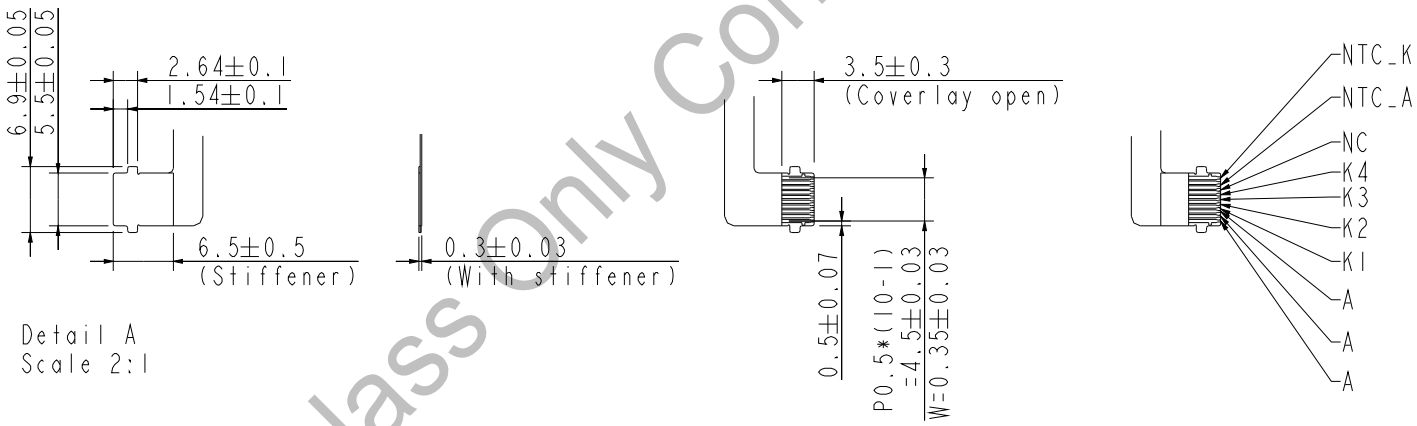


NOTE: General tolerance=±0.3mm

5.2 Rear Side

[Unit：mm]





Detail A
Scale 2:1

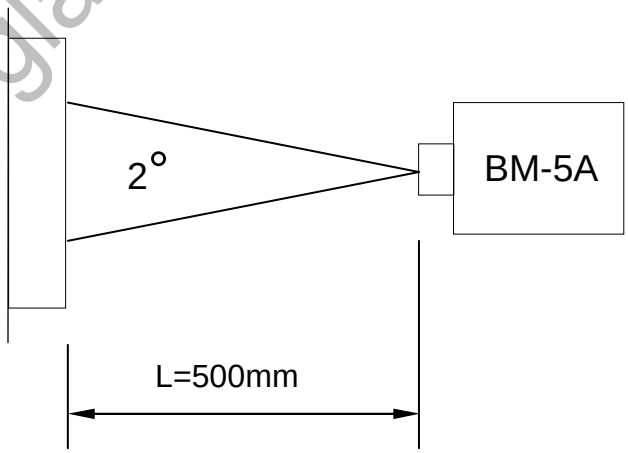
NOTE:
1.General tolerance=±0.3mm
2.CN1 connector(40pin):
IPEX:20455-040E-12(or other compatible connectors)
3.CN2 suggest connector(10pin):
JST:10FHY-RSM1-GAN-TF(LF)(SN)(or other compatible connectors)

6. OPTICAL CHARACTERISTICS

Ta = 25℃, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Constrast Ratio		CR	Point-5	800	1000		--	1, 2, 3
Luminance(CEN)		Lw	Point-5		700		cd/m^2	1, 3
Luminance Uniformity		ΔL		70	80		%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	35	ms	1, 3, 5
NTSC		-	Point-5	60	70	-	%	1, 4
Viewing Angle	Vertical	Upper(θ)	CR≧10 Point-5	75	85	--	°	1, 4
		Down(θ)		75	85			1, 4
	Horizontal	Left(ψ)		75	85			1, 4
		Right(ψ)		75	85	--	°	1, 4
Color Coordinate	White	Wx Wy	Point-5	0.250 0.260	0.290 0.300	0.330 0.340	--	1, 3
	Red	Rx Ry		0.603 0.304	0.643 0.344	0.683 0.384		
	Green	Gx Gy		0.265 0.599	0.305 0.639	0.345 0.679		
	Blue	Bx By		0.107 0.051	0.147 0.091	0.187 0.131		

Note1: Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，**IL=320mA（Backlight current）**，measurement after lighting on 10 mins.



Note2: Definition of contrast ratio：
Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

Note3: Definition of luminance：Measure white luminance on the point 5 as figure.6-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.6-1

$$\Delta L = [L(MIN)/L(MAX)] \times 100$$

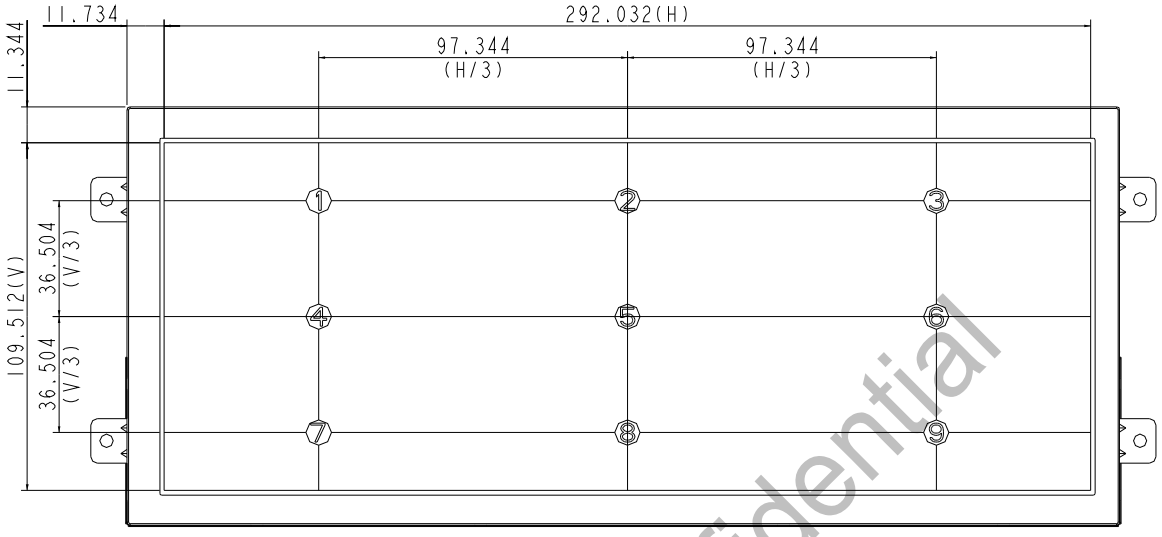


Fig.6-1 Measuring point

Note 4: Definition of Viewing Angle(θ,ψ),refer to Fig.6-2 as below :

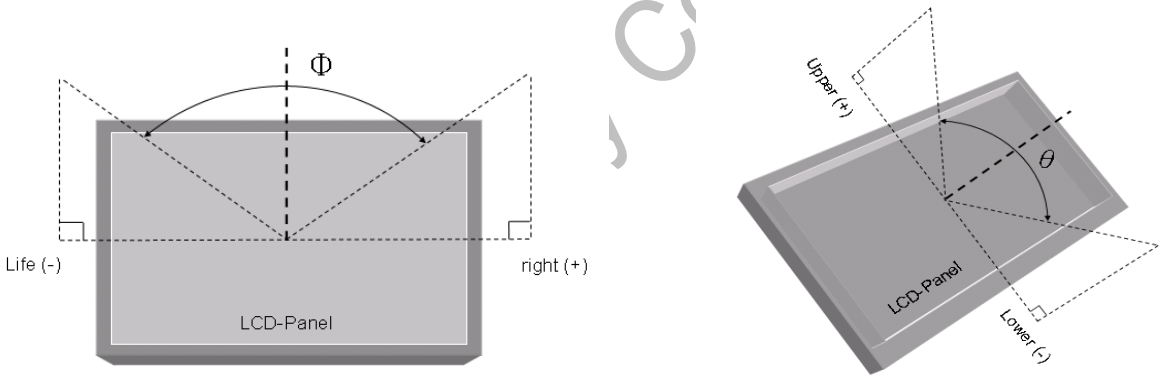


Fig.6-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

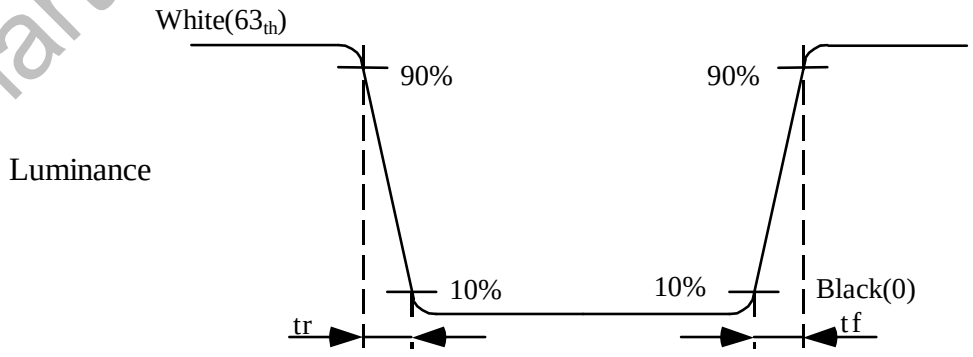


Fig.6-3 Definition of Response Time(White-Black)

7. RELIABILITY TEST

7.1. Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85℃ ;1000hrs	
High Temperature Storage	95℃ ; 1000hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ;1000hrs	No condensation
Low Temperature Operation	-30℃ ; 1000hrs	Backlight unit always turn on
Low Temperature Storage	-40℃ ; 1000hrs	
Thermal Shock	–40℃(0.5hr) ~ 85℃(0.5hr) ; 500 Cycles	
Image Sticking	25 ℃± 2 ℃ ; 2&4hrs	Note 1
MTBF	25 ℃ 87,600hrs	

Note 1.：

Condition of Image Sticking test：25 ℃± 2 ℃

Operation with test pattern sustained for 2 and 4 hrs, then change to gray pattern immediately.

After 5 mins, the mura must be disappeared completely .

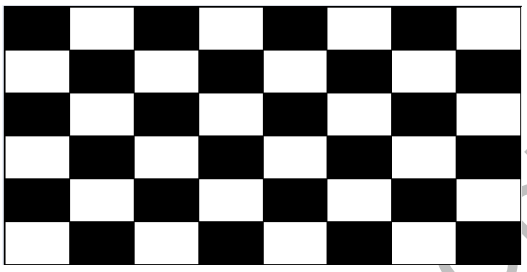


Image Sticking –pattern

128-Gray pattern

7.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level: 980m/s^2(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: X,Y,Z each axis 3 times
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stoke：1.3 mm ● Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2hrs ,y axis: 4hrs). ● Sweep: 2.9G,33.3 Hz -400 Hz ● Cycle time: 15 min

7.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF，330Ω，±8kV&±15kV air& contact test	1
	200pF，0Ω，±200V contact test	2

Note: Measure

1: LCD glass and metal bezel

2: IF connector pins

7.4. Judgment standard

The Judgment of the above test should be made as follow:

Pass:Normal display image with no obvious non-uniformity

Fail:No display image,obvious non-uniform

8. WARRANTY

8.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

8.2 The warranty will be avoided in case of defect induced by customer