

TFT-IPS LCD Simple Display

AM043NDG01

AM - Amulet
043- 4.3" Diagonal
N- 480x272 Resolution
D- No Touch
G- Simple Display
01- Revision

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Date: _____

For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

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2. Revision Record

Date	Rev. No.	Page	Revision Items	Prepared
9-25-2019	A		Initial Release	JG

3. General Specifications

AM043NDG01 is a TFT-LCD module with an exceptionally bright IPS display. IPS (in-plane-switching) technology is an improvement on the traditional TFT display module with enhanced features and more widespread acceptance as in modern smartphones and tablets. IPS LCD monitors consist of the following high-end advantages:

- Wide Symmetric Viewing Angles
- High Transmittance
- Better Color Reproduction
- Quicker Response Times

This product is RoHS compliant.

Item	Specifications	Unit
LCD type	TFT-IPS	
Display color	16.7M	
Viewing direction	ALL	
Display resolution	480x272	pixels
Operating temperature	-20 to +70	°C
Storage temperature	-30 to +80	°C
Module size	105.5 x 67.2 x 2.95	WxHxD (mm)
Brightness	500	cd/m ²
Contrast ratio	800	
Power supply voltage	3.3	V

4. Absolute Maximum Ratings (Ta=25°C)

4.1. Electrical Absolute Maximum Ratings (GND=0V,Ta=25)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	4.0	V	1,2

Notes:

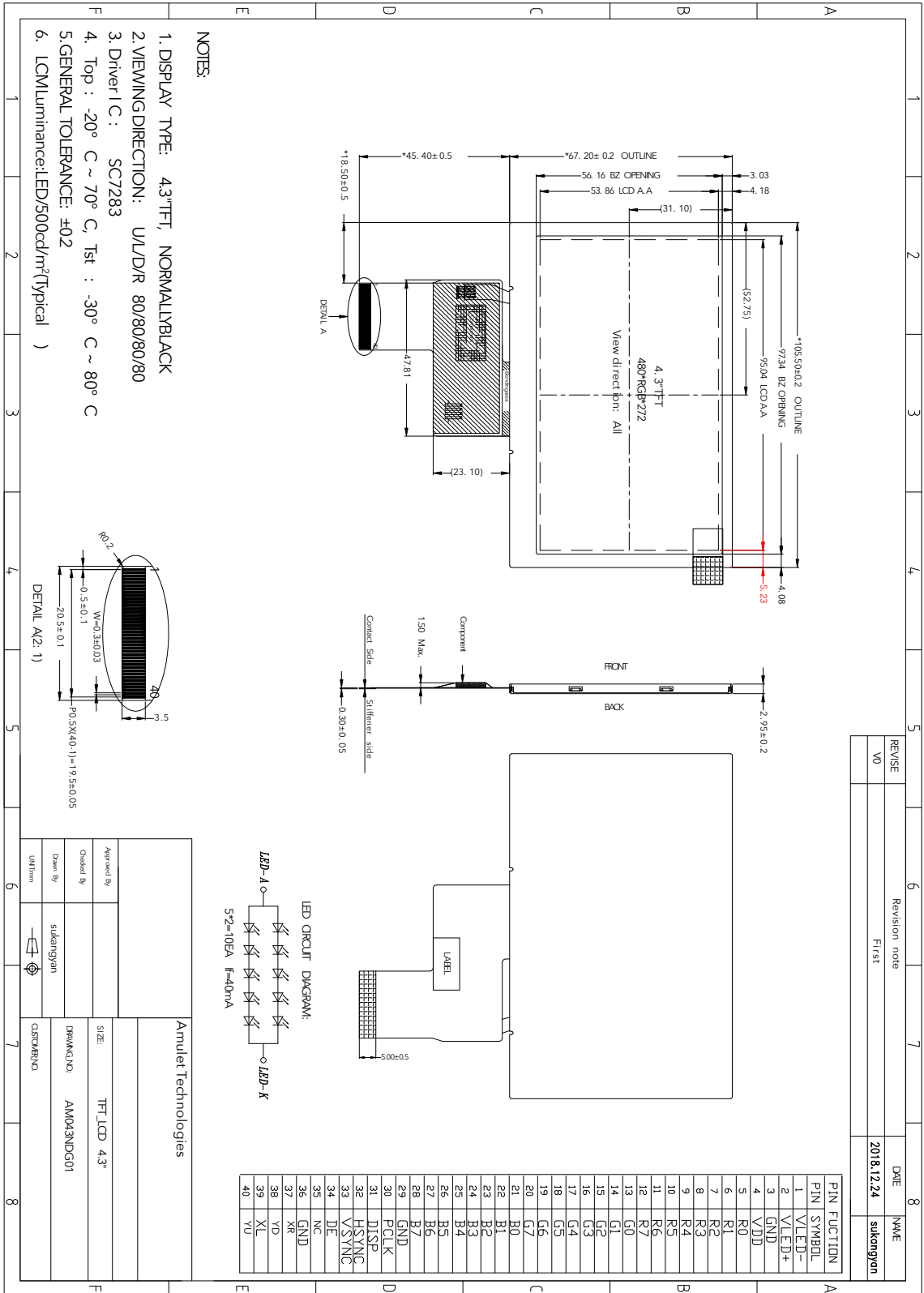
1. If the module is operated above the absolute maximum rating, permanent damage may occur. Operating outside the recommended voltage can lead to module malfunction and poor reliability.
2. VDD>GND must be maintained.

4.2. Environmental Absolute Maximum Ratings

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30°C	+80°C	-20°C	+70°C	1,2
Humidity	-	-	-	-	3

1. Operating below the minimum recommendation can lead to slower response time.
2. Background color changes slightly depending on ambient temperature. This effect is reversible.
3. Ta<=40°C: 85%RH MAX.
Ta>=40°C: Absolute humidity must be lower than the humidity of 85%RH at 40°C.

5. Outline Drawing



6. Electrical Specifications

6.1. Electrical characteristics (GND=0V, Ta=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note	
Power Supply	VDD	Ta=25°C	3.0	3.3	3.6	V		
Input Voltage	'H'	V _{IH}	V _{DD} =3.3V	0.8V _{DD}	-	V _{DD}	V	
	'L'	V _{IL}	V _{DD} =3.3V	0	-	0.2V _{DD}	V	
Current Consumption	I _{DD1}	Normal mode	-	30	45	mA	1	
	I _{DD2}	Sleep mode	-	0.1	-	ma	1	

Note:

1. When an optimum contrast is obtained in transmissive mode.

6.2. LED backlight specification (GND=0V, Ta=25°C)

Item	Symbol	Min	Typ	Max	Unit	Note
Backlight supply voltage	V _f	-	15	-	V	
Backlight supply current	I _{LED}	-	40	-	mA	
Backlight lifetime	time	-	20000	-	hours	1

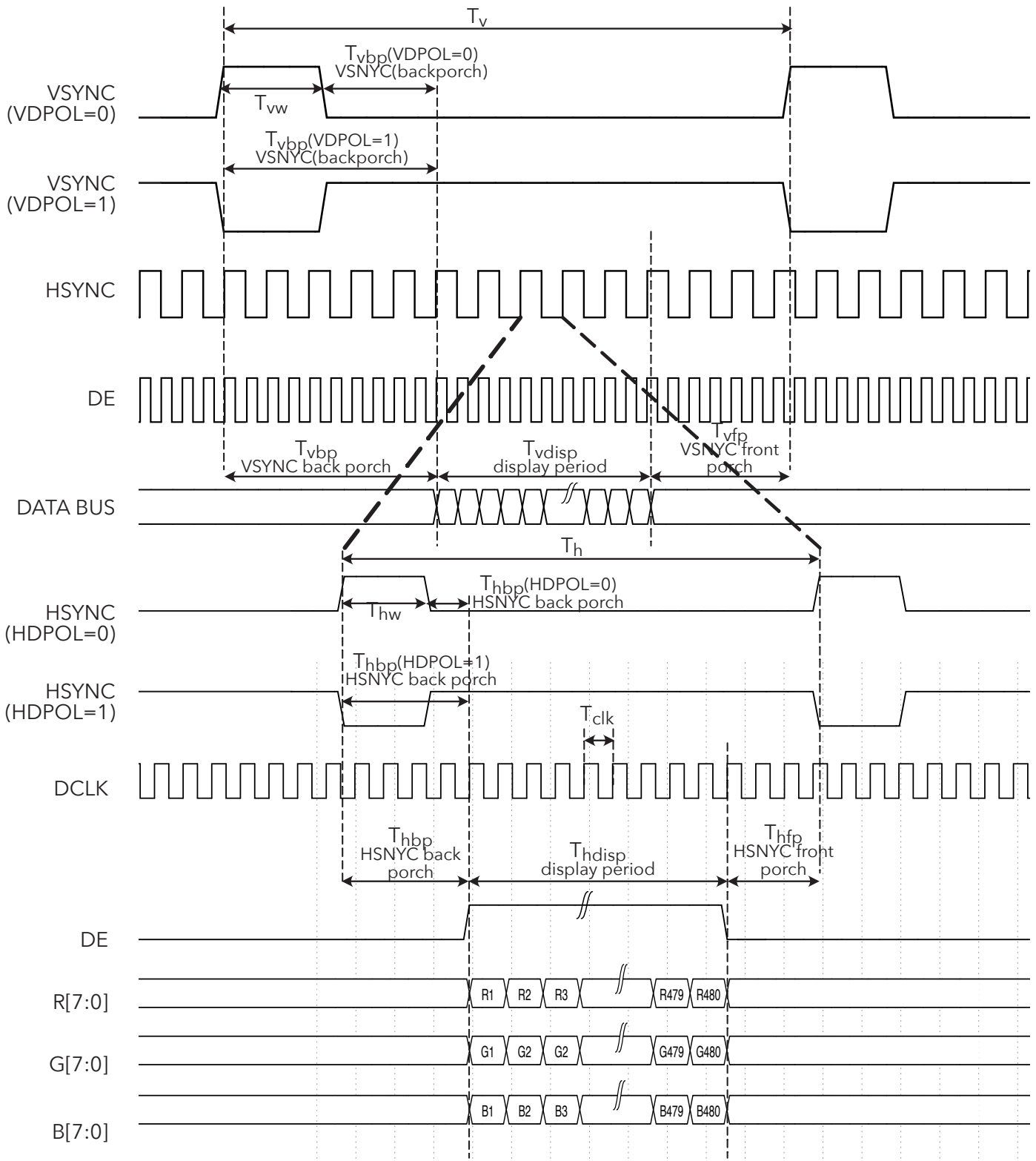
Note:

1. The "Backlight lifetime" is defined as the time it takes for the display brightness to decrease by 50% from the original brightness, operating continuously at Ta=25°C and I_{LED} =40mA.

6.3. Interface signals

Pin No.	Symbol	I/O	Function
1	VLED-	P	LED backlight (Cathode)
2	VLED+	P	LED backlight (Anode)
3	GND	P	Ground
4	VDD	P	Power supply
5-12	R0~R7	I	Red data bus
13-20	G0~G7	I	Green data bus
21-28	B0~B7	I	Blue data bus
29	GND	P	Ground
30	PCLK	I	Pixel Clock
31	DISP	I	Normal/Standby Display Select Pin
32	HSYNC	I	Horizontal sync
33	VSYNC	I	Vertical sync
34	DE	I	Data enable
35	NC	-	No Connect
36	GND	P	Ground
37	XR	O	Touchpanel right
38	YD	O	Touchpanel down
39	XL	O	Touchpanel left
40	YU	O	Touchpanel up

6.4. RGB Interface



SYNC-DE Mode

480 X 272 Resolution Timing Table

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
DCLK Frequency	Fclk	8	9	12	MHz		
DCLK Period	Tclk	83	111	125	ns		
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp		272		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp=12 and Thbp=43 in sync mode. DE mode is unnecessary to keep it.

7. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Brightness	Bp	$\theta=0^\circ$		500		Cd/m ²	1
Uniformity	▲Bp	$\Phi=0^\circ$	80	-		%	1,2
Viewing Angle	3:00	CR \geq 10		80		Deg	3
	6:00			80			
	9:00			80			
	12:00			80			
Contrast Ratio	Cr	$\theta=0^\circ$	640	800			4
Response Time	T _r + T _f	$\Phi=0^\circ$		30	40	ms	5
Color of CIE Coordinate	White	x	$\theta=0^\circ$ $\Phi=0^\circ$	0.32		-	1,6
		y		0.34		-	
	Red	x		0.51		-	
		y		0.34		-	
	Green	x		0.31		-	
		y		0.56		-	
	Blue	x		0.15		-	
		y		0.14		-	
NTSC Ratio	S		50	60	-	%	

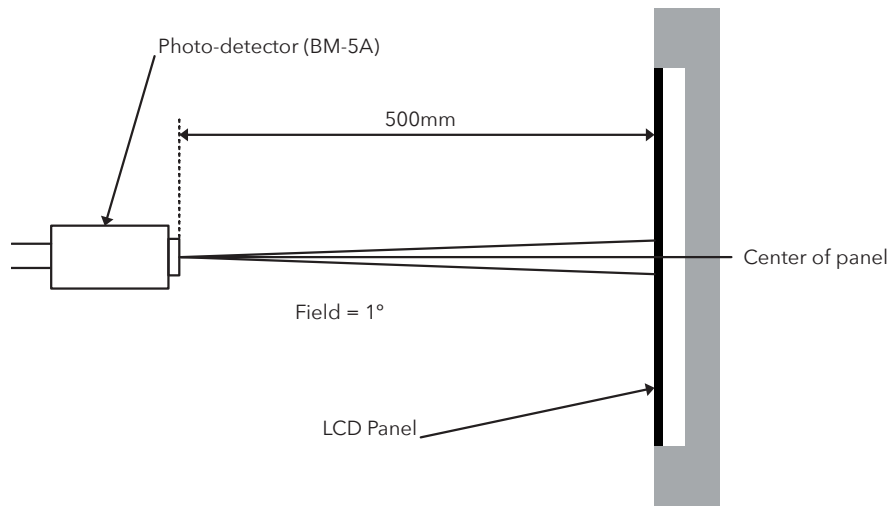
Note : The parameter is slightly changed by temperature, driving voltage and materiel

Note1: Measurements are made after LEDs have been turned on for 15 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ 5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

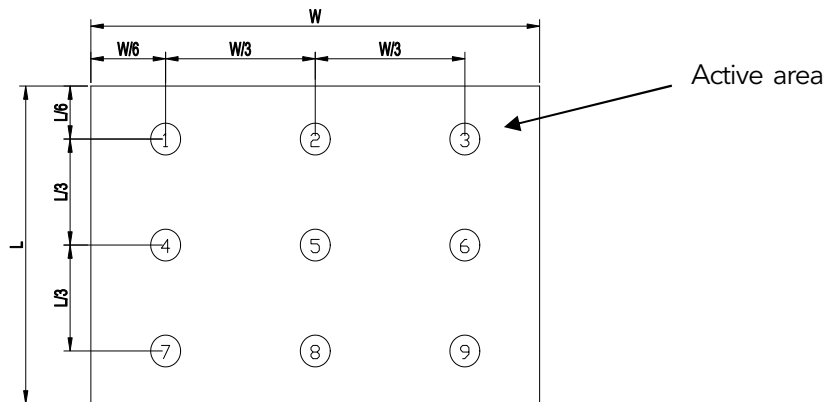
Measured value at the center point of LCD panel after more than 15 minutes while backlight turning



Note 2: The luminance uniformity is calculated by using following formula:

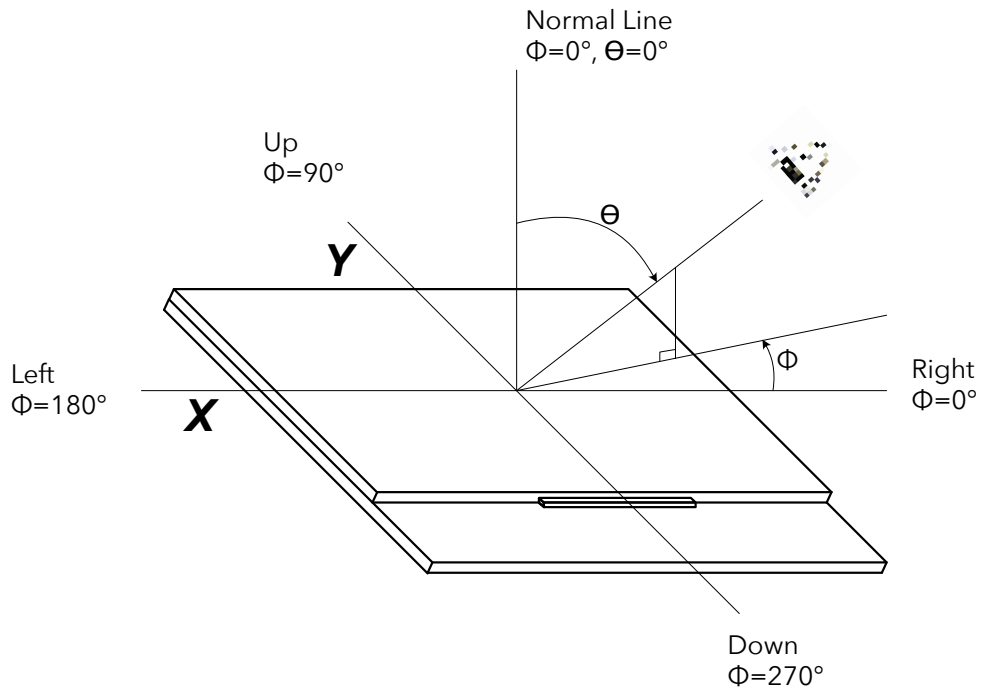
$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

$B_p (\text{Max.})$ = Maximum brightness in 5 measured spots
 $B_p (\text{Min.})$ = Minimum brightness in 5 measured spots



Note 3: The definition of viewing angle:

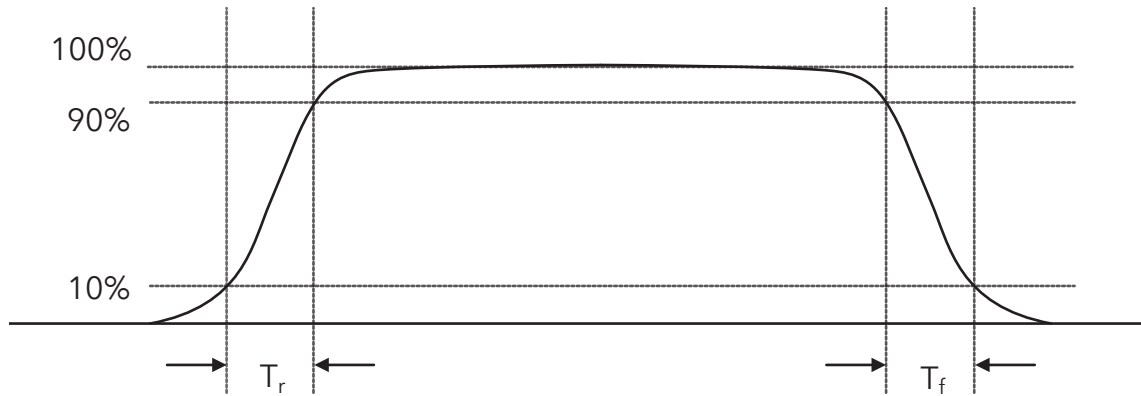
Refer to the graph below marked by θ and Φ .



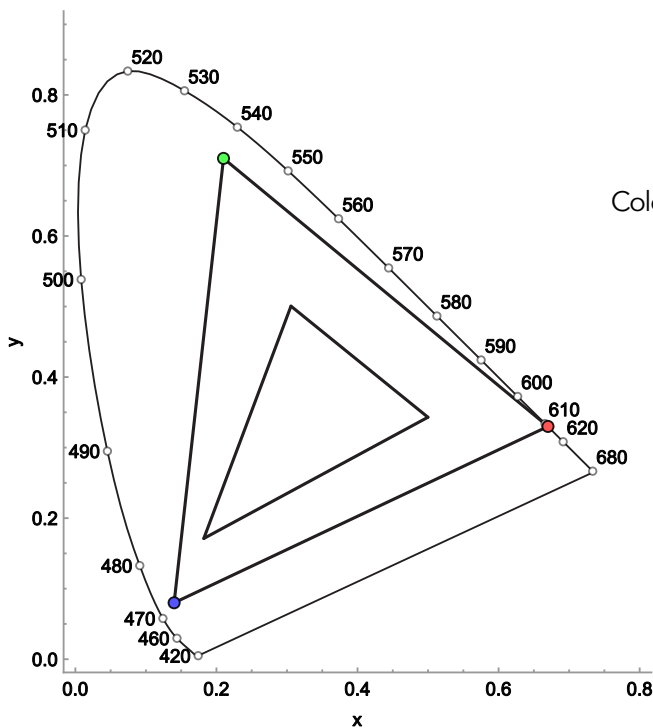
Note 4: Definition of contrast ratio.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance with all pixels "white"}}{\text{Luminance with all pixels "black"}}$$

Note 5: Definition of Response time. (Test LCD using DMS501): The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure below.



Note 6: Definition of Color of CIE Coordinate and NTSCRatio.



Color gamut:

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

1931 CIE Chromaticity Diagram

8. Reliability Test Items and Criteria

No	Test Item	Test Condition	Criteria
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power Off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice the initial value.
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power Off	
3	High Temperature Storage	70°C±2°C 96H Restore 2H at 25°C Power On	
4	Low Temperature Storage	-20°C±2°C 96H Restore 4H at 25°C Power On	
5	High Temperature Storage/Humidity Operation	60°C±2°C 90%RH 96H Power Off	
6	Temperature Cycle	-30°C ←————→ 80°C 30min 5min 30min After 5 cycles, restore 2H at 25°C Power Off	
7	Vibration Test	10Hz ~ 150Hz, 100m/s ² , 120min	No cosmetic or electrical defects allowed
8	Shock Test	Half-sine wave, 300m/s ² , 11ms	

Note: Operation: Supply 3.3V for logic system. The inspection terms after reliability test, as below

Item	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone ±0.05

9. Precautions for Use of LCD Modules

9.1. Handling Precautions

- 9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- 9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 9.1.5 If the display surface is contaminated, blow a breath onto the surface and gently wipe it with a soft microfiber cloth. If still not completely clear, moisten cloth with one of the following liquids:
- Isopropyl alcohol
 - Ethyl alcohol
- Liquids other than those mentioned above may damage the polarizer. Especially, do not use the following:
- Ketone
 - Aromatic solvents
- 9.1.6 Do not attempt to disassemble the LCD Module.
- 9.1.7 If the logic circuit power is off, do not apply the input signals.
- 9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- Be sure to ground the body when handling the LCD Modules.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD Module is coated with a film to protect the display surface. Be careful when peeling of this protective film since static electricity may be generated.
- 9.1.9 During transportation, avoid violent shocking and vibration. Prevent excessive crushing force and exposure to direct sunlight.

9.2. Storage Precautions

- 9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules are stored for a long period of time, the recommended condition is:
- Temperature: 0°C ~ 40°C
- Relative humidity: ≤80%
- 9.2.3 The LCD modules should be stored in the room without acid, alkali or harmful gas.



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