Product Specification

( ) Product Information
( ) Preliminary Specification
(√) Approval Specification

Any modification of Spec is not allowed without SDC's permission.

CUSTOMER	R/A Customer
DATE OF ISSUE	2022/06/19

MODEL NO.	101-E10-B
EXTENSION CODE	-V(0)

Customer Approval & Feedback

Approved by	2022/06/19
Prepared by	2022/06/19

B3 EV101WXM-N80 Product Specification Rev.P1

BUYER	Mindray
SUPPLIER	HEFEI BOE Optoelectronics Technology CO., LTD
FG-Code	EV101WXM-N80-3850

ITEM	BUYER SIGNATURE	DATE
_____	_____	
_____	_____	
	_____	

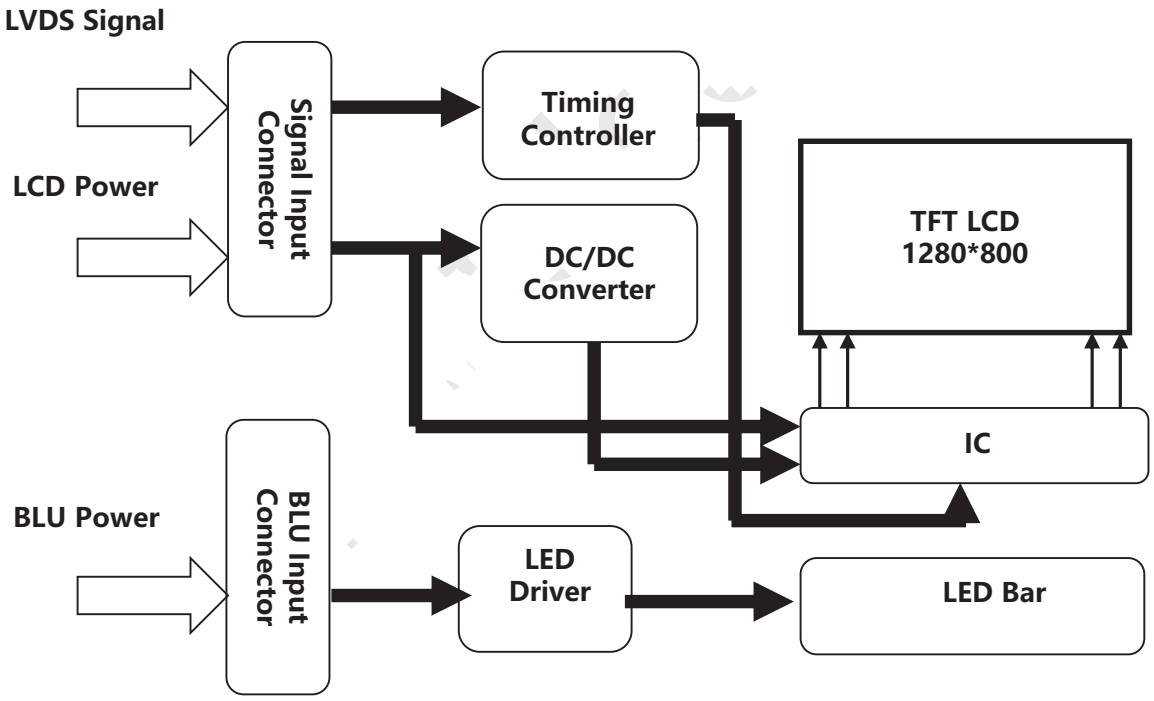
ITEM	SUPPLIER SIGNATURE	DATE
Prepared	_____	_____
Reviewed	_____	_____
Approved	_____	_____

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

1.0 GENERAL DESCRIPTION

1.1 Introduction

EV101WXM-N80 is a color active matrix TFT LCD module using amorphous silicon TFT 's (Thin Film Transistors) as an active switching devices. This module has a 10.1 inch diagonally measured active area with WXGA resolutions (1280 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.2M colors.



1.2 Features

- 1 Port LVDS Interface Input;
- 6+2bit color depth, display 16.2M colors
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS compliant

1.3 Application

- Medical Monitor

1.4 General Specification

The followings are general specifications at the EV101WXM-N80-3

<Table 1. LCD Module Specifications>

Parameter	Specification	Unit	Remarks
Active Area	216.96 (H) × 135.6(V)	mm	
Number Of Pixels	1280(H)×800(V)	pixels	
Pixel Pitch	56.5(H) × RGB × 169.5(V)	um	
Pixel Arrangement	Pixels RGB stripe arrangement		
Display Mode	Normally Black		
Display Colors	16.2M	colors	6+ FRC
Surface Treatment	Normal		
Contrast Ratio	900:1(Typ.); 700:1(Min.)		
Viewing Angle(CR>10)	85/85/85/85(Typ.); 80/80/80/80(Min.)	deg.	
Response Time	30(Typ.); 40(Max.)	ms	
Color Gamut	48%(Typ.); 43%(Min.)		
Brightness	1000 nit	cd/m2	
Brightness Uniformity	9 point: min 65% (Before RA) 9 point: min 60% (After RA)		
Power Consumption	9	Watt	
Outline Dimension	233.2(H)*152.9(V)*6.70(typ)(LCM)	mm	
Weight	505	gram	

2.0 ABSOLUTE MAXIMUM RATINGS

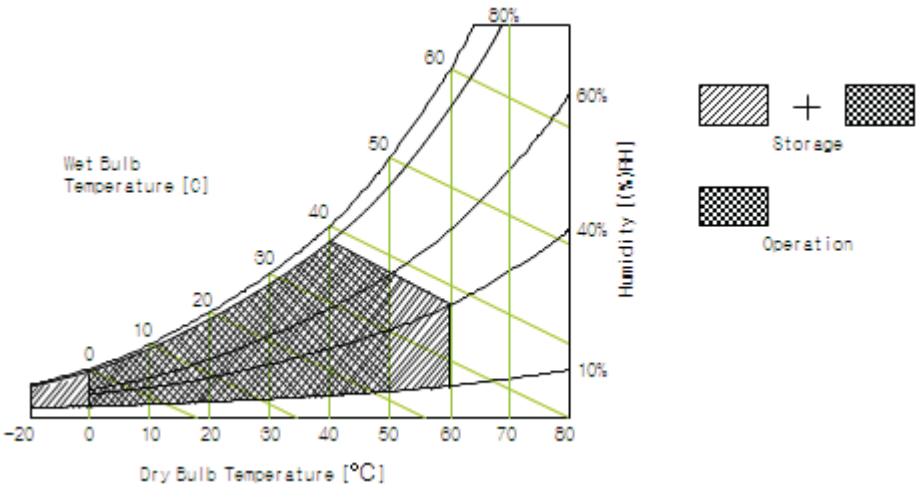
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

Parameter		Symbol	Min.	Max.	Unit	Remarks
Power Supply	LCD Module	VDD	VSS-0.3	4.0	V	Ta = 25 ℃
	BLU	VLED	VSS-0.3	13.2	V	
		PWM	VSS-0.3	6	V	
		BRTC	VSS-0.3	6	V	
Operating Temperature		T_{OP}	-20	+70	℃	Note 1
Storage Temperature		T_{ST}	-30	+80	℃	

Note :

1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40℃ and temperature refers to the Panel surface temperature ;
2. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 ℃ max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

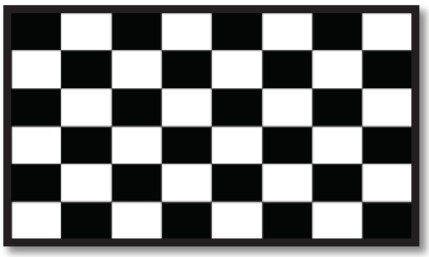
3.1 TFT LCD Module

< Table 3. LCD Module Electrical specifications > [Ta =25±2 °C]

Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	VCC	3.0	3.3	3.6	V	Signal
Power Supply Current	I_{VCC}	-	250	330	mA	Note 1
Power Consumption	P_{LCD}	-	0.80	1.10	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VBAT=3.8V, Frame rate f_V=60Hz and Clock frequency = 156.8MHz. Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)



b) Max : L255

3.2 Back-Light Unit

Table 4. LED Driver Electrical Specifications > [Ta =25±2 ℃]

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
BLU Supply Voltage		VDD	11.5	12	12.5	V	
BLU Forward Current		I_{VDD}	-	800		mA	
Power Consumption		P_{LED}	-	9.6		W	Note 1
BLU BRTC Level		BLU ON	3.0	3.3	3.6	V	
		BLU OFF	0		0.5	V	
PWMIN	Level	High Level	3.0	3.3	3.6	V	
		Low Level	0		0.5	V	
	Frequency	F_{PWM}	180	200	10K	Hz	
	Duty Ratio	D_{PWM}	5	-	100	%	
LED Life Time		TLED	30000	-	-	Hrs	Note 2

Notes:

1. PLED = VDD ×I (Without LED converter transfer efficiency)
2. The life time of LED, 30,000Hrs, is determined as the time at which luminance of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C.

3.3 INPUT TERMINAL PIN ASSIGNMENT

This LCD employs two interface connections, a 20 pin ZIF connector is used for the LCD module electronics interface and a 9 pin ZIF connector is used for the internal backlight system.

3.3.1 Pin assignment for LCD module

Connector : DF19G-20P-1H (56) or equivalent

< Table 5. Pin Assignment for LCD Module Connector >

Pin No.	Symbol	Description	Remark
1	VCC	Power supply	
2	VCC	Power supply	
3	N.C.	Not connect	
4	GND	Ground	
5	D0-	Pixel data	
6	D0+	Pixel data	
7	GND	Ground	
8	D1-	Pixel data	
9	D1+	Pixel data	
10	GND	Ground	
11	D2-	Pixel data	
12	D2+	Pixel data	
13	GND	Ground	
14	CLK-	CLK data	
15	CLK+	CLK data	
16	GND	Ground	
17	SDA	Not connect	NC
18	SCL	Not connect	NC
19	D3-	Pixel data	
20	D3+	Pixel data	

3.4.2 Pin assignment for LED Bar

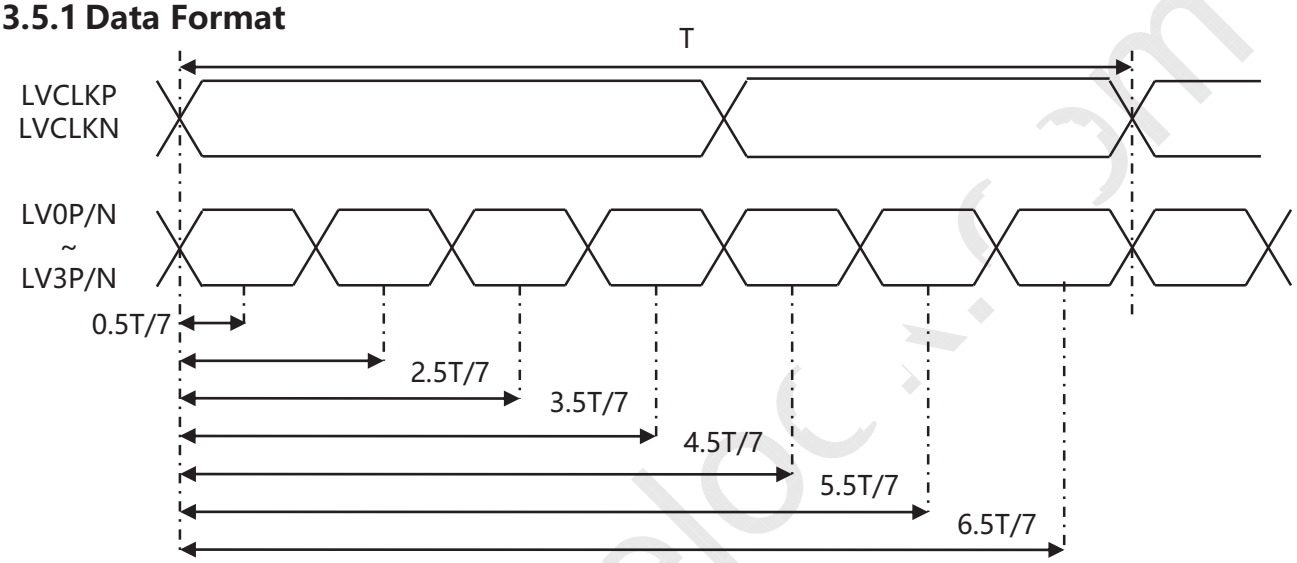
Connector : PF040-B09B-C09 (STM) or equivalent

< Table 6. Pin assignment for LED Bar >

Pin No	Symbol	Description	Remarks
1	PWM	Luminance control	
2	BRTC	Backlight ON/OFF control	High ： Backlight ON Low： Backlight OFF
3	GND	Ground	
4	GND	Ground	
5	VDD	Power supply	
6	VDD	Power supply	

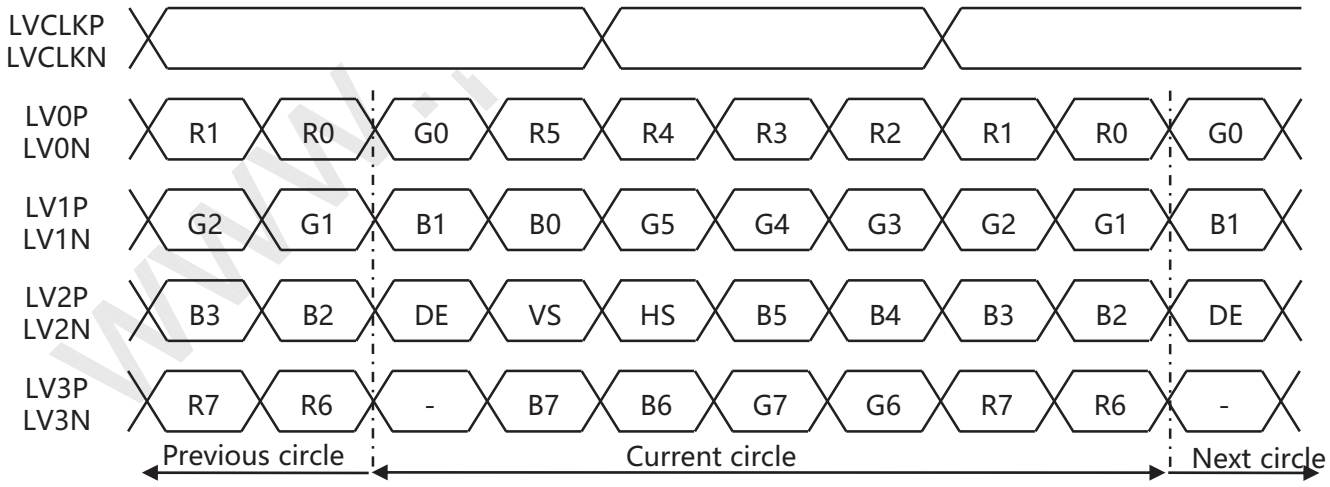
3.5 LVDS Interface Characteristic

3.5.1 Data Format



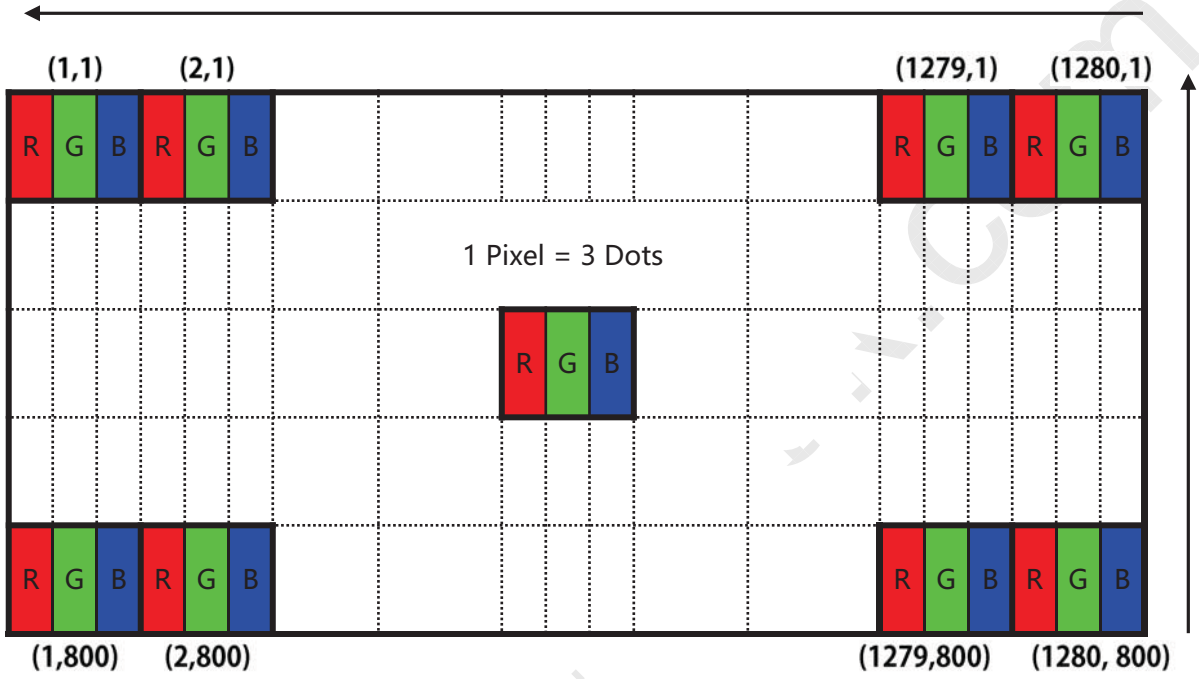
< LVDS input data ideal strobe position >

3.5.2 LVDS input data mapping



< 8 bit LVDS input data mapping >

3.5.3 Pixel Format

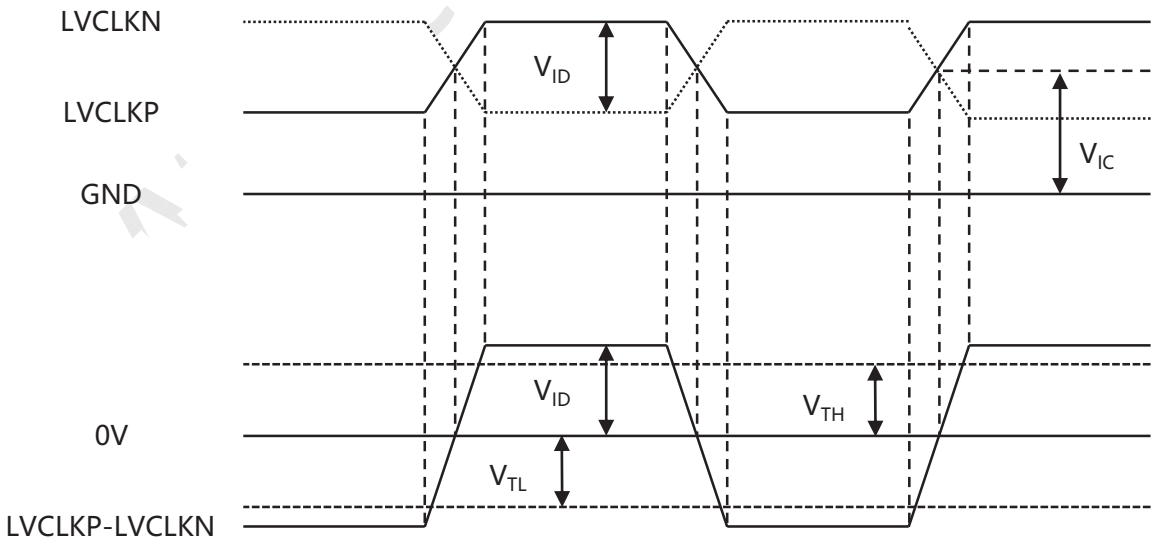


Display Position of Input Data (V-H)

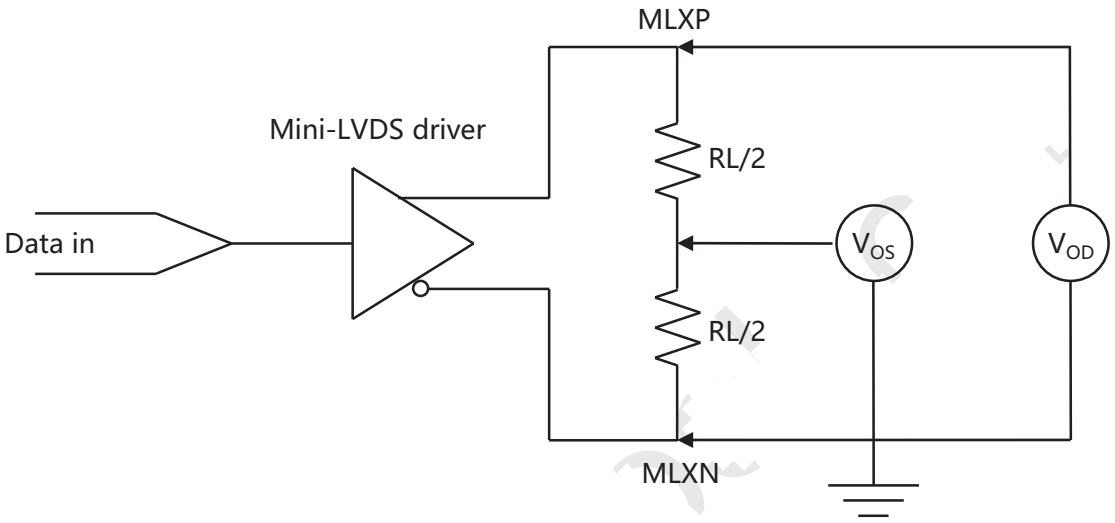
3.5.2 DC Specification

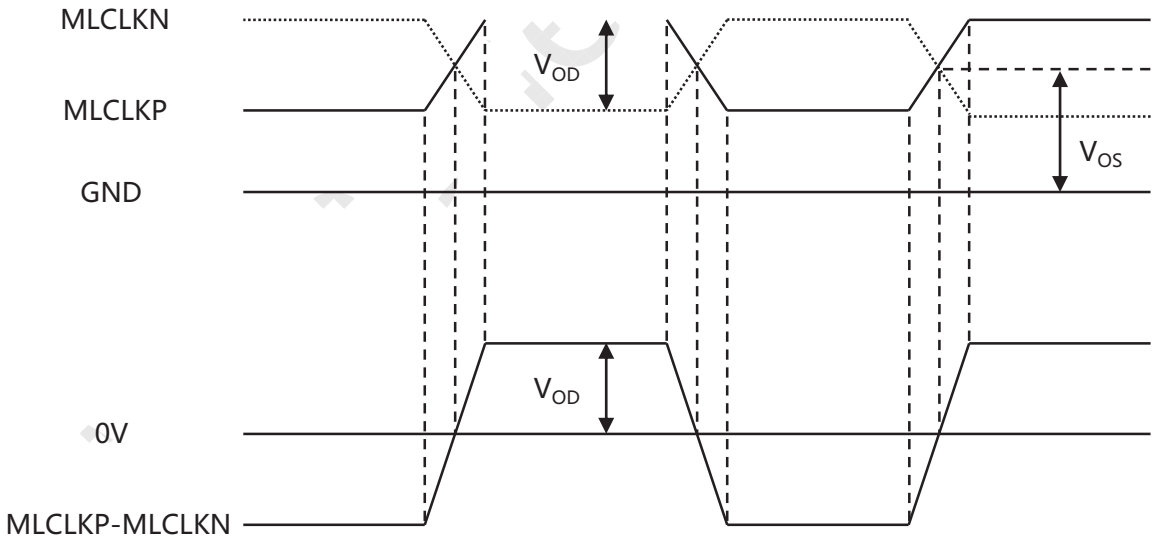
< Table 7. DC Specification >

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply current	I_{DD}	-	100	-	mA	
LVDS DC specifications						
Differential input high threshold	V_{TH}	-	-	+100	mV	V_{IC}=1.2V
Differential input low threshold	V_{TL}	-100	-	-	mV	
LVDS common mode voltage	V_{IC}	0.9	-	1.4	V	
LVDS swing voltage	V_{ID}	±100	-	±600	mV	
Mini-LVDS DC specifications						
Output differential voltage range	V_{OD}	±170	±200	±230	mV	PI=14KΩ RL=100Ω (T_A=25℃)
Output differential voltage deviation		0.64	-	0.96	mV	
Output offset voltage range	V_{OS}	1.1	1.2	1.3	V	
Output offset voltage deviation		1.1	1.2	1.3	V	



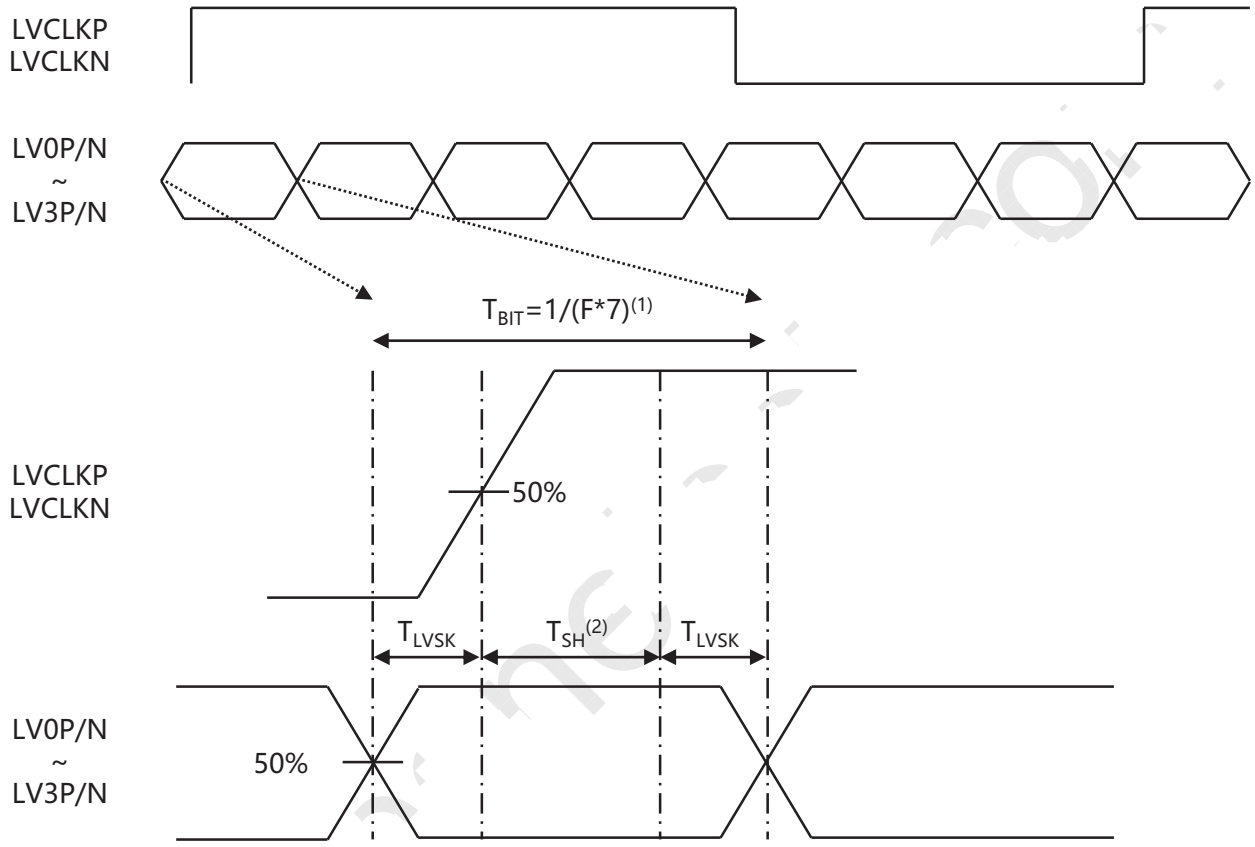
< LVDS V_{ID} and V_{IC} definition>





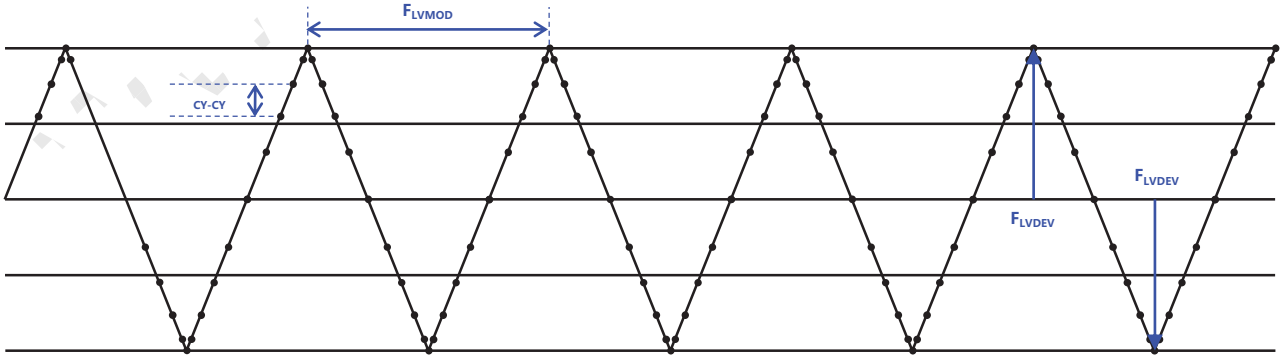
< Mini-LVDS V_{OD} and V_{OS} definition>

3.5.3 AC Specification



Note:
(1) T_{BIT}: Data period
(2) Internal CLK sampling data window

< LVDS channel to channel skew>



< LVDS input SSC>

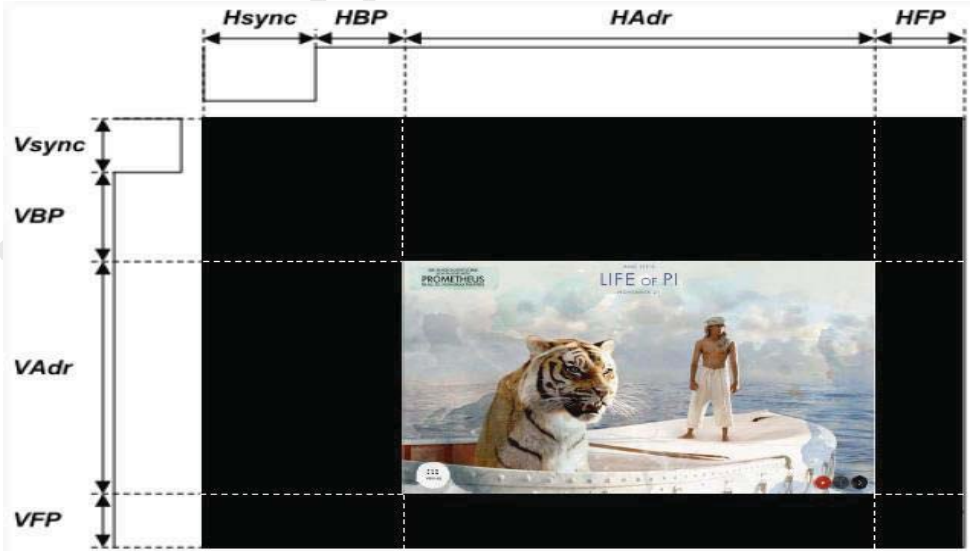
< Table 8. AC Specification >

Description	Symbol	Condition	Min.	Typ.	Max.	Unit
LVDS Input frequency	F	-	68	-	74	MHz
LVDS channel to channel skew	T_{LVSK}	F=65MHz V_{IC}=1.2V V_{ID}=±200mV	-600	-	+600	ps
Modulating frequency of input clock during SSC	F_{LVMOD}	F=85MHz V_{IC}=1.2V V_{ID}=±200m	10	-	300	KHz
Maximum deviation of input clock frequency during SSC	F_{LVDEV}		-3	-	+3	%
Cycle to cycle jitter	T_{CY-CY}		-	-	200	ps

3.6 Interface timing Parameter

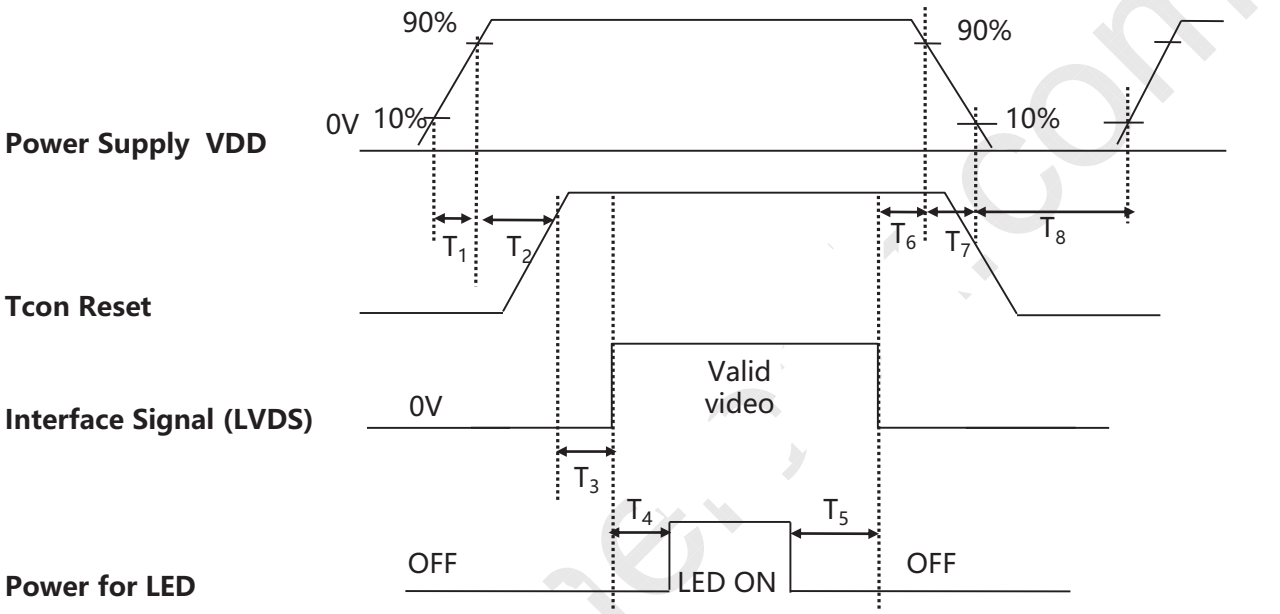
< Table 9. Timing Parameter >

Item			Symbol	Min.	Typ.	Max.	Uuit
LCD	Frame Rate		-	59	60	61	Hz
	Pixels Rate		-	69.922	71	72.293	MHz
Timing	Horizontal	Horizontal total time	tHP	-	1440	-	t_{CLK}
		Horizontal Active time	tHadr		1280		t_{CLK}
		Horizontal Back Porch	tHBP		80		t_{CLK}
		Horizontal Front Porch	tHFP		48		t_{CLK}
	Vertical	Vertical total time	tvp		823		t_H
		Vertical Active time	tVadr		800		t_H
		Vertical Back Porch	tVBP		14		t_H
		Vertical Front Porch	tVFP		3		t_H
Lane				-	1	-	Lane



3.8 Power Sequence

[Ta =25±2 ℃]



< Table 10. Sequence Table >

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.1	-	8	(ms)
T2	-	8	-	(ms)
T3	0	-	-	(ms)
T4	300	-	-	(ms)
T5	300	-	-	(ms)
T6	0	-	50	(ms)
T7	0	-	10	(ms)
T8	500	-	-	(ms)

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

4.2 Optical Specifications

<Table 11. Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ3	CR>10	80	85	-	Deg.	Note1
		Θ9		80	85	-	Deg.	
	Vertical	Θ12		80	85	-	Deg.	
		Θ6		80	85	-	Deg.	
Contrast ratio		CR	Θ = 0°	700	900	-		Note2
Transmittance		Tr		4.6	5.4	-	%	Note3
Luminance of White		Yw		900	1000		cd/m2	Note 4
White luminance uniformity		ΔY		65	75		%	Note 5
Color Gamut		CG		43	48	-	%	
Reproduction of color	Red	Rx	Θ = 0°	0.566	0.596	0.626		Note6 (Based on BLU)
		Ry		0.323	0.353	0.383		
	Green	Gx		0.305	0.335	0.365		
		Gy		0.529	0.559	0.589		

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
	Blue	Bx	0.123	0.153	0.183		
		By	0.086	0.116	0.146		
White Chromaticity	Wx	Θ = 0°	0.283	0.313	0.343		
	Wy		0.299	0.329	0.359		
Response Time (Rising + Falling)	$T_r + T_f$	Ta= 25° C Θ = 0				ms	Note 7

Note:

1.Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2.Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGUR 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3.Transmittance is the Value without APF and without CG.

4.Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

5:Luminance measurement

The test condition is at ILED=20mA and measured on the surface of LCD module at 25 ℃.

●The data are measured after LEDs are lighted on for more than 5 minutes and LCM di splays are fully white. The brightness is the average value of 9 measured spots. Measur ement equipment CS2000 or similar equipments(Field of view:1deg,Distance:50cm)

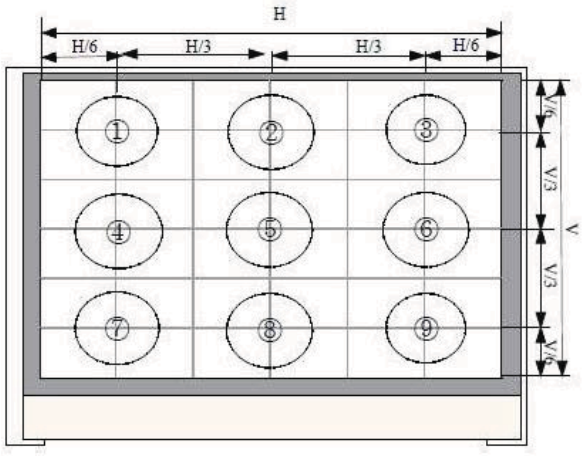
●Measuring surroundings: Dark room.

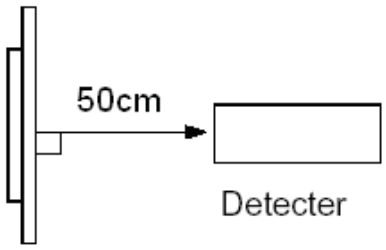
●Measuring temperature: Ta=25℃.

●Adjust operating voltage to get optimum contrast at the center of the display.

●Measured value at the center point of LCD panel must be after more than 5 minutes while backlight turning on.

ΔY = (Minimum Luminance of 9points / Maximum Luminance of 9points) * 100





6.The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

7.The electro-optical response time measurements shall be made as FIGURE 2 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

Figure1 Measurement Set Up

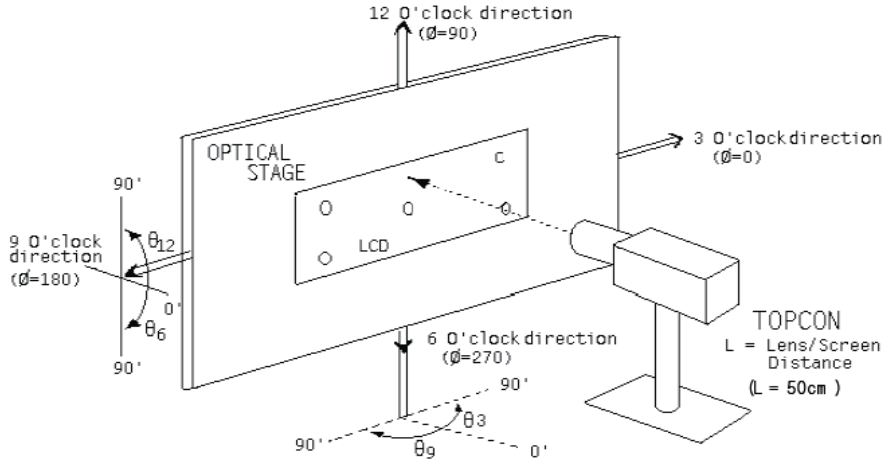
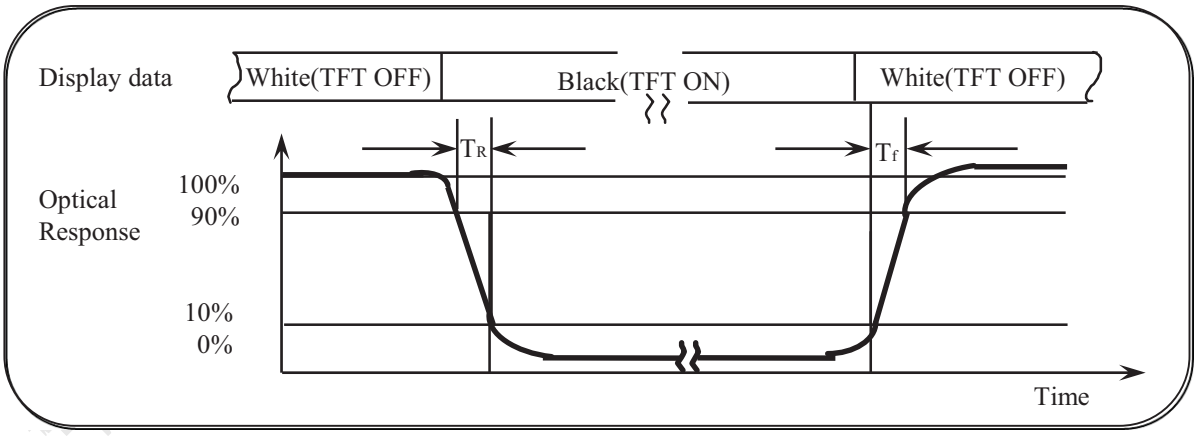


Figure2 Response Time Testing



5.0 RELIABLITY TEST

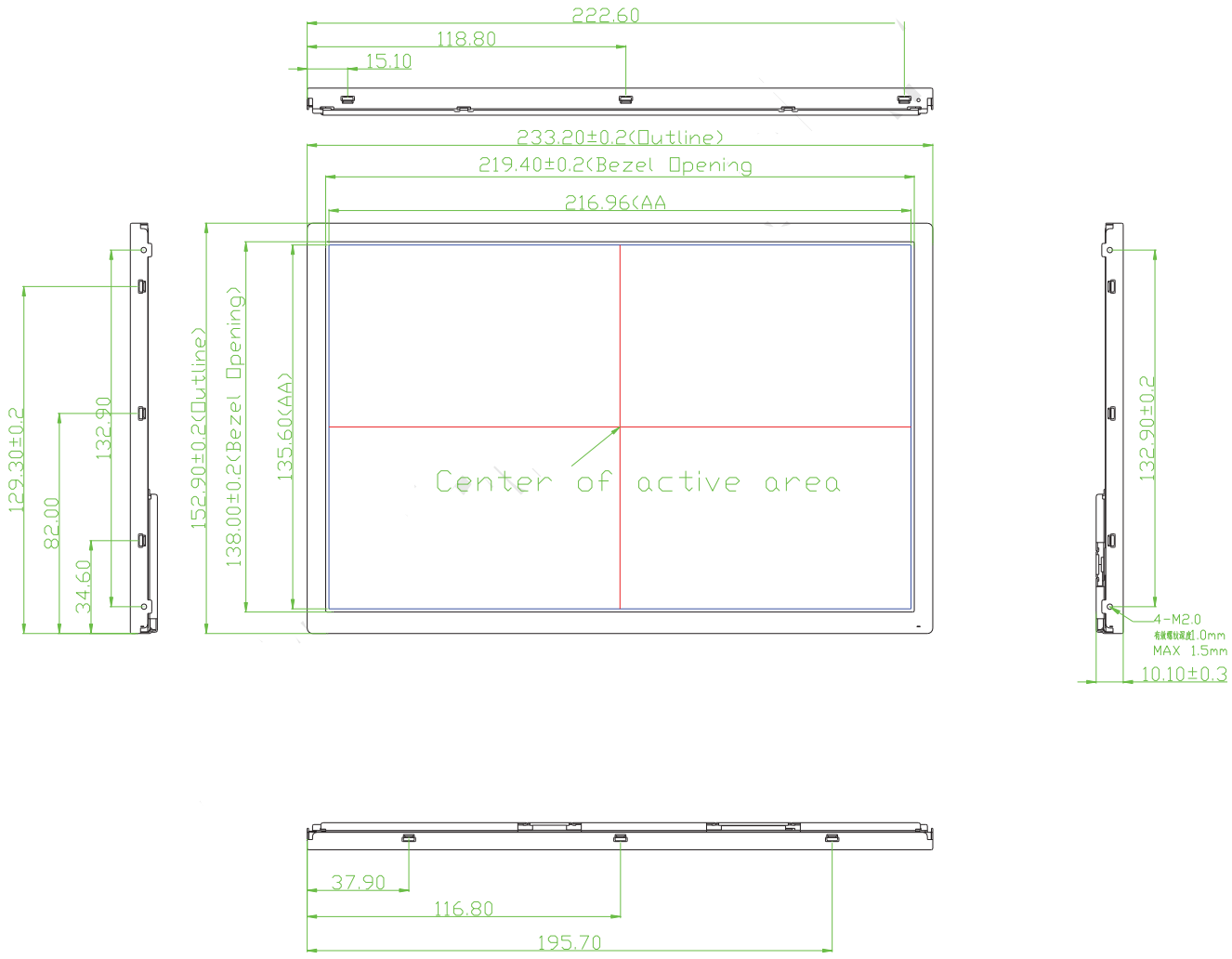
The Reliability test items and its conditions are shown in below.

<Table 12. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	80℃ 240hr Storage
2	Low temperature storage test	-30℃ 240hr
3	High temperature & high humidity (operation test)	60℃ 90%RH 240hr
4	Low temperature operation test	-20℃ 240hr
5	High temperature operation test	70℃ 240hr
6	Thermal Shock Test	[(-40℃ 30min) →(80℃ 30min)]/cycle, 100cycles
7	8585 Storage	85℃ 85%RH 120hr
8	ESD	Air : +/- 15kV Contact :+/- 8kV
9	Packing VIB	Accleration:1.47Grms 5~100Hz 0.015G*2/Hz /100~200Hz -6dB/Oct / 200Hz 0.0038G*2/Hz / 30 min
10	Packing Drop	6 surfaces / 3edges / 1corner/ for Box Test

9.0 APPENDIX

Mechanical Drawing
Drawing Attachment: Front



Mechanical Drawing
Drawing Attachment: Back