DLC Display Co., Limited

德爾西顯示器有限公司

MODEL No: DLC0119AEOF

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Record of Revision

Date	Revision No.	Summary
2019-04-11	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0119AEOF, AMOLED display module. It is composed of an AMOLED panel, driver IC, and FPC. The 1.19″ display area contains 390(RGB) x 390 pixels.
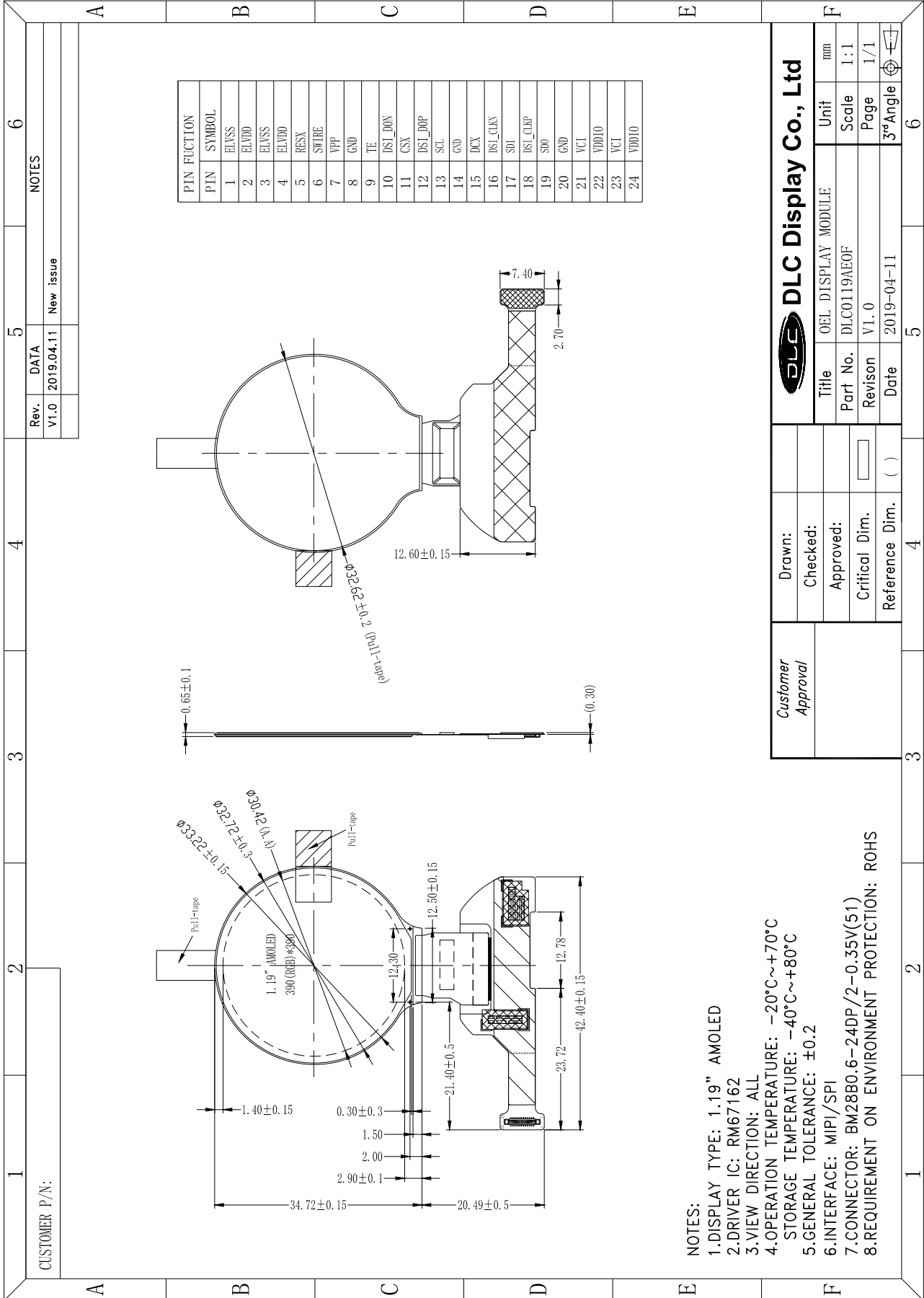
2. Application

Digital equipments which need display, mobile phone, remote control, electronic product.

3. General Information

Item	Contents	Unit
Size	1.19	inch
Resolution	390(RGB) x 390	/
Display Color	16.7M (RGB x 8bits)	
Interface	MIPI / SPI	
Pixel pitch	0.078 x 0.078	mm
Outline Dimension (W x H x D)	33.22 x 34.72 x 0.65	mm
Active Area(W x H)	Φ30.42	mm
Driver IC	RM67162	
Weight	TBD	g
Operating Temperature	-20℃ ~ +70℃	
Storage Temperature	-40℃ ~ +80℃	

4. Outline Drawing

PIN	FUCTION SYMBOL
1	ELVSS
2	ELVDD
3	ELVSS
4	ELVDD
5	RESX
6	SWIRE
7	VPP
8	GND
9	TE
10	DSI_D0N
11	CSX
12	DSI_D0P
13	SCL
14	GND
15	DCX
16	DSI_CLKN
17	SDI
18	DSI_CLKP
19	SDO
20	GND
21	VCI
22	VDDIO
23	VCI
24	VDDIO

NOTES

Rev.	DATA	NOTES
V1.0	2019.04.11	New issue

CUSTOMER P/N:

7.40
2.70
12.60±0.15

0.65±0.1
(0.30)

Φ32.62±0.2 (Pull-tape)

Φ33.22±0.15
Φ32.72±0.3
Φ30.42 (A.A)
1.19" AMOLED
390(RGB)*390
Pull-tape
Pull-tape

12.50±0.15
12.78
42.40±0.15
23.72
21.40±0.5
12.30

1.40±0.15
0.30±0.3
1.50
2.00
2.90±0.1
34.72±0.15
20.49±0.5

NOTES:
1.DISPLAY TYPE: 1.19" AMOLED
2.DRIVER IC: RM67162
3.VIEW DIRECTION: ALL
4.OPERATION TEMPERATURE: -20°C～+70°C
  STORAGE TEMPERATURE: -40°C～+80°C
5.GENERAL TOLERANCE: ±0.2
6.INTERFACE: MIPI/SPI
7.CONNECTOR: BM28B0.6-24DP/2-0.35V(51)
8.REQUIREMENT ON ENVIRONMENT PROTECTION: ROHS

Customer Approval

Drawn:
Checked:
Approved:
Critical Dim.
Reference Dim.

DLC Display Co., Ltd
Title | OEL DISPLAY MODULE
Part No. | DLC0119AEOF
Revison | V1.0
Date | 2019-04-11
Unit | mm
Scale | 1:1
Page | 1/1
3rd Angle

5. Interface signals

No	Pin name	I/O	Description
1	ELVSS	P	AMOLED Power Negative
2	ELVDD	P	AMOLED Power Positive
3	ELVSS	P	AMOLED Power Negative
4	ELVDD	P	AMOLED Power Positive
5	RESX	I	This signal will reset the device and must be applied to properly initialize the chip. Active low.
6	SWIRE	O	Swire protocol setting pin of power IC.
7	VPP	I	Power supply for OTP. Leave the pin to open when not in use.
8	GND	P	The power ground
9	TE	O	Tear effect output
10	DSI_D0N	I/O	MIPI DSI data 0-
11	CSX	I	SPI enable clock
12	DSI_D0P	I/O	MIPI DSI data 0+
13	SCL	I	SPI serial clock
14	GND	P	The power ground
15	DCX	I	SPI CMD/Data selection signal
16	DSI_CLKN	I	MIPI DSI clock-
17	SDI	I	SPI data signal
18	DSI_CLKP	I/O	MIPI DSI clock+
19	SDO	O	SPI output signal
20	GND	P	The power ground
21	VCI	P	Driver IC analog supply
22	VDDIO	P	Driver IC digital I/O supply
23	VCI	P	Driver IC analog supply
24	VDDIO	P	Driver IC digital I/O supply

6. Absolute maximum Ratings

6.1 Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Analog/boost power voltage	VCI	-0.3	-	V	
VCI I/O voltage	VDDIO	-0.3	-	V	

6.2 Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	℃	
Storage Temperature	TSTG	-40	80	℃	

7. Electrical Specifications

7.1 Electrical characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	4.55	4.6	4.65	V	
AMOLED power Negative	ELVSS	-2.45	-2.4	-2.35	V	Ref
Digital Power supply	VDDIO	1.65	1.8	1.95	V	Ref
Analog Power supply	VCI	2.7	2.8	2.9	V	Ref

7.1.1 Normal Mode

Power Supply: VDDIO=1.8V, VCI=2.8V

Frame Frequency: Fframe=60Hz @ 25degC, Brightness 300nits, Command Mode.

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel on 350nits	IELVDD/ELVSS	-	18.5	22.5	mA	Ref
	IVCI	-	6.0	7.2	mA	Ref
	IVDDIO	-	6.0	7.2	mA	Ref
50% Pixel on 150nits	IELVDD/ELVSS	-	4.5	5.5	mA	Ref
	IVCI	-	6.6	8.0	mA	Ref
	IVDDIO	-	6.0	7.2	mA	Ref
10% Pixel on 50nits	IELVDD/ELVSS	-	0.4	0.5	mA	Ref
	IVCI	-	7.2	8.6	mA	Ref
	IVDDIO	-	6.0	7.2	mA	Ref

7.1.2 Idle Mode

Power Supply: IOVCC=1.8V, VCI=2.8V

Frame Frequency: Fframe=15Hz @ 25degC, Brightness 30nits

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
	IELVDD/ELVSS	-	-	-	mA	Supplied by Driver IC
10% Pixel on 50nits	IVCI	-	3.0	3.6	mA	Ref
	IVDDIO	-	1.0	1.2	mA	Ref

7.1.3 Deep Standby Mode

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	3.0	µA	
	IVDDIO	-	-	0.3	µA	

7.2 Display Module Block Diagram
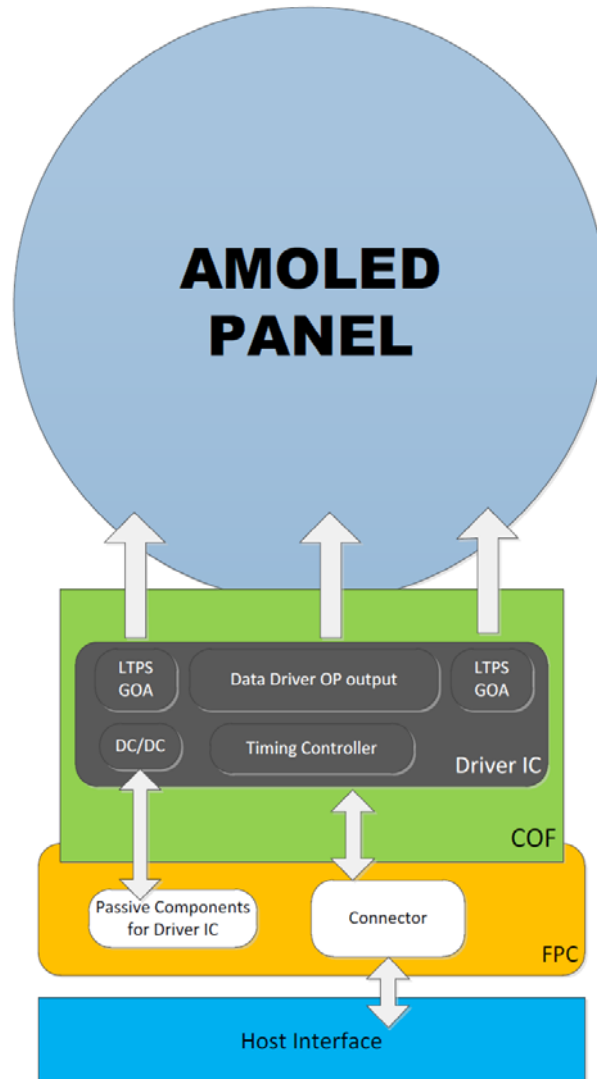
7.3 Application circuit (This is for reference only)

1) RT4723
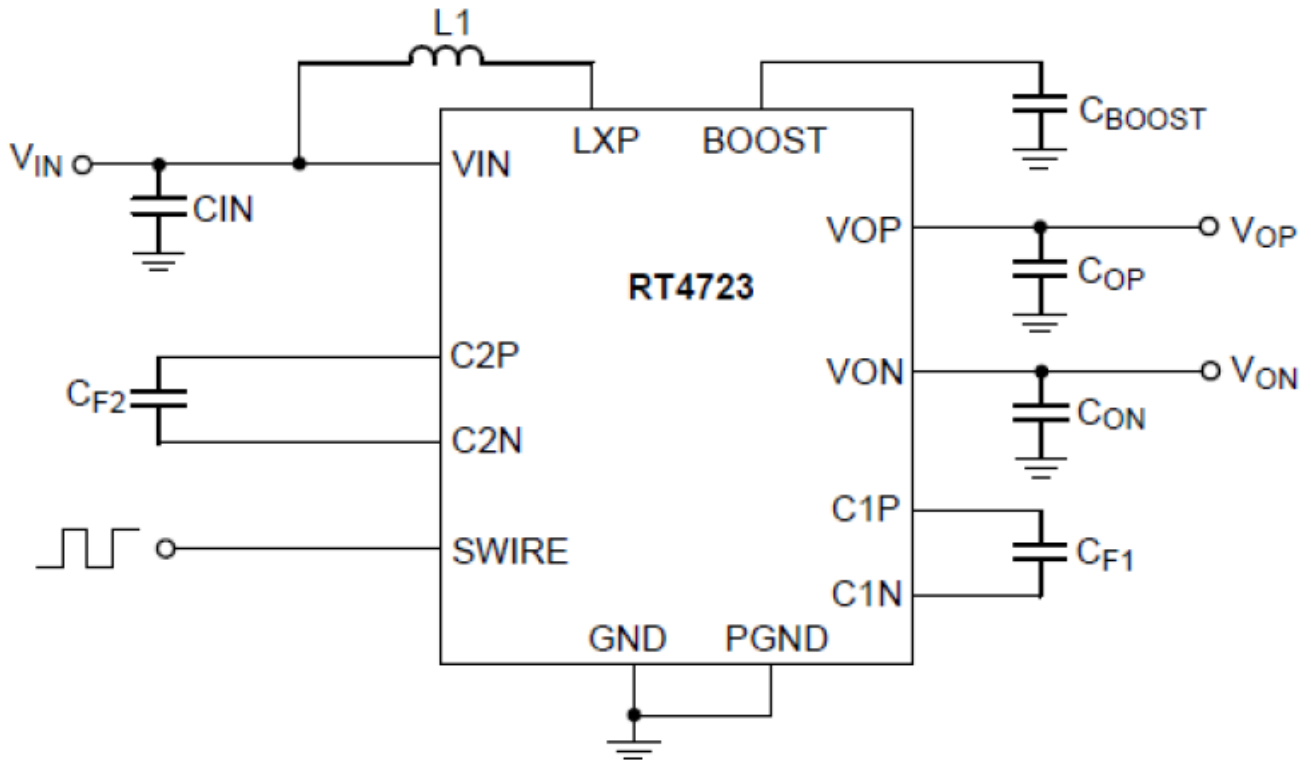
2) SM3321
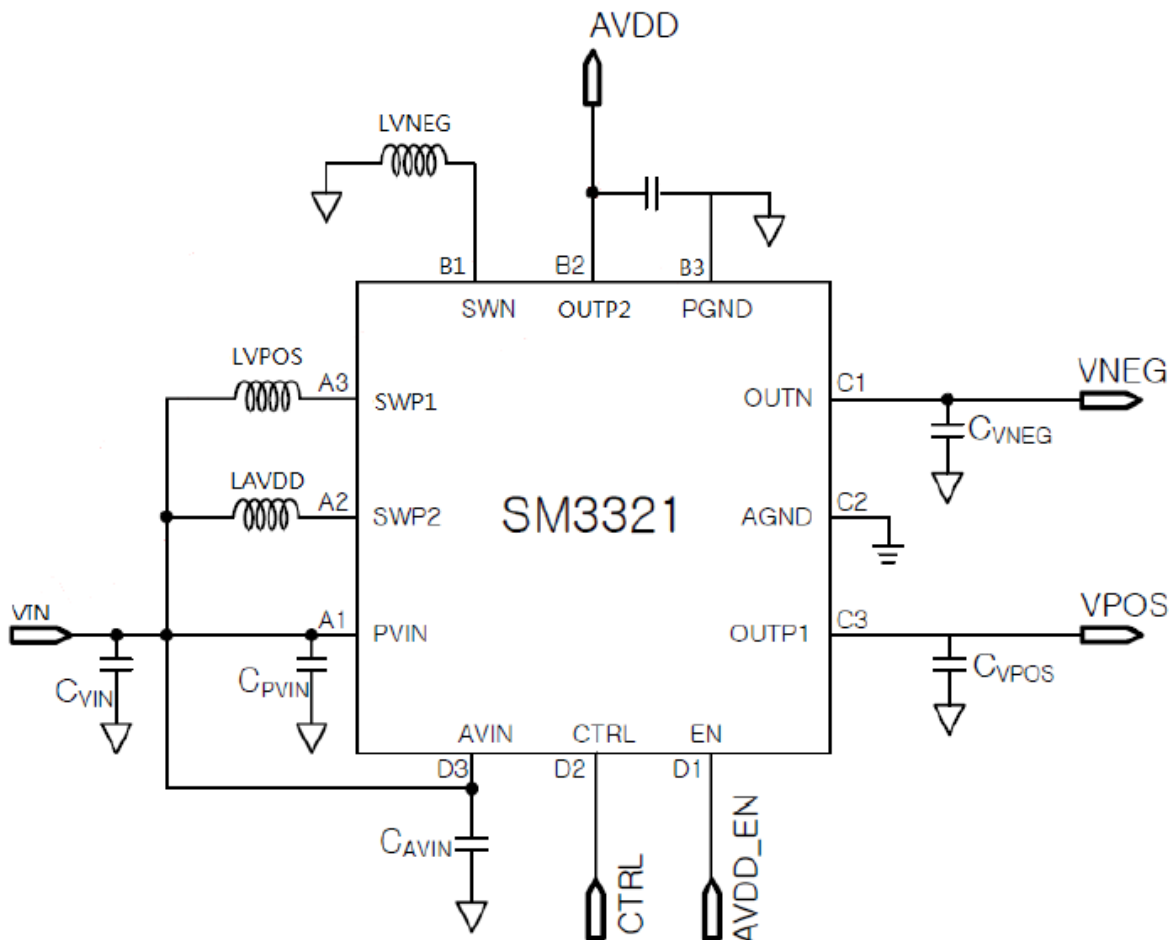
3) TPS65631W
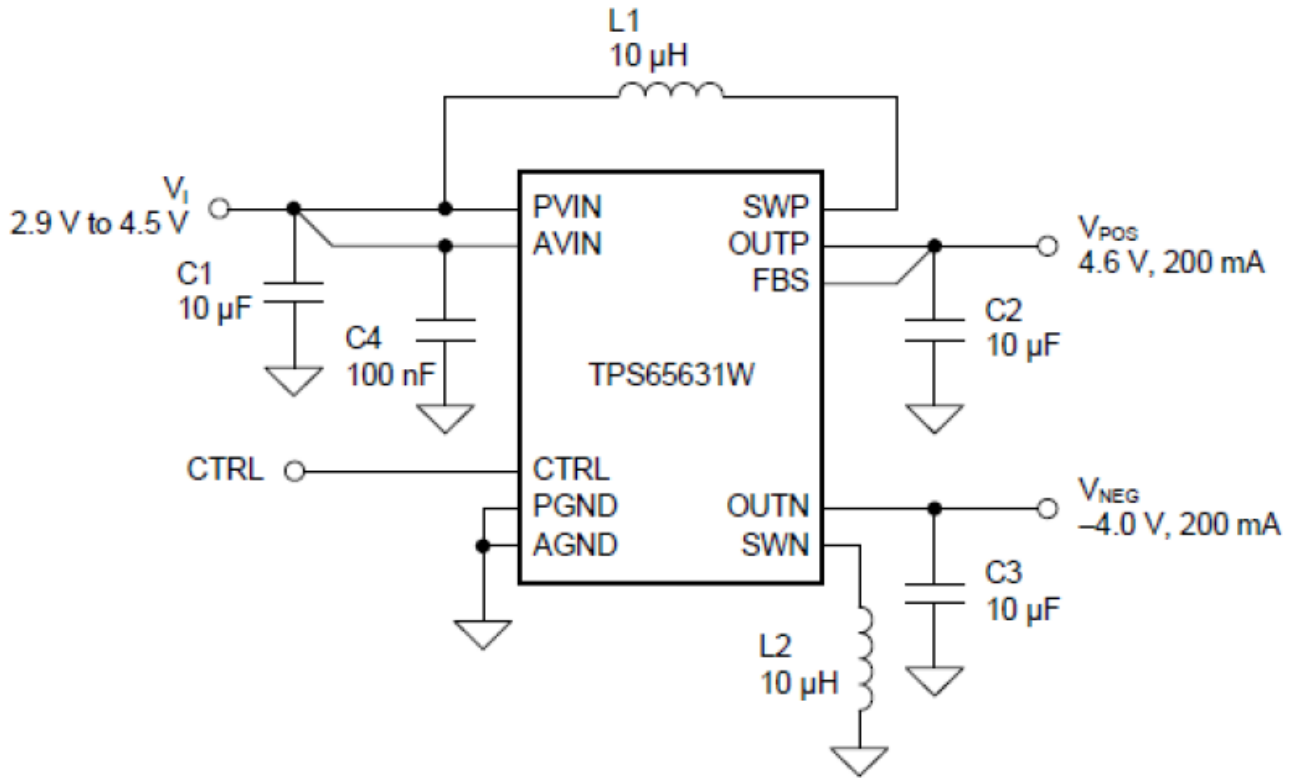
4) STAM1332
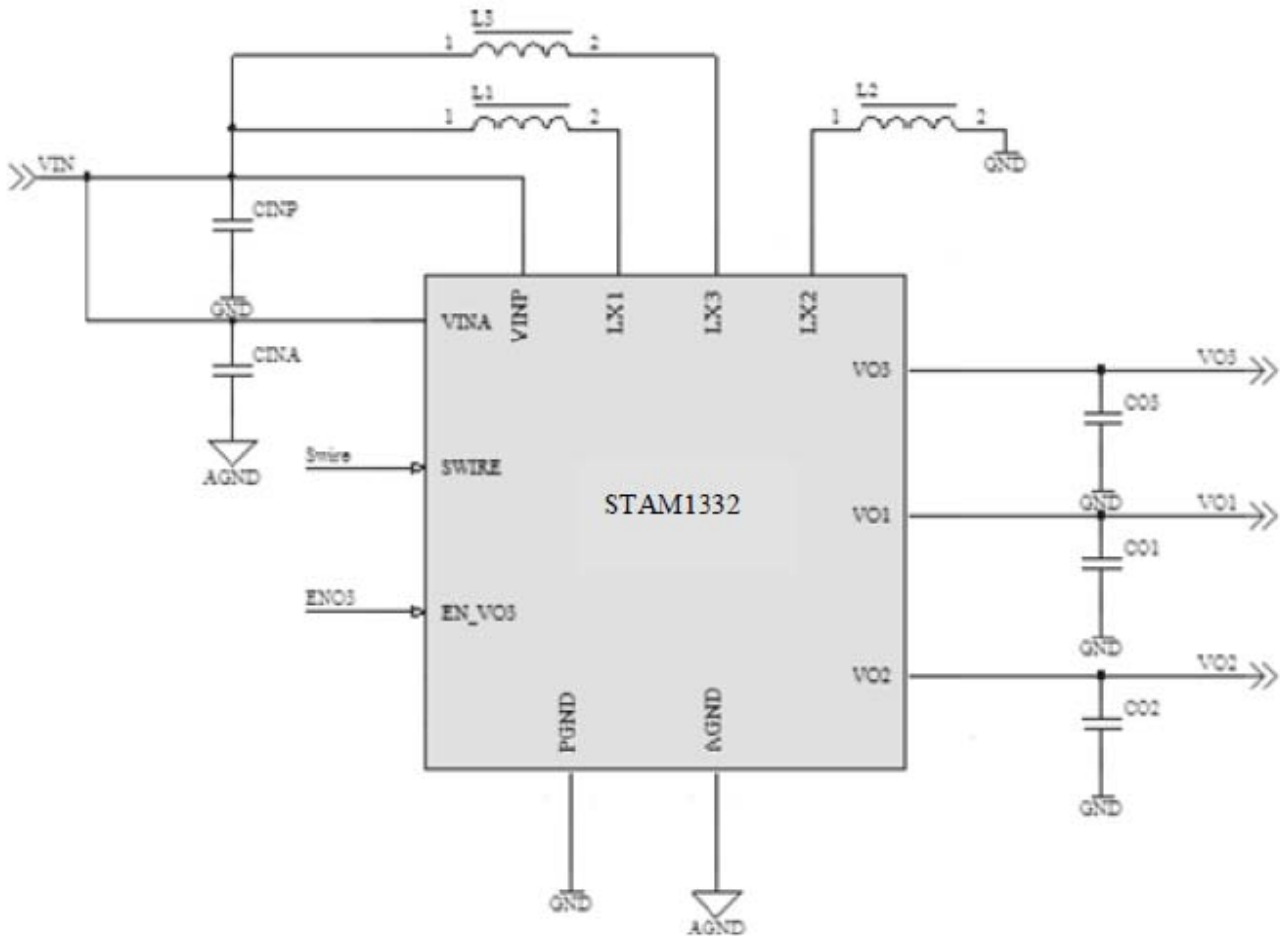
8. Command/AC Timing
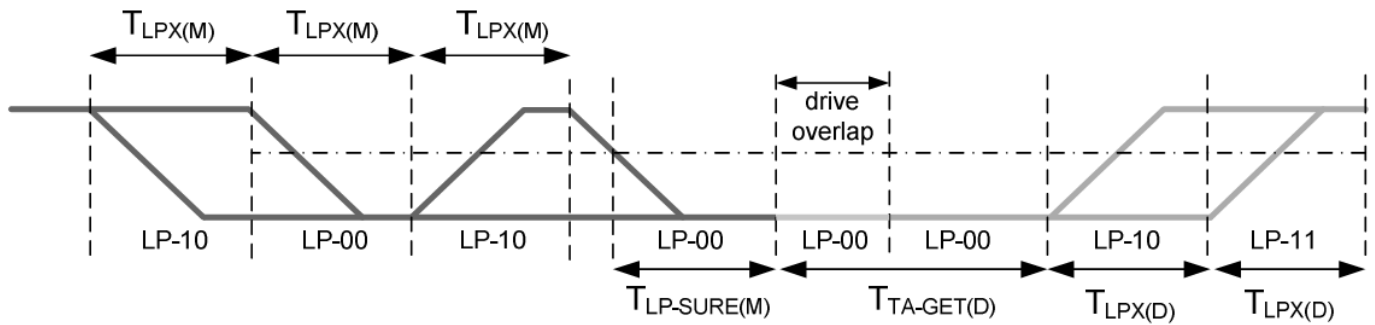
8.1 AC Characteristics (MIPI)

8.1.1 HS Data Transmission Burst
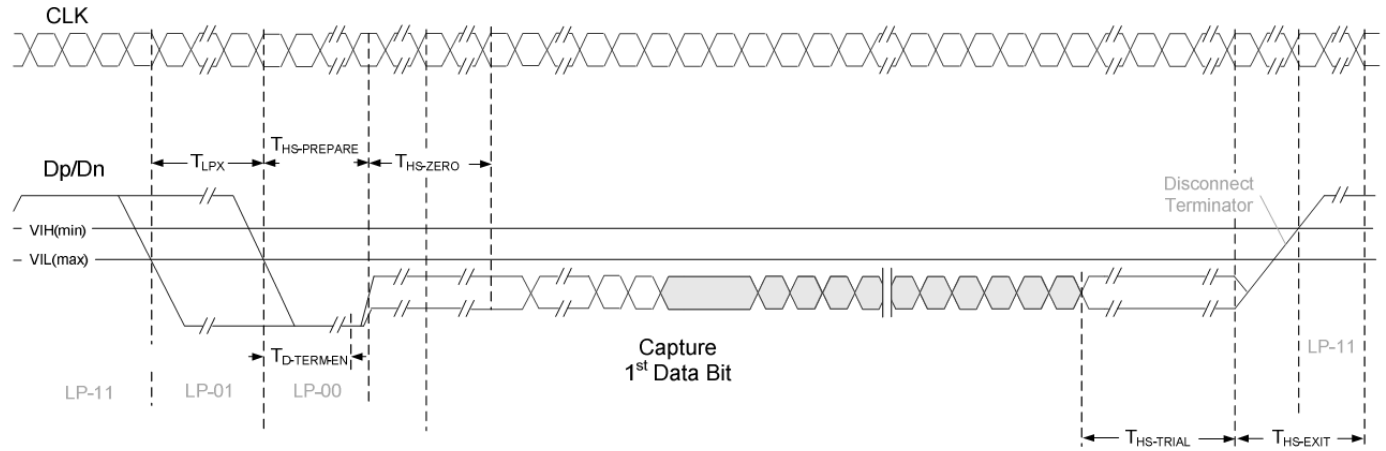
8.1.2 HS Clock Transmission
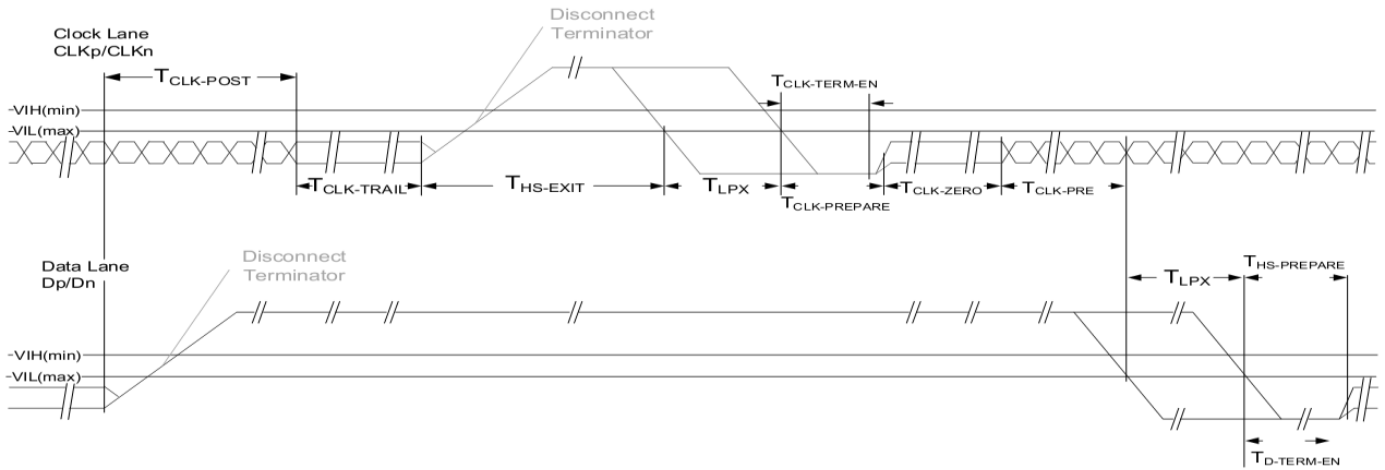
8.1.3 Turnaround Procedure

8.1.4 Timing Parameters

Symbol	Description	Min	Typ	Max	Unit
T_{REOT}	30%-85% rise time and fall time	-	-	35	ns
$T_{CLK-MISS}$	Timeout for receiver to detect absence of clock transitions and disable the clock Lane HS-RX.	-	-	60	ns
$T_{CLK-POST}$*1	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as	60ns+52*UI (For DCS)	-	-	ns

		Min.	Typ.	Max.	Unit
	the period from the end of THS-TRAIL to the beginning of TCLK-TRAIL.				
TCLK-PRE	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8	-	-	ns
TCLK-SETTLE	Time interval during which the HS receiver shall ignore any clock Lane HS transitions, starting from the beginning of TCLK-PRE.	95	-	300	ns
TCLK-TERM-EN	Time for the clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses VIL, MAX.	Time for Dn to reach VTERM-EN	-	38	UI
THS-SETTLE	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of THSPREPARE.	85ns+6*UI	-	145ns+10*UI	ns
TEOT	Time from start of THS-TRAIL or TCLK-TRAIL period to start of LP-11 state.	-	-	105ns+48*UI	ns
THS-EXIT(1)	Time to drive LP-11 after HS burst	100	-	-	ns
THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40ns+4*UI	-	85ns+6*UI	ns
THS-PREPARE + THS-ZERO	THS-PREPARE + Time to drive HS-0 before the Sync sequence	145ns+10*UI	-	-	ns
THS-SKIP	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns
THS-TRAIL	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	60ns+4*UI	-	-	ns
TLPX	Length of any Low-Power state period	50	-	-	ns
Ratio TLPX	Ratio of TLPX(MASTER)/TLPS(SLAVE) between Master and Slave side.	2/3	-	3/2	ns
TTA-GET	Time to drive LP-00 by new TX	5*TLPX	5*TLPX	5*TLPX	ns
TTA-GO	Time to drive LP-00 after Turnaround Request	4*TLPX	4*TLPX	4*TLPX	ns
TTA-SURE	Time-out before new TX side starts driving	TLPX	-	2*TLPX	ns

8.1.5 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.

When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

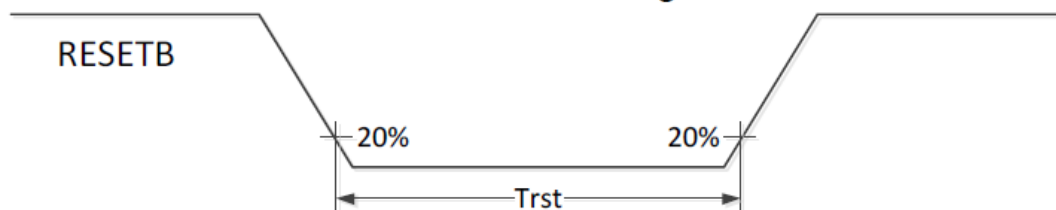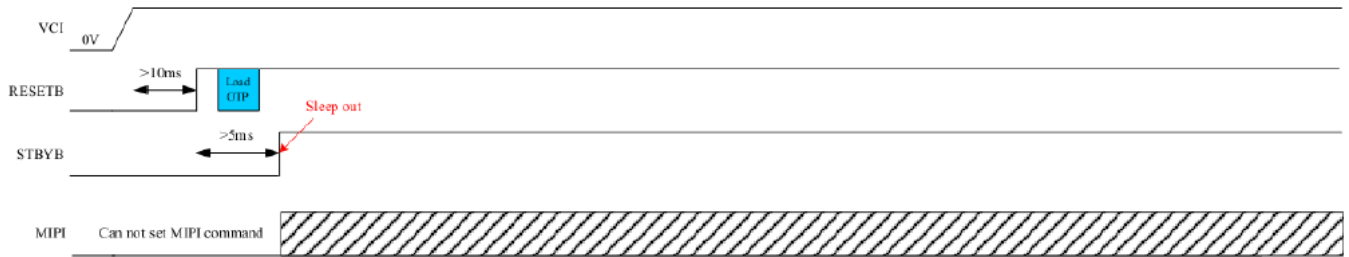The closed interval of Low can be shown as the following.

Figure: Rest timing
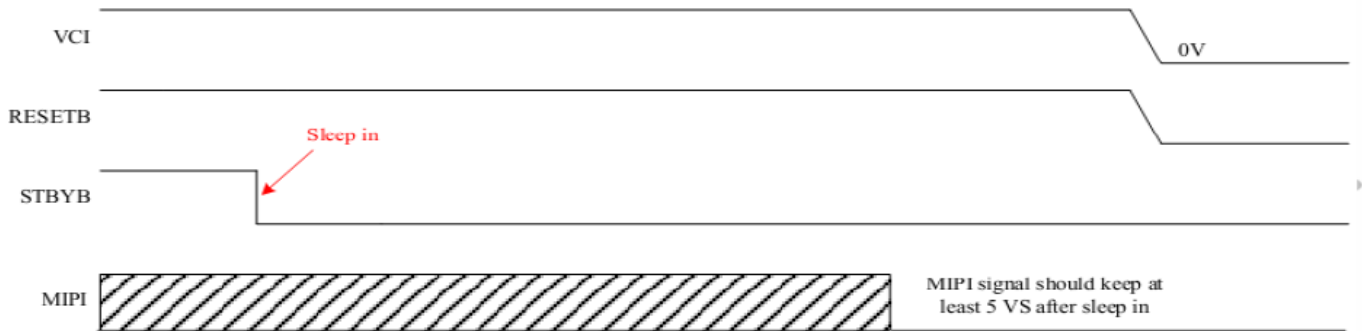
(Test condition: VDDIO=1.65V~3.6V, VSS=0V, Ta=-20℃ ~ +85℃)

Parameter	Symbol	Conditions	Spec			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	µs

8.2 Recommended Operating sequence
8.2.1 Power on Sequence


8.2.2 Power off Sequence

9. Optical Specification

Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	5000	10000	-		Note1 Note2
View Angles		Θ	U/D/L/R CR≥200	80	85	-	Degree	Note 3
Chromaticity	White	x	Normal to surface	0.28	0.30	0.32		Note4, Note1
		y		0.29	0.31	0.33		
	Red	x		0.635	0.665	0.695		
		y		0.304	0.334	0.364		
	Green	x		0.17	0.22	0.27		
		y		0.67	0.72	0.77		
	Blue	x		0.10	0.14	0.18		
		y		0.003	0.04	0.08		
NTSC				85	100		%	
Brightness Uniformity			Full White	80	-		%	Note6
Luminance		L	Full White	315	350	385	cd/m^2	Note1 Note5
Response time		-	-	-	2	4	ms	Note7

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃)

LED back-light: ON, Environment brightness < 150 lx
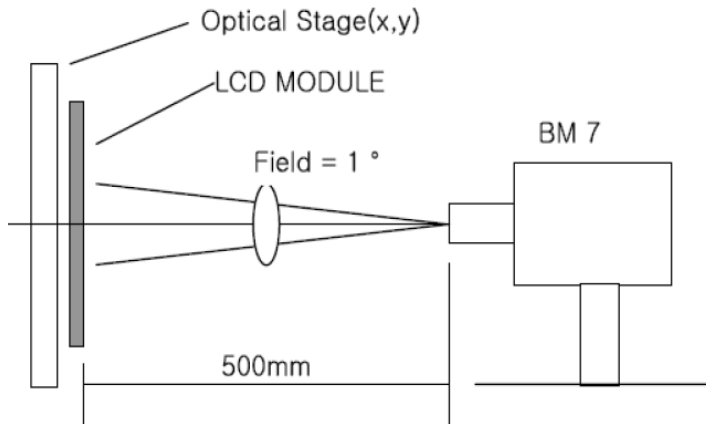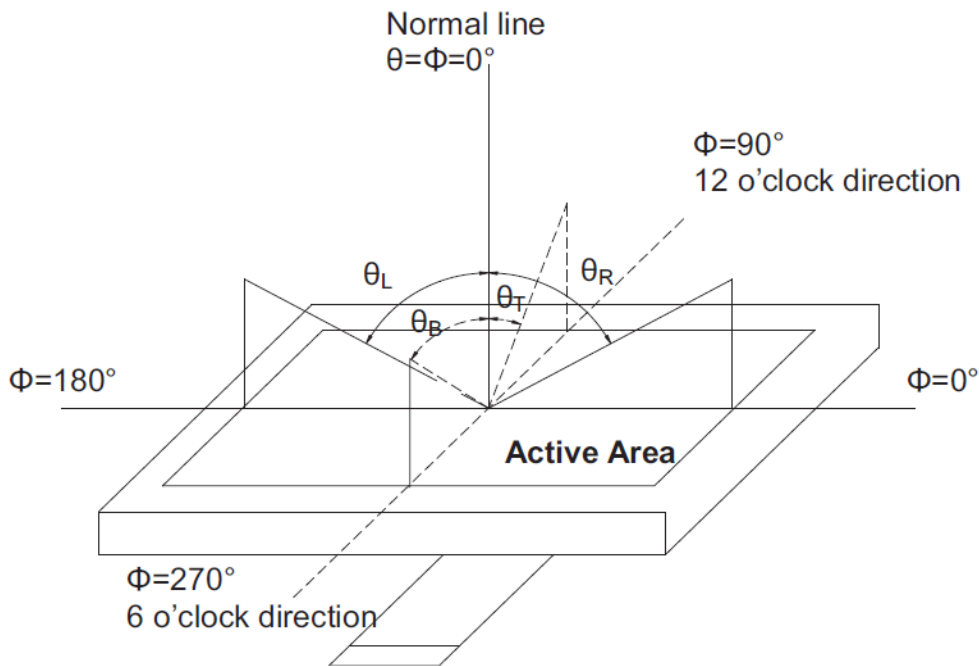

Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$
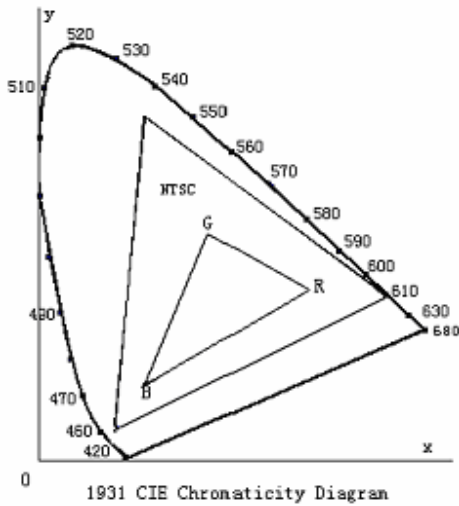
Note 3: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.

Note 4: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.

1931 CIE Chromaticity Diagram

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 5: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

Note 6: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$
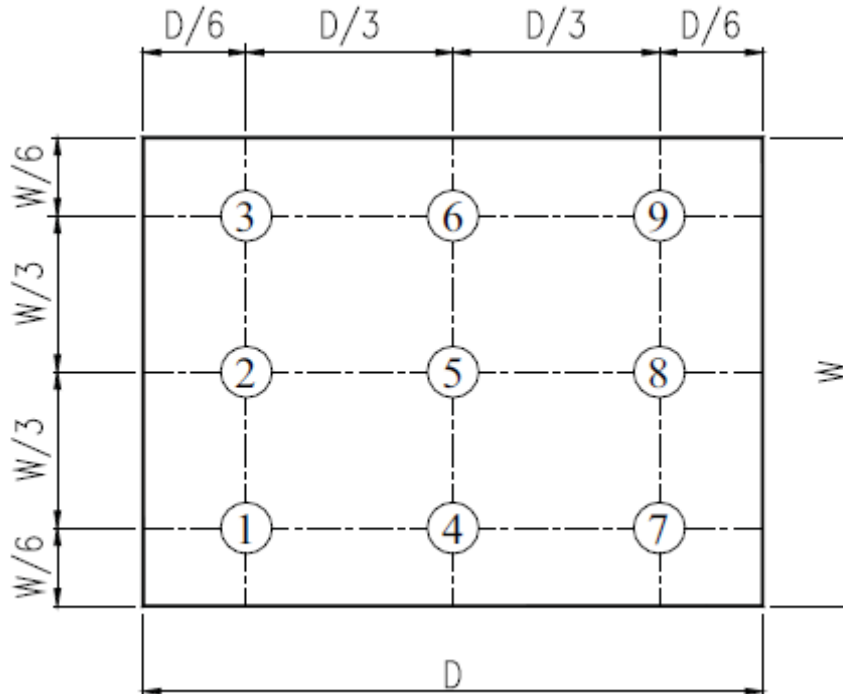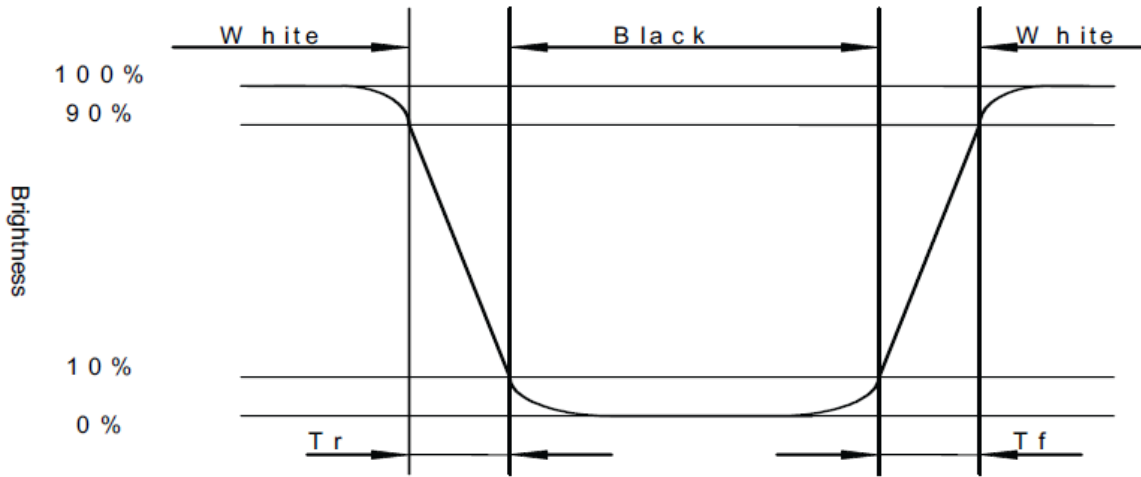

Fig. 2 Definition of uniformity

Note 7: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, Tr) and from white to black(Decay Time, Tf).

White → | ← Black → | ← White

Brightness

100%
90%

10%
0%

Tr | Tf

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70℃, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20℃, 120hrs	Per table in below
3	High Temp Storage	Ta=+80℃, 120hrs	Per table in below
4	Low Temp Storage	Ta=-40℃, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60℃, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-40℃ 30 min~+80℃ 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω，5points/panel Air:±2KV, 2times; Contact:±2KV, 2times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the OLED Panel
Alignment of OLED Panel	No Bubbles in the OLED Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of OLED Modules

11.1 Safety

The liquid crystal in the OLED is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The OLED and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability

C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

D. Provide a space so that the panel does not come into contact with other components.

E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.

B. Ground your body when handling the products.

C. Power on the OLED module before applying the voltage to the input terminals.

D. Do not apply voltage which exceeds the absolute maximum rating.

E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

A. Store the products in a dark place at +25℃±10℃ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.

B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.

B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

A. Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

B. In order to make the display assembly stable and firm, DLC recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.

C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.