奇美電子
CHIMEI INNOLUX

PRODUCT SP ECIFICATION

Doc. Number:

■ T entative Specification
□ P reliminary Specification
□ A pproval Specification

MODEL NO.: N133HSE
SUFFIX: EA1

Customer:

APPROVED BY   **SIGNA TURE**

Name / Title
Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By

奇美電子
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CONTENTS

PRODUCT SP ECIFICATION

REVISION HISTORY

Version	Date	Page	Description
0.0	Feb.16, 2012	All	Spec. Ver. 0.0 was first issued.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

PRODUCT SP ECIFICATION

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N133HSE – EA1 is a 13.3" TFT Liquid Crystal Display module with LED Backlight unit and 30 pins eDP interface. This module s upports 1920 x   1080 F HD mode and c an d isplay 16, 777,216 c olors. The optimum viewing angle is at 6 o'clock direction. The converter module for Backlight is built in.

1.2 GENERAL SPECIFICATI0NS

| Item S	pecification	Unit	Note
Screen Size	13.3 diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.1529 (H) x 0.1529 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16,777,216	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare	-	-
Luminance, White	350	Cd/m2	
Power Consumption	Total (6.39 W)(Max.) @ cell (1.24W)(Max.), BL (5.15 W)(Max.)		(1)

Note (1) The specified power consumption (with converter efficiency) is under t he conditions at VCCS = 3.3 V, fv = 60 Hz , LED_VCCS = Typ, fPWM = 200 Hz , Duty=100% and Ta = 25 ± 2 ºC, whereas mosaic pattern is displayed.

2. MECHANICAL SPECIFICATIONS

Item Mi		n.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	305.05	305.35 305.	65 m	m	(1)
	Vertical (V) (W/ PCBA)	187.47	187.77	188.07	mm	
	Thickness (T) (W/ PCBA)	NA	2.7	2.85	mm	
Active Area	Horizontal	293.46	293.76 294.	06 m	m	
	Vertical	164.94	165.24 165.	54 m	m	
Weight -			245	260	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2.1 CONNECTOR TYPE

Pin30 ——— Pin1
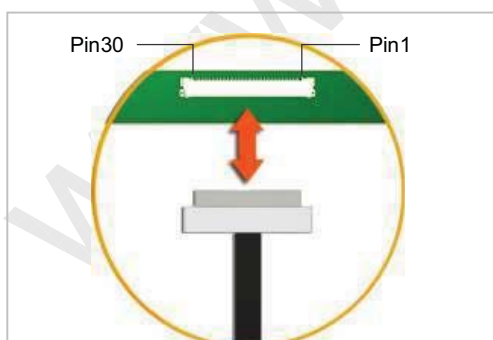
Please refer Appendix Outline Drawing for detail design.

Connector Part No.: IPEX-20455-030E-12 or FOXCONN GS13301-1110S-7H or equivalent

User's connector Part No: IPEX-20453-030T-01 or equivalent

PRODUCT SPECIFICATION

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

Note (1)   (a) 90 %RH Max. (Ta <= 40 ºC).

                (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

                (c) No condensation.

Note (2)   The temperature of panel surface should be 0 ºC min. and 60 ºC max.

Relative Humidity (%RH)

Temperature (ºC)
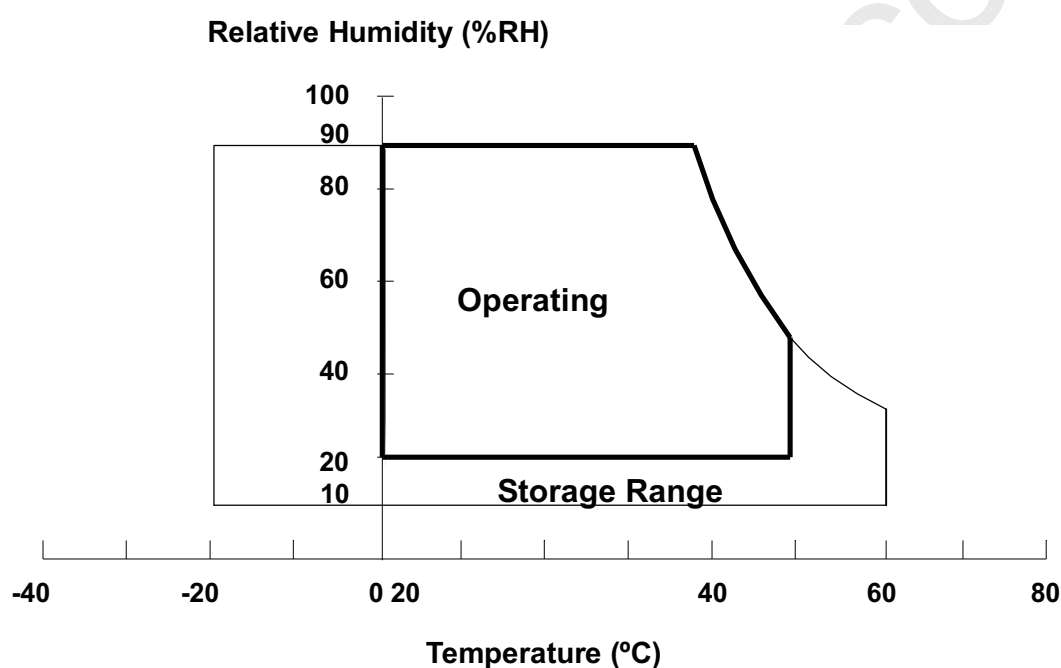
3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	VCCS+0.3	V	
Converter Input Voltage	LED_VCCS	-0.3	(25)	V	
Converter Control Signal Voltage	LED_PWM,	-0.3	(5)	V	
Converter Control Signal Voltage	LED_EN	-0.3	(5)	V	

Note (1) Stresses beyond those listed in above "ELECTRICAL ABSOLUTE RATINGS" may cause permanent damage to the device. Normal operation should be restricted to the conditions described in "ELECTRICAL CHARACTERISTICS".

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PRODUCT SP ECIFICATION

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM
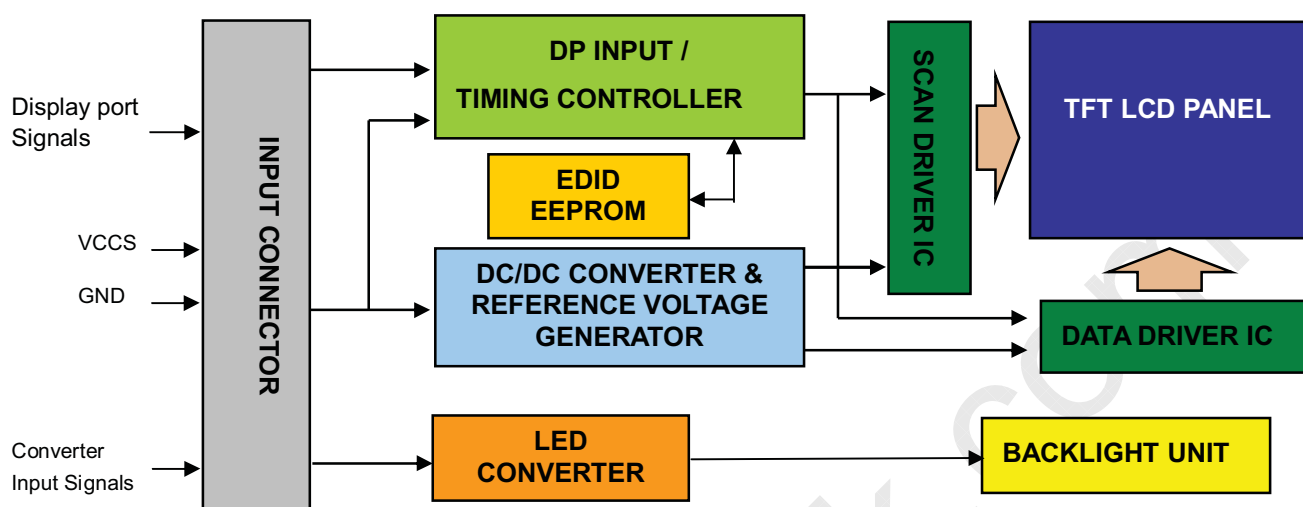
4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

Pin Sy	mbol	Description	Remark
1	NC	No Connection (Reserved for CMI test)	
2	H_GND	High Speed Ground	
3	ML1-	Complement Signal-Lane 0	
4	ML1+	True Signal-Main Lane 0	
5	H_GND	High Speed Ground	
6 M	L0-	Complement Signal-Lane 0	
7	ML0+	True Signal-Main Lane 0	
8	H_GND	High Speed Ground	
9	AUX+	True Signal-Auxiliary Channel	
10 A	UX-	Complement Signal-Auxiliary Channel	
11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3 V (typical)	
13	VCCS	Power Supply +3.3 V (typical)	
14	NC	No Connection (Reserved for CMI test)	
15	GND	Ground	
16 G	ND	Ground	
17	HPD	Hot Plug Detect	
18 B	L_GND	BL Ground	
19 B	L_GND	BL Ground	
20 B	L_GND	BL Ground	
21 B	L_GND	BL Ground	
22	LED_EN	BL_Enable Signal of LED Converter	

23 LE	D_PWM	PWM Dimming Control Signal of LED Converter	
24	NC	No Connection (Reserved for CMI test)	
25	NC	No Connection (Reserved for CMI test)	
26 LE	D_VCCS	BL Power	
27 LE	D_VCCS	BL Power	
28 LE	D_VCCS	BL Power	
29 LE	D_VCCS	BL Power	
30	NC	No Connection (Reserved for CMI test)	

Note (1)   The first pixel is odd as shown in the following figure.

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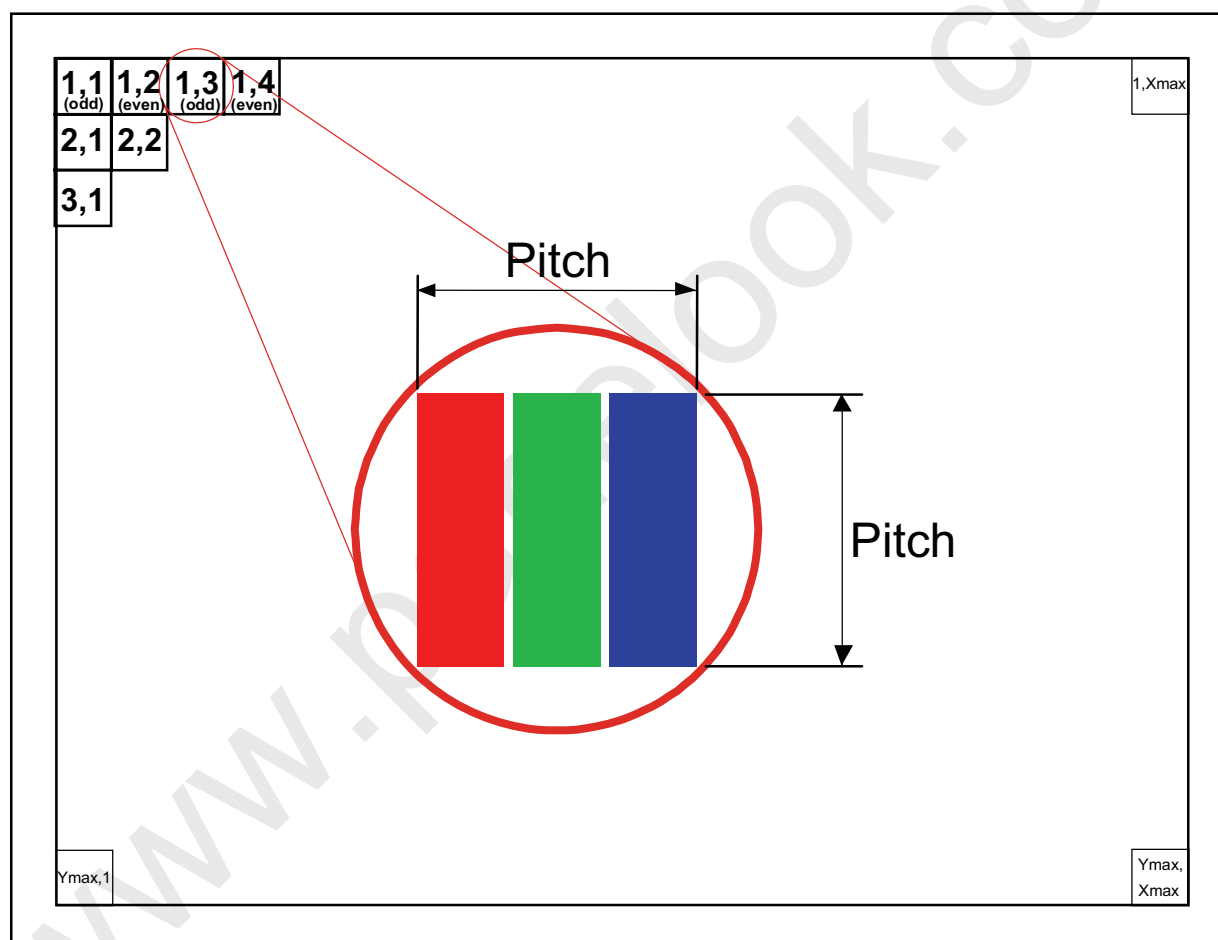
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

Parameter Sy		mbol	Value			Unit N	ot	e
			Min. T	yp.	Max.			
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)-	
HPD	High Level		2.25	-	2.75	V		
	Low Level		0	-	0.4	V		
Ripple Voltage		V_{RP}	- 5	0 -		mV	(1)-	
Inrush Current		I_{RUSH}	-	-	1.5	A	(1),(2)	
Power Supply Current	Mosaic	Icc		(343)	(376)	mA	(3)a	
	White		(	408)	(448)	mA	(3)b	

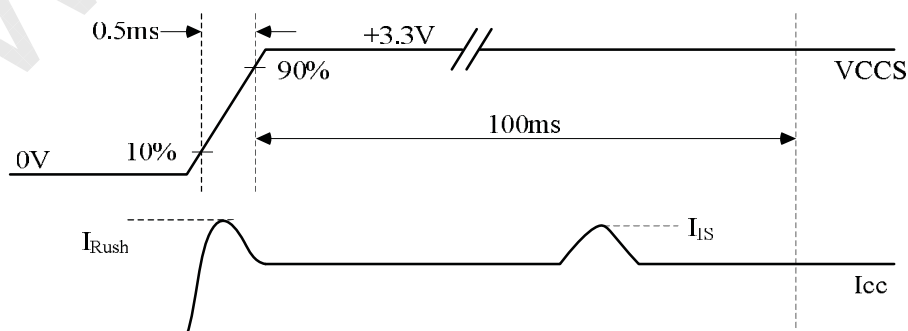Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.

VCCS rising time is 0.5ms

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com
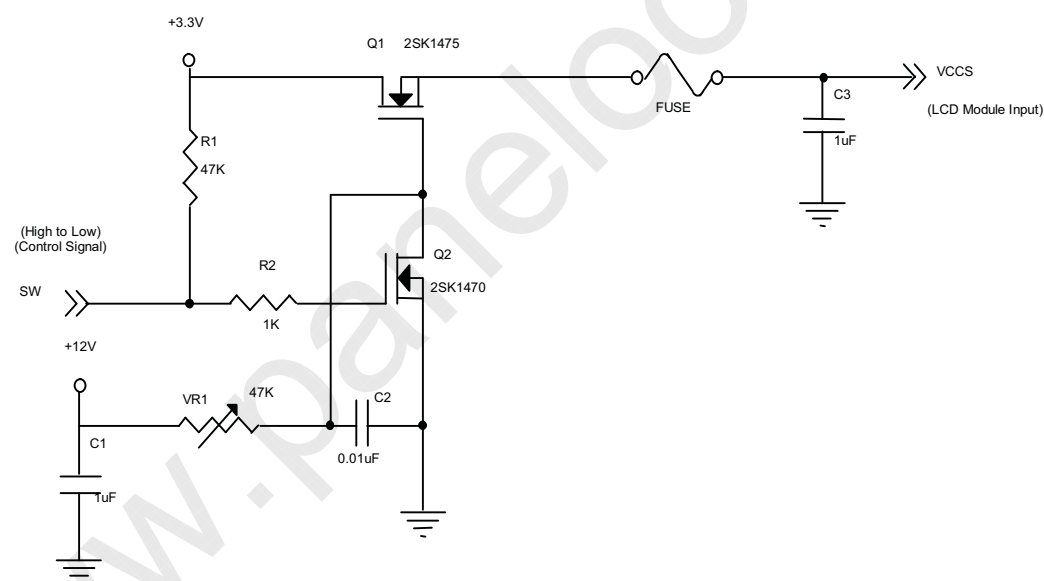
Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, Ta = 25 ± 2 ℃, DC

Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.
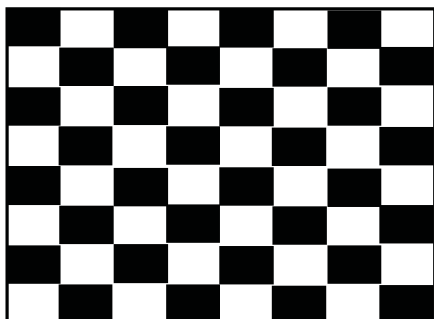
a. Mosaic Pattern   b. White Pattern

Active Area   Active Area

4.3.2 LED CONVERTER SPECIFICATION

Parameter Sy		mbol	Value			Unit Not	e
			Min. T	yp.	Max.		
Converter Input power supply voltage		LED_Vccs	(5.0) (	12.0)	(21.0)	V	
Converter Inrush Current		ILED$_{RUSH}$	- -		(1.5)	A	(1)
EN Control Level	Backlight On		(2.3) - (5		.0)	V	
	Backlight Off		(0) -		(0.5)	V	
PWM Control Level	PWM High Level		(2.3) - (5		.0)	V	
	PWM Low Level		(0) -		(0.5)	V	
PWM Control Duty Ratio			(10) -		(100)	%	
			(5) -		(100)	%	(2)
PWM C ontrol Permissive Ripple Voltage		VPWM_pp	- -		(100)	mV	
PWM Control Frequency		f$_{PWM}$ (1	90)	-	(2K)	Hz	(3)
LED Power Current LED_VCCS =Typ.		ILED	(293) (	329)	(429)	mA	(4)

Note (1) ILED$_{RUSH}$: the maximum current when LED_VCCS is rising,

IL   ED$_{IS}$: the maximum current of the first 100ms after power-on,
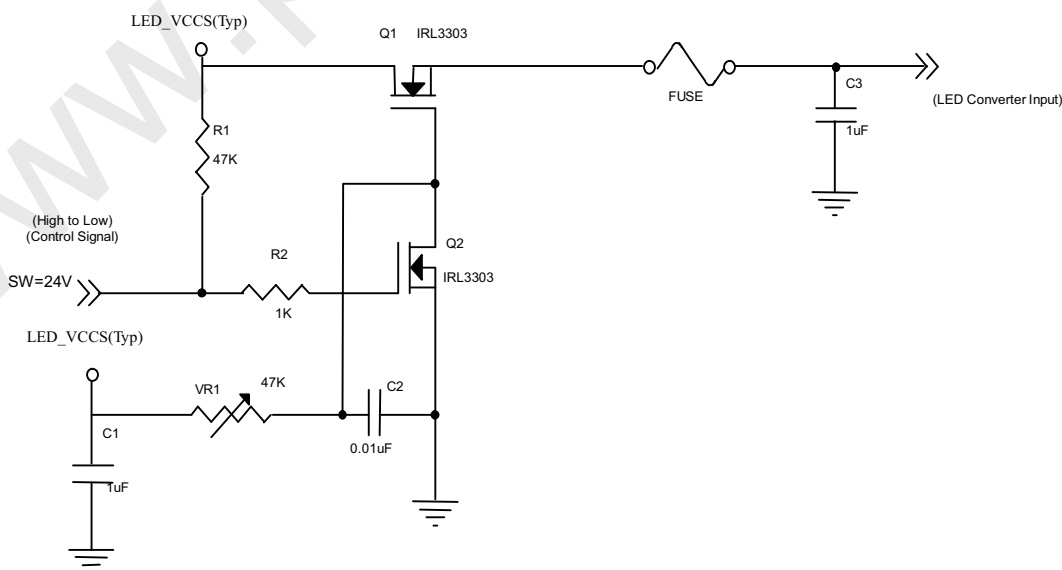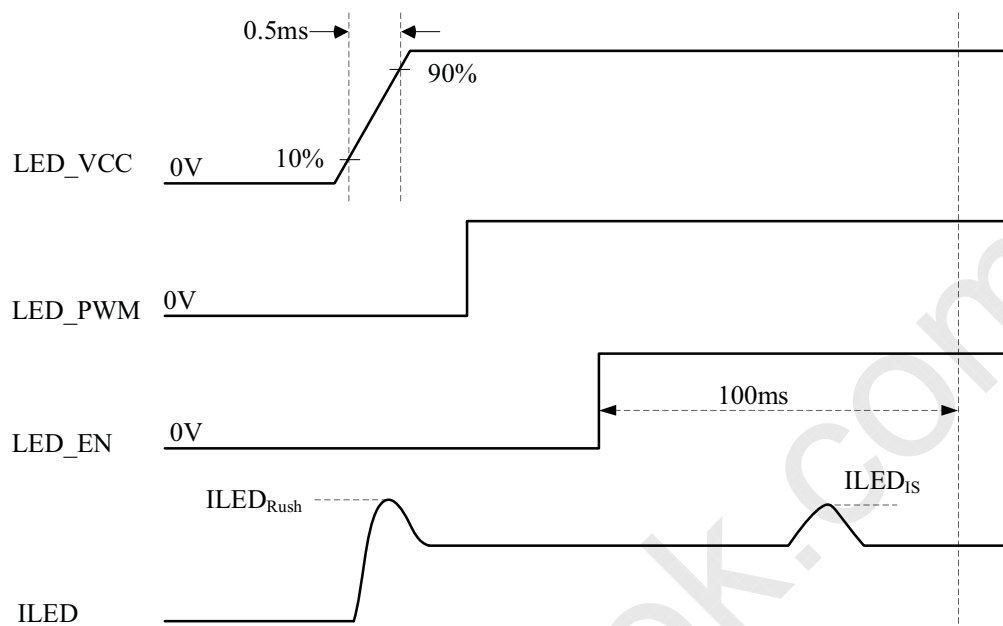
Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 ºC, f$_{PWM}$ = 200 Hz, Duty=100%.

PRODUCT SP ECIFICATION

VLED rising time is 0.5ms

Note (2) If the PWM control duty ratio is less than 10%, there is some possibility that acoustic noise or backlight flash can be found. And it is also difficult to control the brightness linearity.

Note (3)   If PWM control frequency is applied in the range less than 1KHz, the "waterfall" phenomenon on the screen may be found. To avoid the issue, it's a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency f_{PWM} should be in the range

$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

$$N : \text{Integer} \ (N \geq 3)$$

$$f : \text{Frame rate}$$

Note (4) The specified LED power supply current is under the conditions at "LED_VCCS = Typ.", Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.

PRODUCT SP ECIFICATION

4.3.3 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Pa rameter	Symbol	Value			Unit Not	e
		Min. T	yp.	Max.		
LED Light Bar Power Supply Voltage	V_L	25.2 27 29.		7	V	(1)(2)(Duty100%)
LED Light Bar Power Supply Current	I_L 125.	4	132	138.6	mA	
Power Consumption	P_L 3.	160	3.564	4.116	W	(3)
LED Life Time	L_{BL} 12	000	-	-	Hrs	(4)

Note (1)   LED current is measured by utilizing a high frequency current meter as shown below :

$V_{L,}$ I_L

Light Bar Feedback

Channels

LED
Light Bar
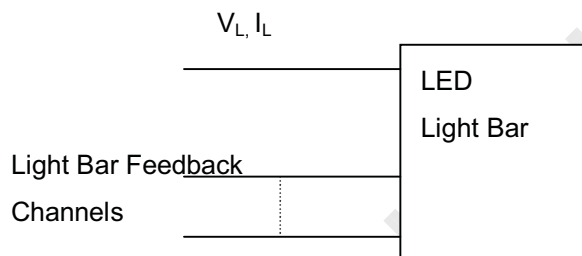
Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$ (Without LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ºC and I_L = 20 mA(Per EA) until the brightness becomes $\leqq$ 50% of its original value.

PRODUCT SP ECIFICATION

4.4 DISPLAY PORT SIGNAL TIMING SPECIFICATION

4.4.1 DISPLAY PORT INTERFACE

Parameter Sy	mbol	Min.	Typ.	Max.	Unit	Notes
Differential Signal Common Mode Voltage(MainLink and AUX)	VCM 0			2	V	(1)(3)
AUX AC Coupling Capacitor	C_{AUX} 75			200	nF	(2)

Note (1) Display port i nterface rel ated AC coupled s ignals s hould follow VESA Di splayPort S tandard

Version1. Revision 1a and VESA Embedded DisplayPort[TM] Standard Version 1.1.

(2) The AUX AC Coupling Capacitor should be placed on Source Devices.

(3)The s ource de vice s hould p ass t he t est c riteria des cribed i n D isplayPortCompliance Test
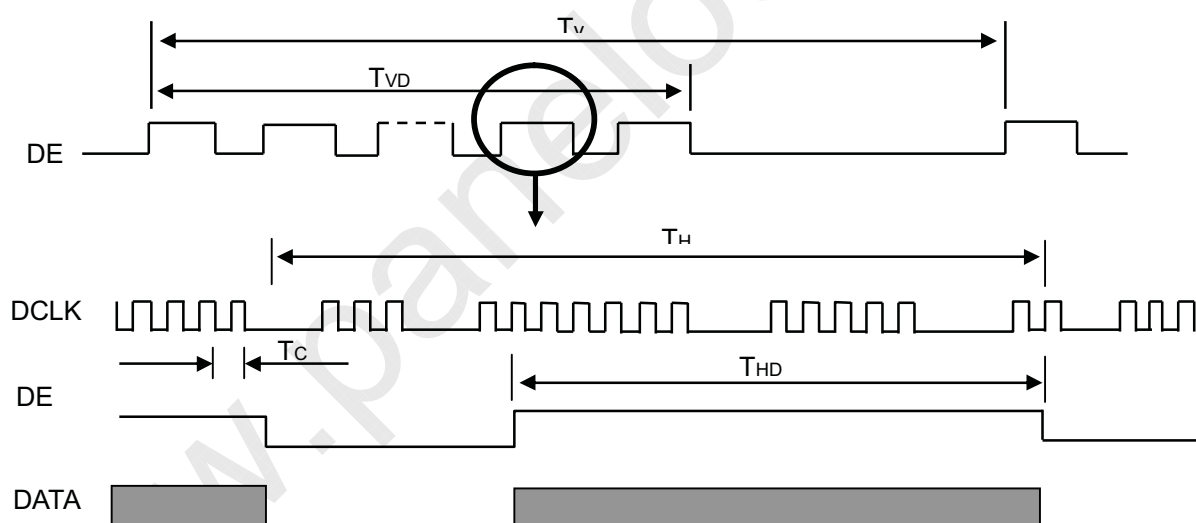
Specification (CTS) 1.1

V_{D+}

V_{CM}

Single Ended V_{D-}

$|V_{ID}|$

0V

PRODUCT SP ECIFICATION
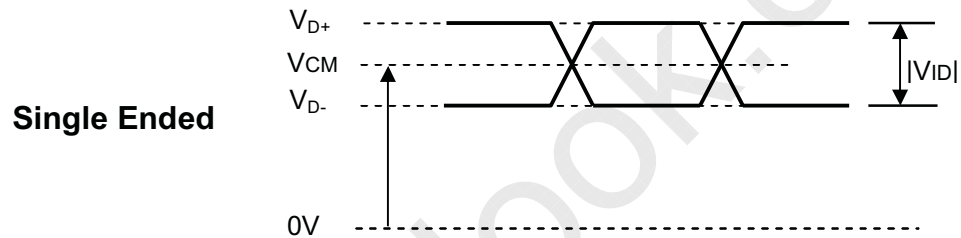
4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal I	tem	Symbol	Min. T	yp.	Max.	Unit	Note
DCLK F	requency	1/Tc	TBD	138.5	TBD M	H　z	-
DE	Vertical Total Time	TV	TBD	1112	TBD	TH	-
	Vertical Active Display Period	TVD	1080	1080	1080	TH -	
	Vertical Active Blanking Period	TVB	TV-TVD	30 T	V-TVD	TH -	
	Horizontal Total Time	TH	TBD	2080	TBD T	c	-
	Horizontal Active Display Period	THD	1920	1920	1920	Tc -	
	Horizontal Active Blanking Period	THB	TH-THD	160	TH-THD	Tc	-

Note (1)　Display timing s ignal s hould be c ontained and t ransferred by D isplay P ort Main Li nk s tream
data packing described in VESA Display Port Standard V1.1a

DISPLAY SIGNAL TIMING DIAGRAM

PRODUCT SP ECIFICATION

4.6 POWER ON/OFF SEQUENCE

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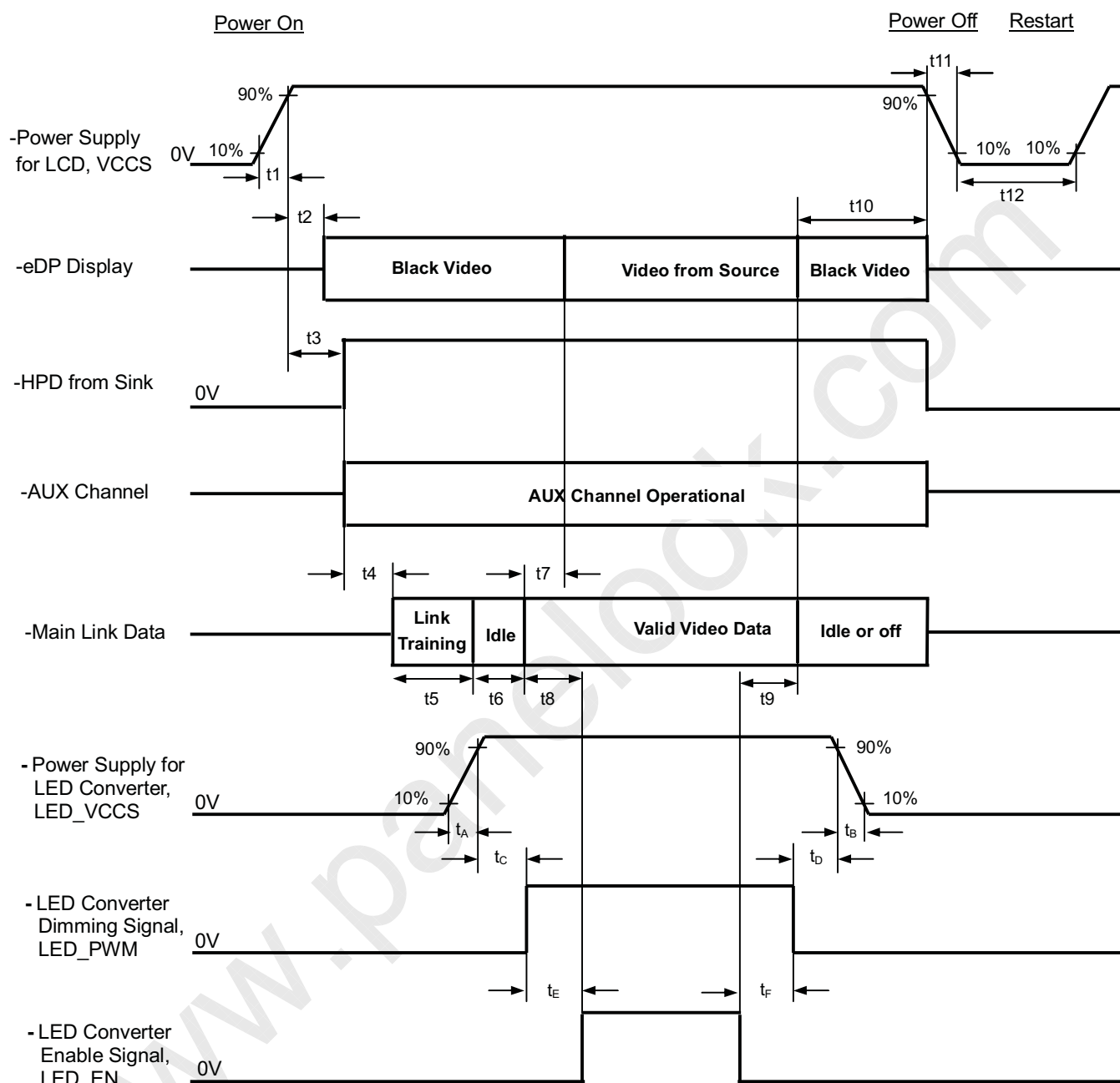
Timing Specifications: Follow VESA Embedded Display Port Standard Version 1

Parameter	Description	Reqd. By	Value		Unit	Notes
			Min	Ma x		
t1	Power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t2	Delay from LCD,VCCS to black video generation	Sink	0	200	ms	-
t3	Delay from LCD,VCCS to HPD high	Sink	0	200	ms	-
t4	Delay from HPD high to link training initialization	Source -		-	ms	-
t5	Link training duration	Source	- -		ms	-
t6	Link idle	Source	- -		ms	-
t7	Delay from valid video data from Source to video on display	Sink	0	50	ms	-
t8	Delay from valid video data from Source to backlight on	Source	-	-	ms	-
t9	Delay from backlight off to end of valid video data	Source -		-	ms	-
t10	Delay from end of valid video data from Source to power off	Source 0		500	ms	-
t11	VCCS power rail fall time, 90% to 10%	Source 0.	5	10	ms	-
t12	VCCS Power off time	Source	500	-	ms	-
t_A	LED power rail rise time, 10% to 90%	Source 0.	5	10	ms	-
t_B	LED power rail fall time, 90% to 10%	Source 0		10	ms	-
t_C	Delay from LED power rising to LED dimming signal	Source 1	0	-	ms	-
t_D	Delay from LED dimming signal to LED power falling	Source 1	0	-	ms	-
t_E	Delay from LED dimming signal to LED enable signal	Source 1	0	-	ms	-
t_F	Delay from LED enable signal to LED dimming signal	Source 1	0	-	ms	-

Note (1) Please follow t he pow er on/ off sequence des cribed abo ve. O therwise, t he LCD   module might abnormal display or be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD VCCS to 0 V.

Note (3) The backlight must be turned on after the power supply for the logic and the interface signal is valid. The backlight must be t urned off before t he power s upply for t he logic and t he interface s ignal i s invalid.

Note (4) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller

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PRODUCT SP ECIFICATION

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item S	ymbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	132	mA

The measurement methods o f opt ical c haracteristics ar e s hown i n S ection 5. 2. The following items should be measured under the test conditions described in Section 5.1 and stable environment shown in Note (5).

5.2 OPTICAL SPECIFICATIONS

Item S		ymbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		500	700	-	-	(2), (5), (7)
Response Time		T_R -			14	19	ms	(3), (7)
		T_F -			11	16	ms	
Average Luminance of White		L_{AVE}		295	350	-	cd/m^2	(4), (6), (7)
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing Normal Angle	Typ – 0.03	TBD	Typ + 0.03	-	(1), (7)
		Ry			TBD		-	
	Green	Gx			TBD		-	
		Gy			TBD		-	
	Blue	Bx			TBD		-	
		By			TBD		-	
	White	Wx			0.308		-	
		Wy			0.324		-	
Viewing Angle	Horizontal	θ_x+	CR≥10	80	89		Deg.	(1), (5), (7)
		θ_x-		80	89	-		
	Vertical	θ_Y+		80 89		-		
		θ_Y-		80 89		-		
White Variation of 5 Points		δW_{5p}	θ_x=0°, θ_Y =0°	70 8	0	-	%	(5), (6),

Note (1) Definition of Viewing Angle (θx, θy)

Normal
θx = θy = 0º

θy- θy+

θX- = 90º   x-

12 o'clock direction
θy+ = 90º

θx−
y+
θX+

6 o'clock
y-
θY- = 90º

x+ θX+ = 90º
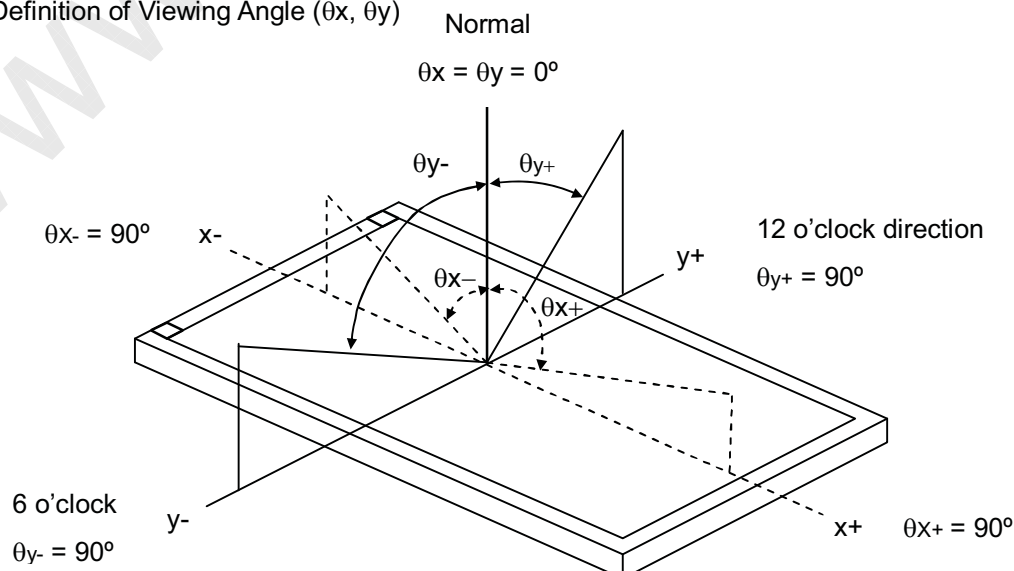
Note (2) Definition of Contrast Ratio (CR):

    The contrast ratio can be calculated by the following expression.

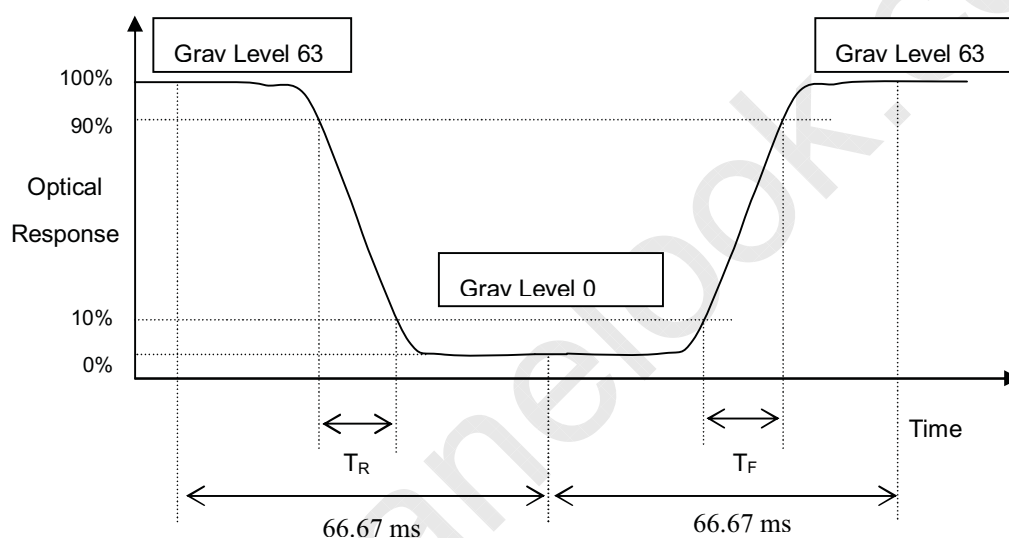   Contrast Ratio (CR) = L63 / L0

      L63: Luminance of gray level 63

      L 0: Luminance of gray level 0

      CR = CR (1)

      CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):

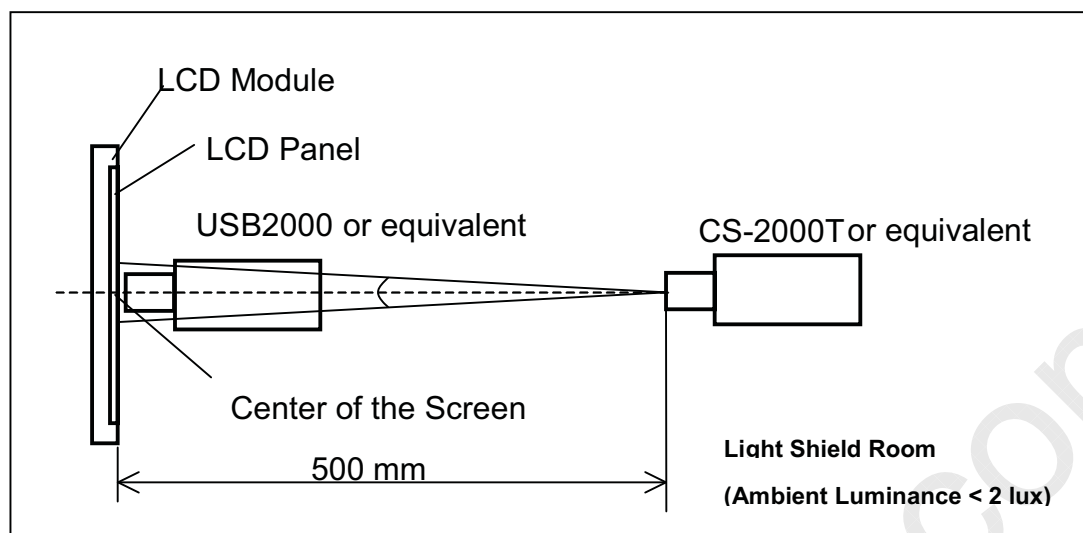Note (4) Definition of Average Luminance of White (L_{AVE}):

    Measure the luminance of gray level 63 at 5 points

      L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

    L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

    The LCD module s hould be s tabilized at gi ven t emperature for 20 minutes t o a void abr upt temperature c hange dur ing measuring. In or der t o s tabilize t he l uminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

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PRODUCT SP ECIFICATION

LCD Module

LCD Panel

USB2000 or equivalent

CS-2000T or equivalent

Center of the Screen

500 mm

Light Shield Room

(Ambient Luminance < 2 lux)

Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW_{5p} = {Minimum [L (1)~L (5)] / Maximum [L (1)~ L (5)]}*100%

X : Test Point

X=1 to 13

Active area
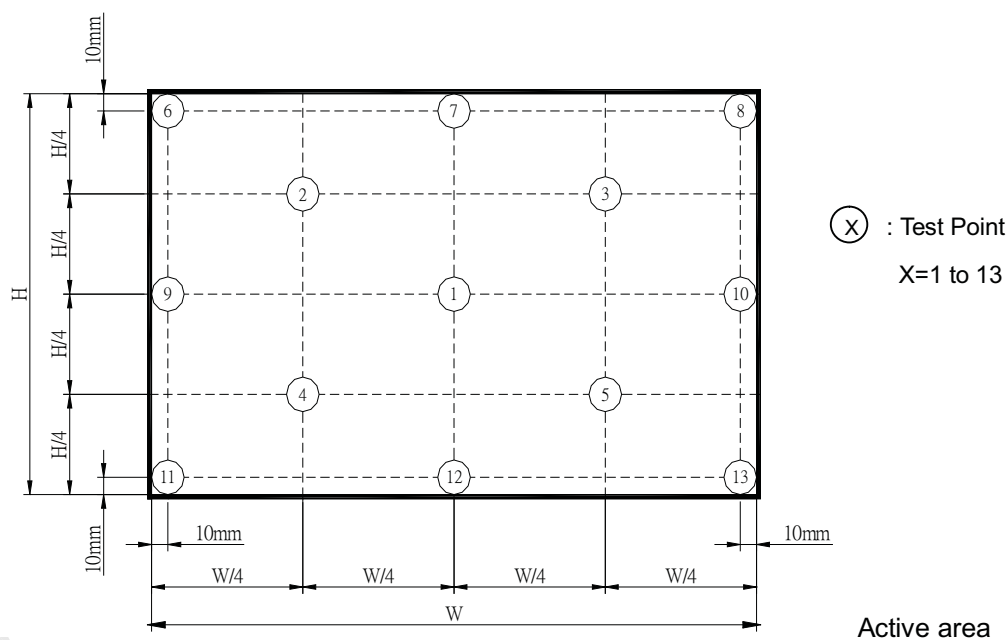
Note (7) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.

PRODUCT SP ECIFICATION

6. RELIABILITY TEST ITEM

Test Item	Test Condition	Note
High Temperature Storage Test	60ºC, 240 hours	(1) (2)
Low Temperature Storage Test	-20ºC, 240 hours	
Thermal Shock Storage Test	-20ºC, 0.5hour←→60℃, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	50ºC, 240 hours	
Low Temperature Operation Test	0ºC, 240 hours	
High Temperature & High Humidity Operation Test	50ºC, RH 80%, 240hours	
ESD Test (Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : Contact Discharge, ±8KV Condition 2 : Air Discharge, ±15KV	(1)
Shock (Non-Operating)	220G, 2ms, half sine wave,1 time for each direction of ±X,±Y,±Z	(1)(3)
Vibration (Non-Operating)	1.5G / 10-500 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	(1)(3)

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough

so that the module would not be twisted or bent by the fixture.

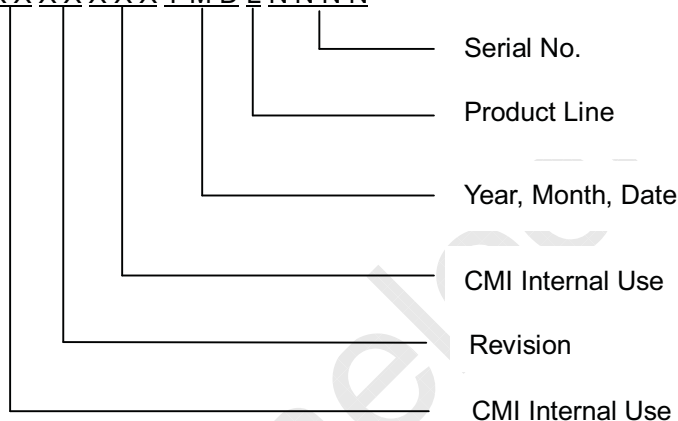PRODUCT SP ECIFICATION

7. PACKING

7.1 MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

```
CHIMEI INNOLUX
      N133HSE-EA1   Rev. XX          cᴿᵁus
                                     MADE IN XXXXXX
   ||||||||||||||||||||||||||||        XXXX
   X X X X X X X Y M D L N N N N        (10)
```

(a) Model Name: N133HSE – EA1

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X X Y M D L N N N N

— Serial No.

— Product Line

— Year, Month, Date

— CMI Internal Use

— Revision

— CMI Internal Use

Serial ID includes the information as below:

(a) M anufactured Date: Year: 0~9, for 2010~2019

Month: 1~9, A~C, for Jan. ~ Dec.

D ay: 1~9, A~Y, for 1st to 31st, exclude I , O and U
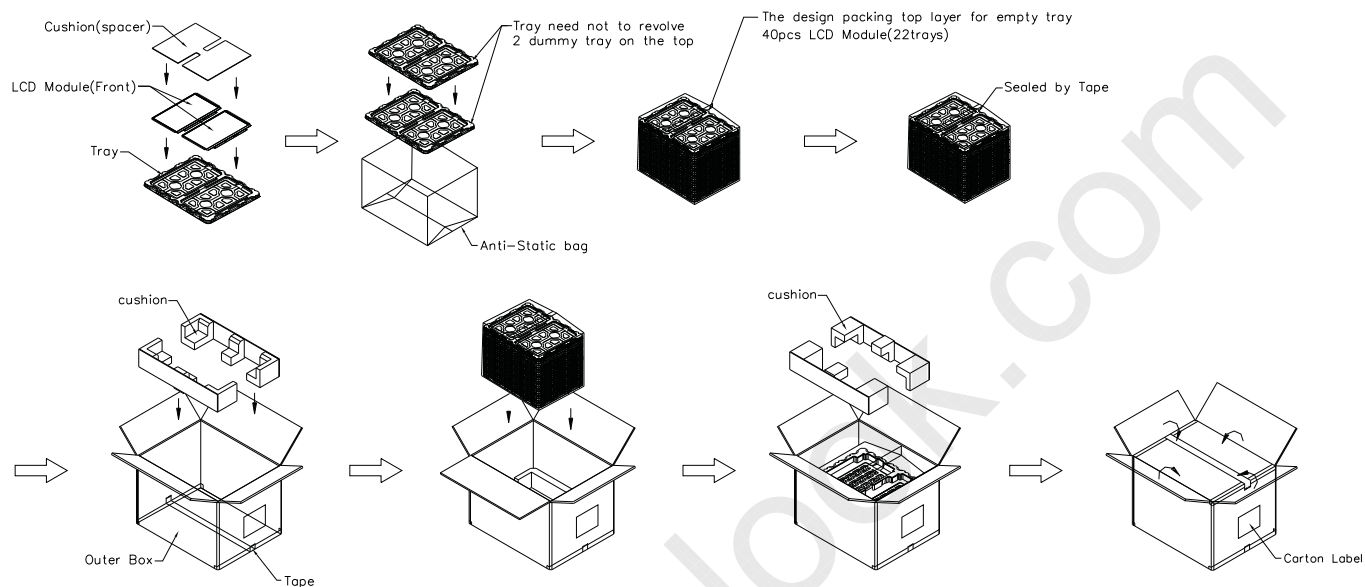
(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

(e) UL logo: "XXXX" is factory ID

7.2 CARTON

Box Dimensions : 540(L)*450(W)*320(H)
Weight : Approx. TBD Kg (40 module .per. 1box)

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7.3 PALLET

Sea & Land Transportation　　　　　　　　　Air Transportation
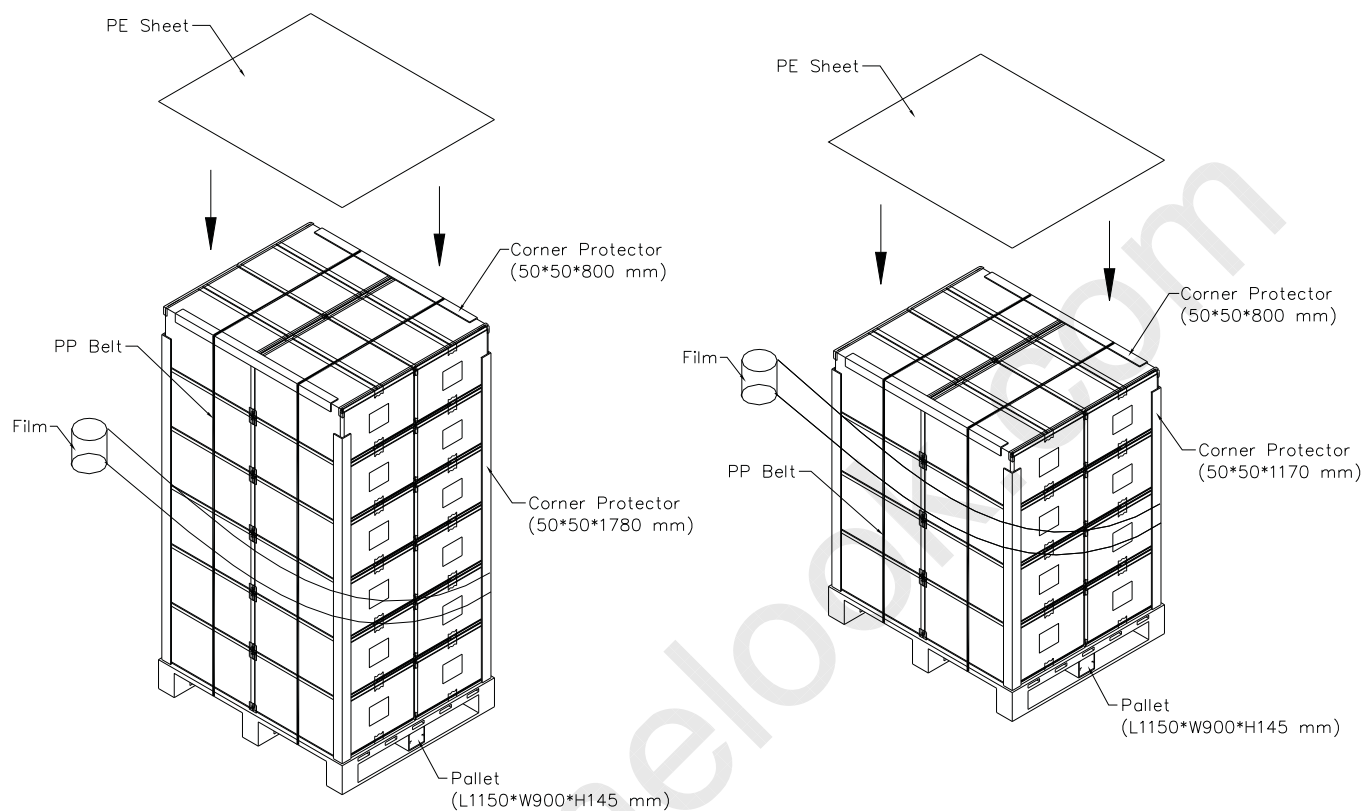
8. PRECAUTIONS

8.1 HANDLING PRECAUTIONS

(1) The module should be as sembled into the system firmly by using every mounting hol e. B e careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use f ingerstalls or s oft g loves i n or der t o k eep d isplay c lean dur ing the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use K etone t ype materials (ex. A cetone), E thyl al cohol, Toluene, E thyl ac id or M ethyl c hloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the LED wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

8.2 STORAGE PRECAUTIONS

(1) High t emperature or hu midity may r educe t he performance of module. P lease s tore LCD m odule within the specified storage conditions.

(2) It is danger ous t hat moisture c ome i nto or c ontacted the LCD module, bec ause t he moisture may damage LCD module when it is operating.

(3) It may r educe t he display quality if the ambient temperature is l ower t han 10 ºC. F or ex ample, the response t ime w ill bec ome s lowly, and t he s tarting voltage o f LE D w ill be hi gher than t he r oom temperature.

8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always f ollow t he c orrect pow er on/ off s equence whe n LCD module i s c onnecting and oper ating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The s tartup voltage o f Backlight i s appr oximately 10 00 V olts. I t may c ause el ectrical s hock w hile assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

奇美電子
CHIMEI INNOLUX

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Appendix. EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.
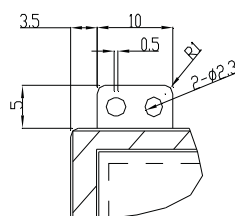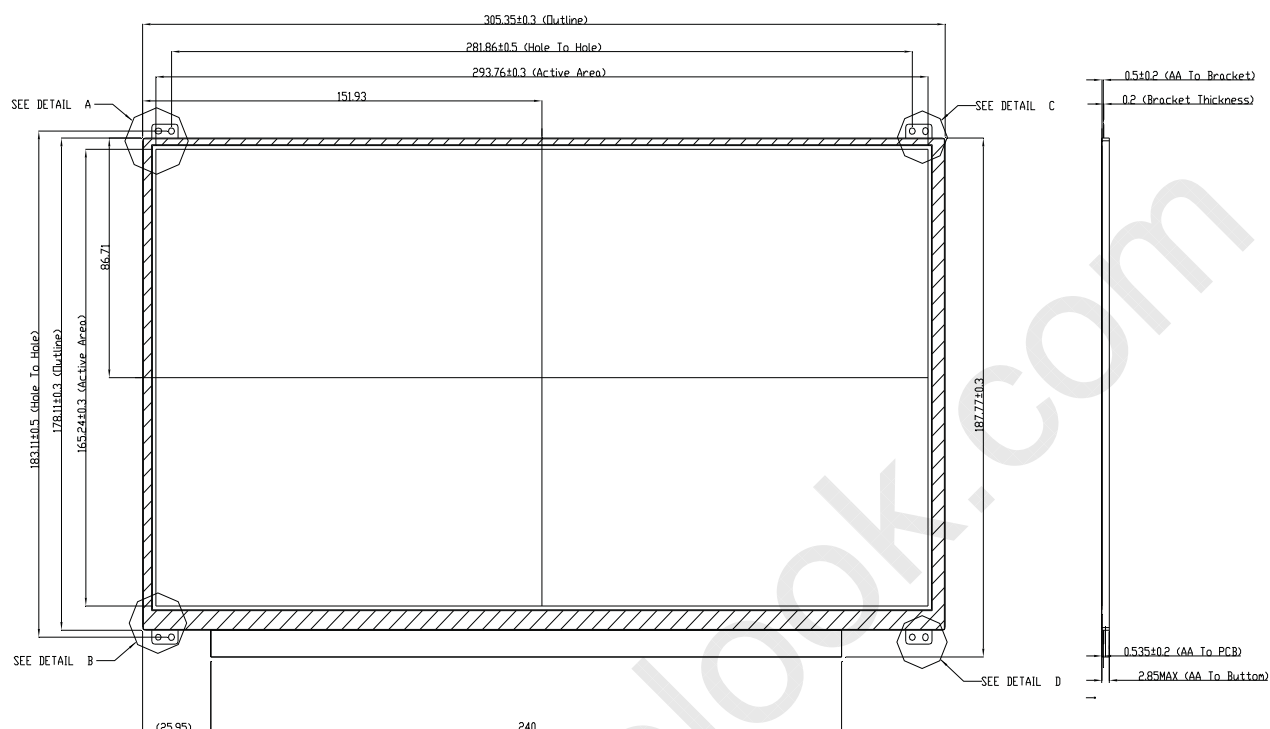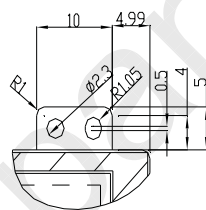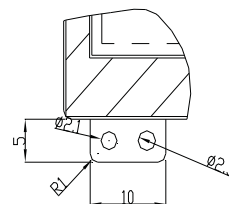
Byte #(decimal)	Byte #(hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1 1		Header	FF	11111111
2 2		Header	FF	11111111
3 3		Header	FF	11111111
4 4		Header	FF	11111111
5 5		Header	FF	11111111
6 6		Header	FF	11111111
7 7		Header	00	00000000
8	8	EISA ID manufacturer name ("CMN")	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AE	10101110
10	0A	ID product code (N133HSE-EA1)	43	01000011
11	0B	ID product code (hex LSB first; N133HSE-EA1)	13	00010011
12	0C	ID S/N (fixed "0")	00	00000000
13	0D	ID S/N (fixed "0")	00	00000000
14	0E	ID S/N (fixed "0")	00	00000000
15	0F	ID S/N (fixed "0")	00	00000000
16	10	Week of manufacture (fixed week code)	34	00110100
17	11	Year of manufacture (fixed year code)	15	00010101
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("4")	04	00000100
20 14		Vedio Input Definition	A5	10100101
21	15	Max H image size ("28.186cm")	1C	00011100
22	16	Max V image size ("16.524cm")	10	00010000
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24 18		Feature support	02	00000010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	93	10010011
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	AD	10101101
27	1B	Red-x (Rx = "0.662")	A9	10101001
28	1C	Red-y (Ry = "0.325")	53	01010011
29	1D	Green-x (Gx = "0.296")	4C	01001100
30	1E	Green-y (Gy = "0.588")	96	10010110
31	1F	Blue-x (Bx = "0.146")	25	00100101
32	20	Blue-y (By = "0.068")	11	00010001
33	21	White-x (Wx = "0.311")	4F	01001111
34	22	White-y (Wy = "0.325")	53	01010011
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001

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42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54 36		Detailed timing description # 1 Pixel clock ("138.78MHz", According to VESA CVT Rev1.4)	36	00110110
55	37	# 1 Pixel clock (hex LSB first)	36	00110110
56	38	# 1 H active ("1920")	80	10000000
57	39	# 1 H blank ("160")	A0	10100000
58	3A	# 1 H active : H blank ("1920 :160")	70	01110000
59	3B	# 1 V active ("1080")	38	00111000
60	3C	# 1 V blank ("32")	20	00100000
61	3D	# 1 V active : V blank ("1080 :32")	40	01000000
62	3E	# 1 H sync offset ("46")	2E 00101	110
63	3F	# 1 H sync pulse width ("30")	1E 0	0011110
64	40	# 1 V sync offset : V sync pulse width ("2 : 4")	24	00100100
65 41		# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00 00000000	
66	42	# 1 H image size ("282 mm")	1A	00011010
67	43	# 1 V image size ("165 mm")	A5	10100101
68	44	# 1 H image size : V image size ("282 : 165")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71 47		# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72 48		Detailed timing description # 2 Pixel clock ("92.52MHz", According to VESA CVT Rev1.4)	24	00100100
73	49	# 2 Pixel clock (hex LSB first)	24	00100100
74	4A	# 2 H active ("1920")	80	10000000
75	4B	# 2 H blank ("160")	A0	10100000
76	4C	# 2 H active : H blank ("1920 :160")	70	01110000
77	4D	# 2 V active ("1080")	38	00111000
78	4E	# 2 V blank ("32")	20	00100000
79	4F	# 2 V active : V blank ("1080 :32")	40	01000000
80	50	# 2 H sync offset ("46")	2E	00101110
81	51	# 2 H sync pulse width ("30")	1E 0	0011110
82	52	# 2 V sync offset : V sync pulse width ("2 : 4")	24	00100100
83 53		# 2 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00 00000000	
84	54	# 1 H image size ("282 mm")	1A	00011010
85	55	# 1 V image size ("165 mm")	A5	10100101

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PRODUCT SP ECIFICATION

86	56	# 1 H image size : V image size ("282 : 165")	10	00010000
87	57	# 2 H boarder ("0")	00 00000000	
88	58	# 2 V boarder ("0")	00	00000000
89 59		# 2 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor "CMO", ASCII)	FE 1111111 0	
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string ("C")	43	01000011
96	60	# 3 2nd character of string ("M")	4D	01001101
97	61	# 3 3rd character of string ("N")	4E 01001 110	
98	62	# 3 New line character indicates end of ASCII string	0A 00001010	
99	63	# 3 Padding with "Blank" character	20	00100000
100	64	# 3 Padding with "Blank" character	20	00100000
101	65	# 3 Padding with "Blank" character	20	00100000
102	66	# 3 Padding with "Blank" character	20	00100000
103	67	# 3 Padding with "Blank" character	20	00100000
104	68	# 3 Padding with "Blank" character	20	00100000
105	69	# 3 Padding with "Blank" character	20	00100000
106	6A	# 3 Padding with "Blank" character	20	00100000
107	6B	# 3 Padding with "Blank" character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111 6	F	# 4 FE (hex) defines ASCII string (Model Name"N156B3-L03", ASCII)	FE 1111111 0	
112	70	# 4 Flag	00 00000000	
113	71	# 4 1st character of name ("N")	4E	01001110
114	72	# 4 2nd character of name ("1")	31	00110001
115	73	# 4 3rd character of name ("3")	33	00110011
116	74	# 4 4th character of name ("3")	33	00110011
117	75	# 4 5th character of name ("H")	48	01001000
118	76	# 4 6th character of name ("S")	53	01010011
119	77	# 4 7th character of name ("E")	45	01000101
120	78	# 4 8th character of name ("-")	2D	00101101
121	79	# 4 9th character of name ("E")	45 01000101	
122	7A	# 4 Ath character of name ("A")	41	01000001
123	7B	# 4 Bth character of name ("1")	31	00110001
124	7C	# 4 New line character indicates end of ASCII string	0A 00001010	
125	7D	# 4 Padding with "Blank" character	20	00100000
126 7E		No extension	00	00000000
127 7F		Checksum	CD	11001101

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Appendix. OUTLINE DRAWING

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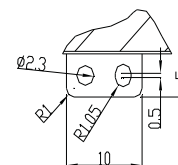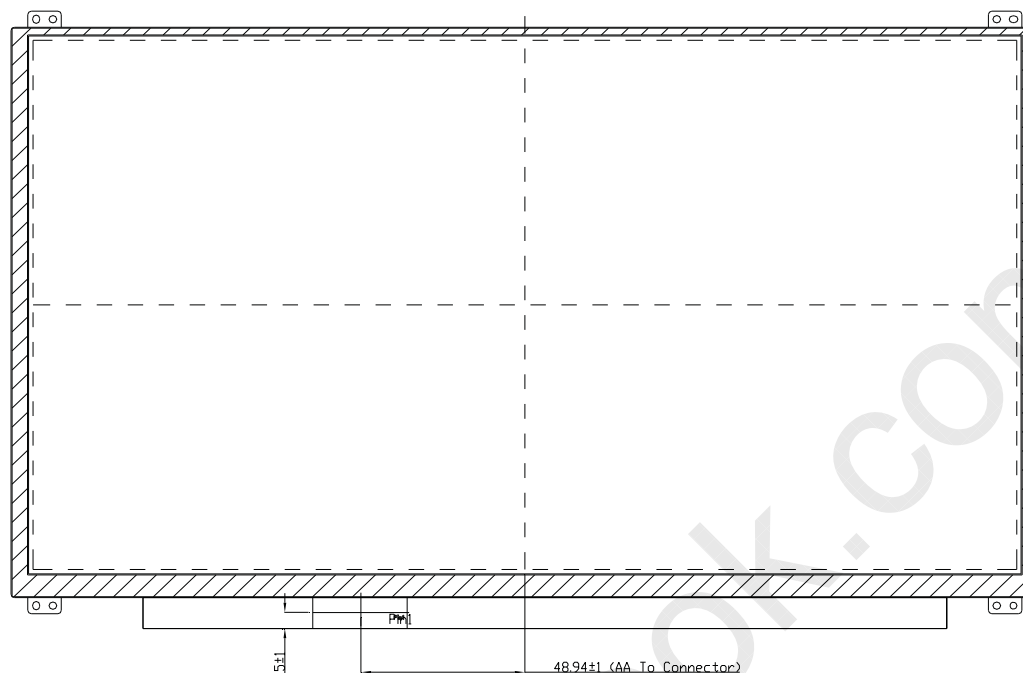
NOTES :

1. FLATNESS 0.5 mm MAX

2. LCD MODULE INPUT CONNECTOR: IPEX20455-030E-12 OR EQUIVALENT.

3. IN ORDER TO AVOID ABNORMAL DISPLAY, POOLING AND WHITE SPOT, NO OVERLAPPING IS SUGGESTED AT CABLES, ANTENNAS,   CAMERA, WLAN, WAM OR OTHER FOREIGN OBJECTS OVER COF DRIVER IC, TCON AND VR LOCATION.

4. GAP BETWEEN BEZEL AND PANEL : 0.5mm MAX.

5. LVDS CONNECTOR IS MEASURED AT PIN1 AND ITS MATING LINE.

6. "( )" MARKS THE REFERENCE DIMENSION.