Product Specification

Part Name: 5.94 inch TFT Display Module
Customer Part ID:
Topovision Part ID: TVT0600A2-CP
Ver: A

Customer:
Approved by

From: Topovision Technology Co.,Ltd.
Approved by

Notes:

1. Please contact Topovision Technology Co., Ltd. before assigning your product based on this module specification
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Topovision Technology Co., Ltd. for any intellectual property claims or other problems that may result from application based on the module described herein.

1. Introduction

1.1 Scope of application

This specification applies to the LCD module that is supplied by Topovision Technology CO., LTD.
LCD specification: Dots 720xRGBx1280
As to basic specification of the driver IC, refer to the IC (**Raydium:RM68200**) specification and data book.
All material & processing of the LCD module should be Lead Free.

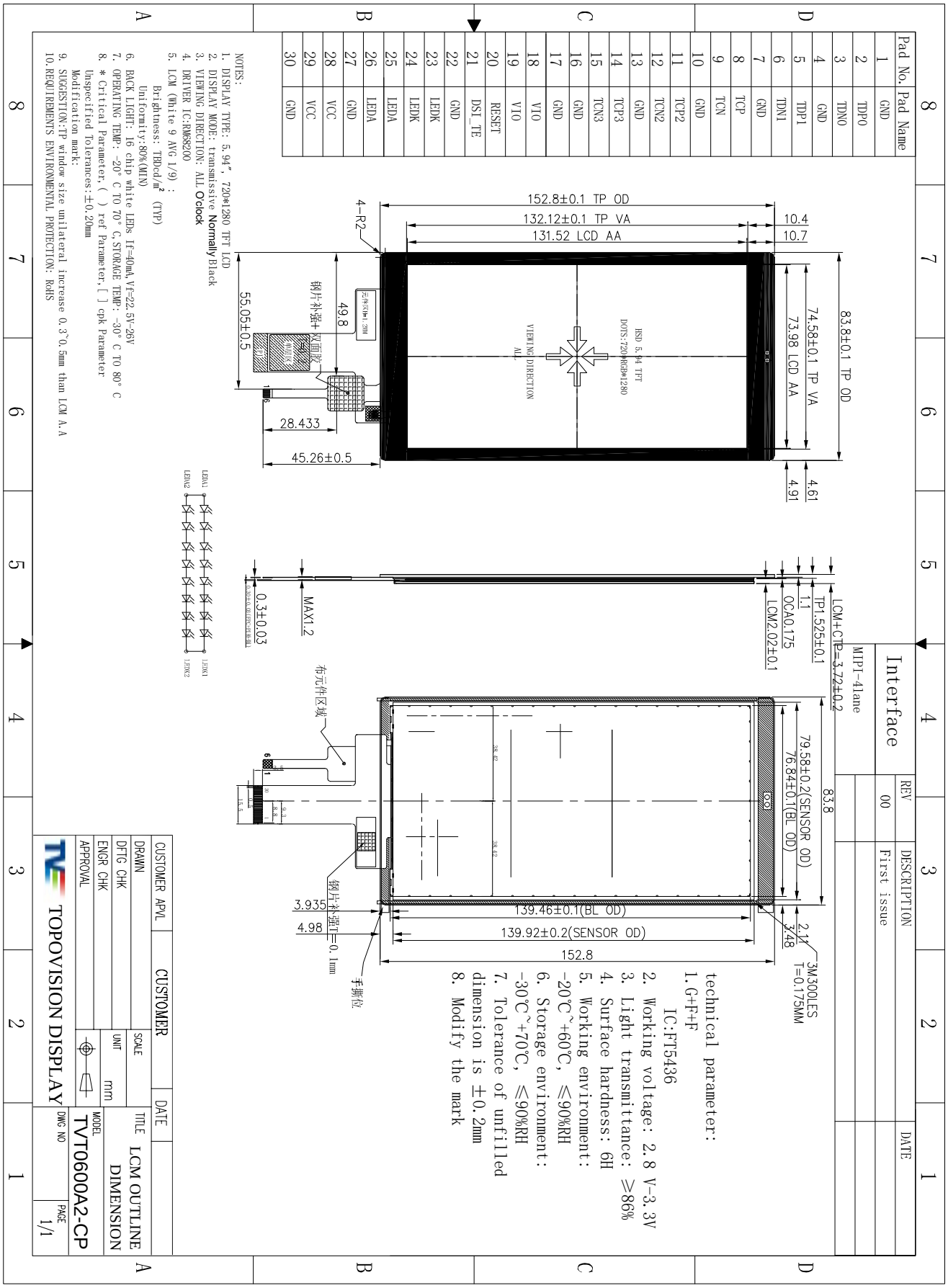
1.2 TFT features:

TFT Structure: TFT PANNEL+IC +FPC+BL;
TP Structure: G+F+F
IPS Type LCD
720dot-segment and 1280 dot-common outputs;
16.7M Color can be selected by software;
White LED back light;
TFT interface: MIPI-4lane
TP interface: I2C

1.3 Applications:

2. LCM General specification

ITEM	Sandard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	720*3RGB(H)X1280(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (W*H)	0.10275(W) × 0. 10275 (H)	mm
Active area	73.98(W) × 131.52(H)	mm
Viewing direction	ALL O'CLOCK	-
TFT Driver IC	RM68200	
TFT interface	MIPI 4Lane	-
TFTModule Size(W*H*T)	76.84(W) ×139.46(H) ×2.02D)	mm
Approx. Weight	TBD	g
Touch structure	G+F+F	
Touch Driver IC	FT5436	-
Touch Interface	I2C	
TP Module Size(W*H*T)	83.3(W) ×152.8(H) ×3.72(D)	


Pad No. Pad Name
1 GND
2 TDP0
3 TDN0
4 GND
5 TDP1
6 TDN1
7 GND
8 TCP
9 TCN
10 GND
11 TCP2
12 TCN2
13 GND
14 TCP3
15 TCN3
16 GND
17 GND
18 VIO
19 VIO
20 RESET
21 DSI_TE
22 GND
23 LEDK
24 LEDK
25 LEDA
26 LEDA
27 GND
28 VCC
29 VCC
30 GND
NOTES:
1. DISPLAY TYPE: 5.94", 720*1280 TFT LCD
2. DISPLAY MODE: transmissive Normally Black
3. VIEWING DIRECTION: ALL Oclock
4. DRIVER IC:RM68200
5. LCM (White 9 AVG 1/9) :
Brightness: TBDcd/m² (TYP)
Uniformity:80%(MIN)
6. BACK LIGHT: 16 chip white LEDs If=40mA,Vf=22.5V~26V
7. OPERATING TEMP: -20° C TO 70° C,STORAGE TEMP: -30° C TO 80° C
8. * Critical Parameter,( ) ref Parameter,[ ] cpk Parameter
Unspecified Tolerances:±0.20mm
Modification mark:
9. SUGGESTION:TP window size unilateral increase 0.3~0.5mm than LCM A.A
10.REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS
152.8±0.1 TP OD
132.12±0.1 TP VA
131.52 LCD AA
10.4
10.7
4-R2
83.8±0.1 TP OD
74.58±0.1 TP VA
73.98 LCD AA
4.61
4.91
55.05±0.5
49.8
钢片补强+双面胶
28.433
45.26±0.5
MAX1.2
0.3±0.03
LCM+CTP=3.72±0.2
TP1.525±0.1
1.1
OCA0.175
LCM2.02±0.1
83.8
79.58±0.2(SENSOR OD)
76.84±0.1(BL OD)
3M300LES
T=0.175MM
2.11
3.48
139.46±0.1(BL OD)
139.92±0.2(SENSOR OD)
152.8
3.935
4.98
钢片补强T=0.1mm
手撕位
布元件区域
Interface
MIPI-4lane
technical parameter:
1.G+F+F
IC:FT5436
2. Working voltage: 2.8 V-3.3V
3. Light transmittance: ≥86%
4. Surface hardness: 6H
5. Working environment:
-20℃~+60℃, ≤90%RH
6. Storage environment:
-30℃~+70℃, ≤90%RH
7. Tolerance of unfilled dimension is ±0.2mm
8. Modify the mark
REV
DESCRIPTION
DATE
00
First issue
CUSTOMER APVL
CUSTOMER
DATE
DRAWN
SCALE
TITLE
LCM OUTLINE DIMENSION
DFTG CHK
UNIT
mm
ENGR CHK
APPROVAL
MODEL
TVT0600A2-CP
TOPOVISION DISPLAY
DWG NO
PAGE
1/1

3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T_{OPR}	-20	+70	°C
LCM Storage Temperature	T_{STG}	-30	+80	°C
TP Operating Temperature & Humidity(20% ~ 90%RH)	T_{OPR}	-20	+70	°C
TP SStorage Temperature & Humidity(20% ~ 90%RH)	T_{STG}	-30	+80	°C
Humidity	RH	-	90	%

4.Electrical Characteristics

4.1.1TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for I/O	VDDIO	1.65	1.8	3.3	V
Supply Voltage for(DC/DC)	VDD	2.5	2.8	3.6	V
Supply Voltage for(DC/DC)	AVDD				V
Supply Voltage for(DC/DC)	AVEE				V
Current Consumption	I_{DD}	-	TBD	-	mA
	$I_{DD-SLEEP}$		TBD		uA

4.1.2Touch Electric Characteristics

项目 Items	值 Value
工作电压Working voltage	DC2.8~ 3.3V
绝缘阻抗Insulation Resistance	> 20M
工作电流Working current	12mA~14.5mA
响应时间Response time	≤16ms

4.2 Back-Light Unit Characeristics

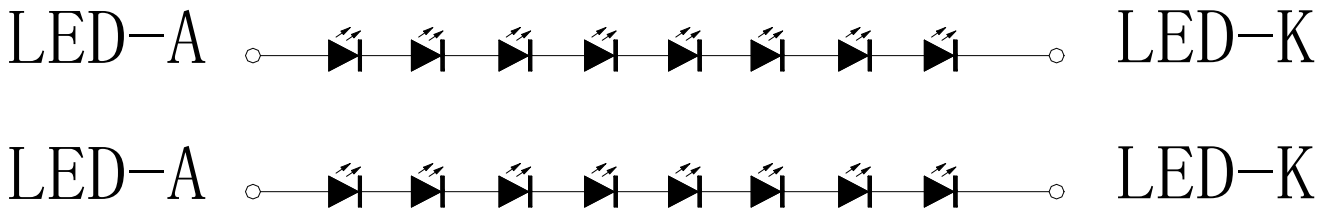
The back-light system is an edge-lighting type with16 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V_F	22.5	--	26	V	-
Forward current	I_F	--	40	-	mA	-
Luminance(With LCD)	Lv		300	--	cd/m^2	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

(1) The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_L=20mA/LED. The LED life time could be decreased if operating I_L is larger than 25mA/LED.

Backlight circuit diagram shown in below:



5. Module Function Description

Pin No.	Symbol	Functional	Notes
1	GND	Power Ground	
2	TDP0	MIPI DSI differential data pair	
3	TDN0		
4	GND	Power Ground	
5	TDP1	MIPI DSI differential data pair	
6	TDN1		
7	GND	Power Ground	
8	TCP	MIPI DSI differential clock pair	
9	TCN		
10	GND	Power Ground	
11	TDP2	MIPI DSI differential data pair	

12	TDN2		
13	GND	Power Ground	
14	TDP3	MIPI DSI differential data pair	
15	TDN3		
16	GND	Power Ground	
17	GND	Power Ground	
18	IOVCC	I/O Voltage (VDDI to DGND): 1.65V ~ 3.3V	
19	IOVCC	I/O Voltage (VDDI to DGND): 1.65V ~ 3.3V	
20	RESET	Reset signal input terminal. Active at 'L'.	
21	TE	Tearing effect output pin to synchronize MPU to frame writing	
22	GND	Power Ground	
23	LEDK	Power supply for backlight cathode input terminal.	
24	LEDK	Power supply for backlight cathode input terminal.	
25	LEDA	Power supply for backlight anode input terminal.	
26	LEDA	Power supply for backlight anode input terminal.	
27	GND	Power Ground	
28	VCC	MIPI Voltage (VDDAM to VSSAM): 2.5V ~ 3.6V	
29	VCC	MIPI Voltage (VDDAM to VSSAM): 2.5V ~ 3.6V	
30	GND	Power Ground	

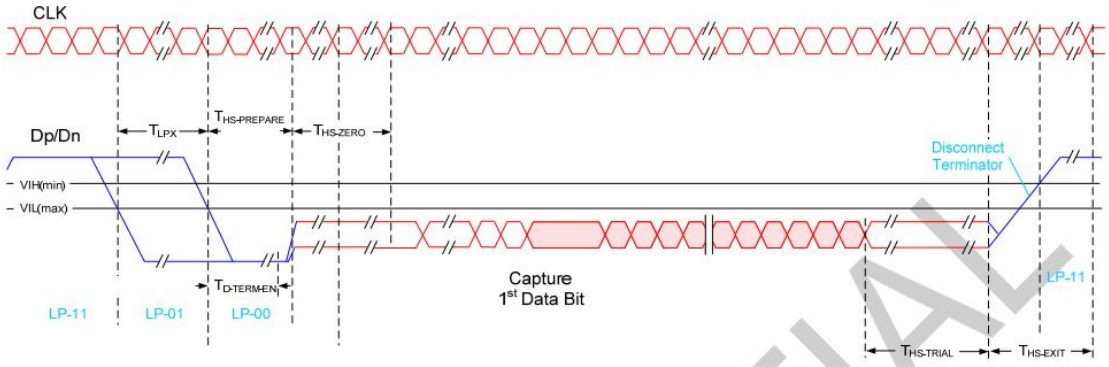
TP Pin Descriptions

NO:	SYMBOL	I/O	FUNCTION
1	SCL	I/O	Touch panel I2C clock
2	SDA	I/O	Touch panel I2C data
3	GND	P	Ground
4	RST	I/O	Touch panel reset
5	INT	I/O	Touch panel interrupt output
6	VDD	P	Touch panel I/O PWR supply

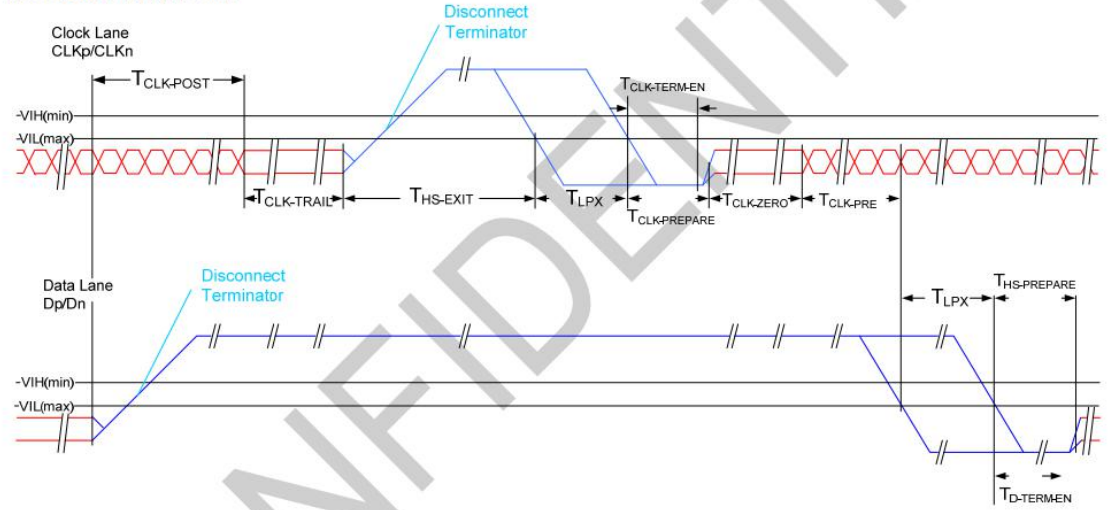
6. Timing Characteristics

9.5.4 DSI Timing Characteristics

HS Data Transmission Burst



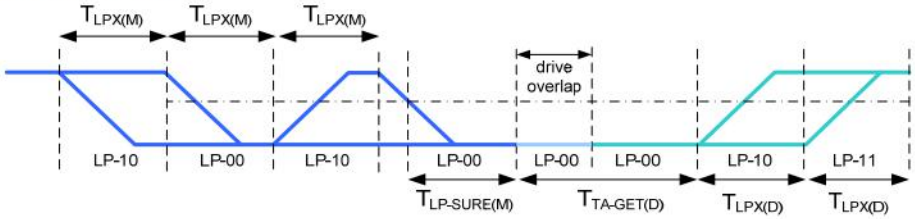
HS clock transmission



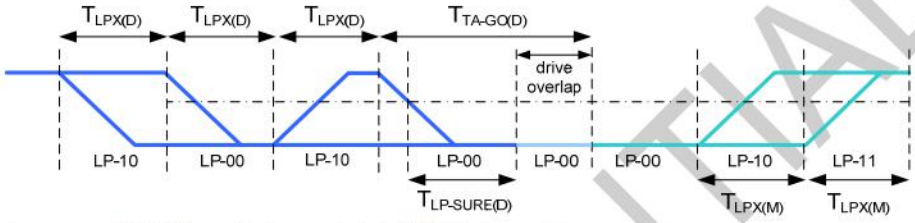
Timing Parameters:

Parameter	Description	Min	Typ	Max	Unit
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$.	60ns + 52*UI			ns
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.	60			ns
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following a HS burst.	**300**			ns
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38	ns
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	38		95	ns
$T_{CLK-PRE}$	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			UI
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.	300			ns
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		35 ns +4*UI	
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission	40ns + 4*UI		85 ns + 6*UI	ns
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.	145ns + 10*UI			ns
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	60ns + 4*UI			ns

Turnaround Procedure



Bus turnaround (BAT) from MPU to display module timing



Bus turnaround (BAT) from display module to MPU timing

Low Power Mode:

Parameter	Description	Min	Typ	Max	Unit	Notes
$T_{LPX(M)}$	Transmitted length of any Low-Power state period of MCU to display module	50		**150**	ns	1,2
$T_{TA-SURE(M)}$	Time that the display module waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.	$T_{LPX(M)}$		$2*T_{LPX(M)}$	ns	2
$T_{LPX(D)}$	Transmitted length of any Low-Power state period of display module to MCU	50		**150**	ns	1,2
$T_{TA-GET(D)}$	Time that the display module drives the Bridge state (LP-00) after accepting control during a Link Turnaround.		$5*T_{LPX(D)}$		ns	2
$T_{TA-GO(D)}$	Time that the display module drives the Bridge state (LP-00) before releasing control during a Link Turnaround.		$4*T_{LPX(D)}$		ns	2
$T_{TA-SURE(D)}$	Time that the MPU waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.	$T_{LPX(D)}$		$2*T_{LPX(D)}$	ns	2

NOTE:
1. T_{LPX} is an internal state machine timing reference. Externally measured values may differ slightly from the specified values due to asymmetrical rise and fall times.
2. Transmitter-specific parameter

7.Optical Characteristics

Items		Symbol	Condition	Specifications			Unit	
				Min.	Typ.	Max.		
Contrast Ratio		CR		-	800	-	-	
Response Time		$T_R + T_F$		-	35	-	ms	
				-	-	-	ms	
Chromaticity	Red	X_R			/		-	
		Y_R			/		-	
	Green	X_G			/		-	
		Y_G			/		-	

	Blue	X_B			/		-	
		Y_B			/		-	
	White	X_W		0.28	0.31	0.34	-	
		Y_W		0.29	0.32	0.35	-	
Viewing angle	Hor.	ϕ1(3 o'clock)	Center CR≥10	-	80	-	g.	
		ϕ2(9 o'clock)		-	80	-		
	Ver.	θ2(12 o'clock)		-	80	-		
		θ1(6 o'clock)		-	80	-		
Uniformity					--		%	

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

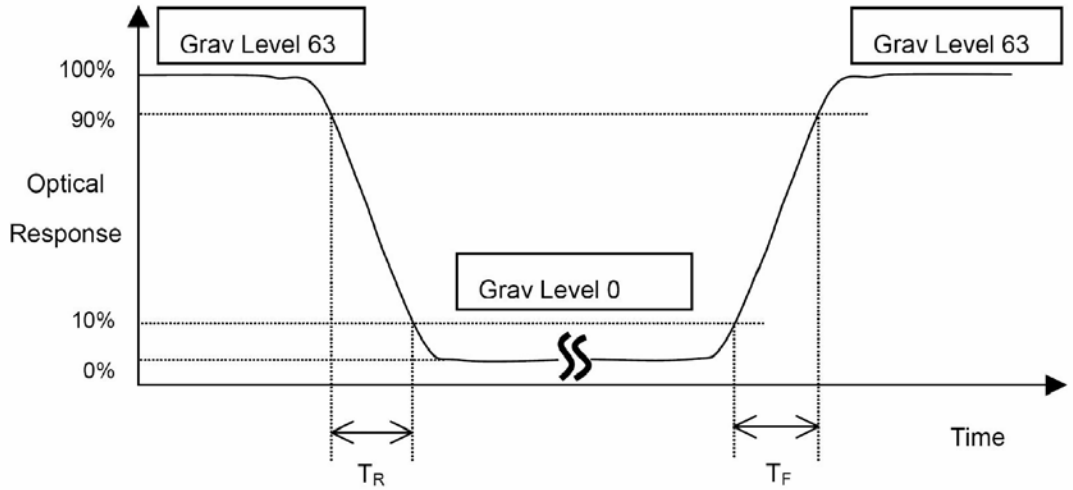
L63: Luminance of gray level 63

L0: Luminance of gray level 0

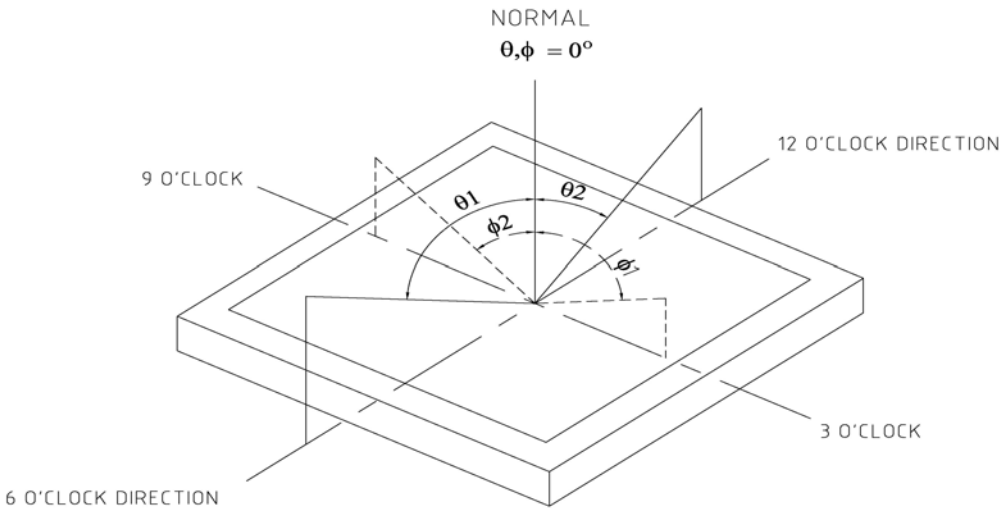
CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

Note 2: Definition of Response Time (TR, TF):



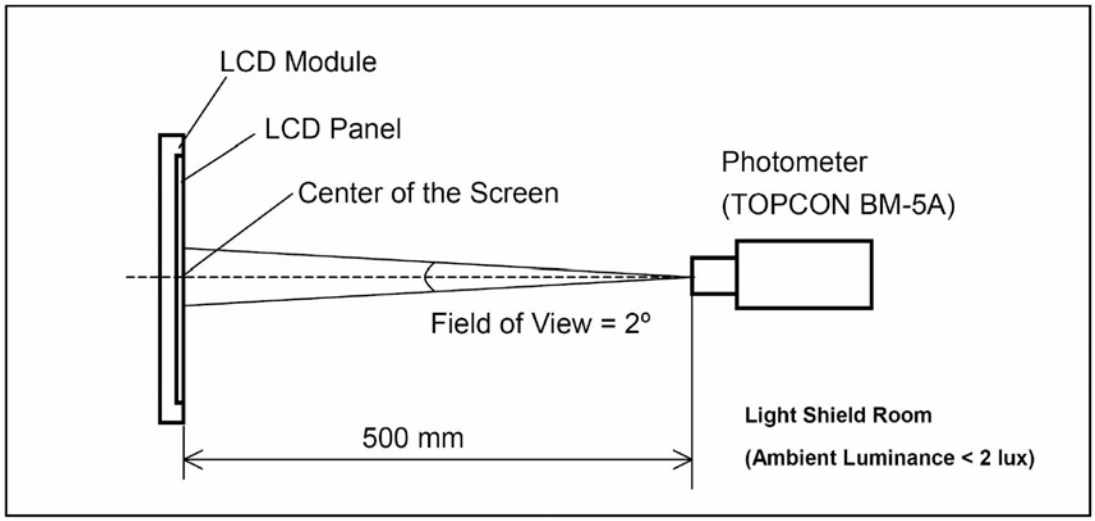
Note 3: Viewing Angle



The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

Note 4: Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



8. Reliability Test Item

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C, 240hrs	-
2	Low Temperature Storage	Ta=-30°C, 240hrs	-
3	High Temperature Operation	Ta=+70°C, 240hrs	-
4	Low Temperature Operation	Ta=-20°C, 240hrs	-
5	High Temperature and High Humidity (Operating)	Ta=+60°C, 90%RH, 240hrs	-

Note: (1) All tests above are practiced at module type.
(2) There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

9. Packing Method----TBD

- END -