



1000 NITS 1.77 INCH DISPLAY

P/N: DTM-3525-S000

General Specifications

- This model is a Color TFT LCD.
- This main Module has a 1.77 inch diagonally measured active display area with 128(RGB)X160 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots, which are arranged in vertical stripes.
- The model has been designed to apply the MCU interface method that enables low power, high speed, and high contrast.

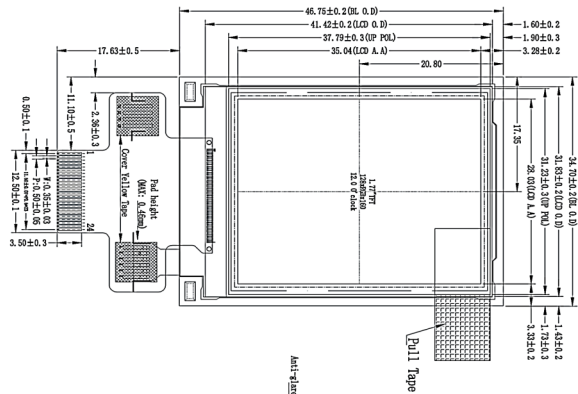
Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	65K		
Viewing Direction	6	O'Clock	
Gray scale inversion direction	12	O'Clock	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	°C	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	28.03X35.04	mm	
Number of Dots	128×160	dots	
Controller	ST7735S	-	
Power Supply Voltage	2.8	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	1X5-LEDs (white)	pcs	
Weight	---	g	
Interface	MCU 8 bit	-	



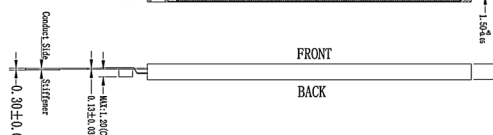
ALL PAGES OF THIS VERSION APPROVED
SIGNATURE: _____ DATE: _____

Note: The upper case window must be smaller than LCD POL 0.3mm or more,
LCD V.A is recommended for the upper lens window.

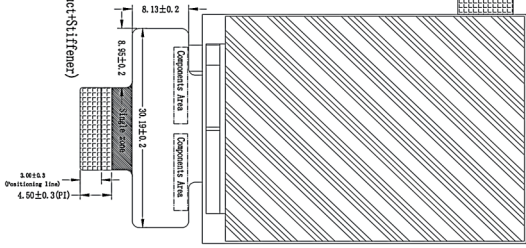
Front View



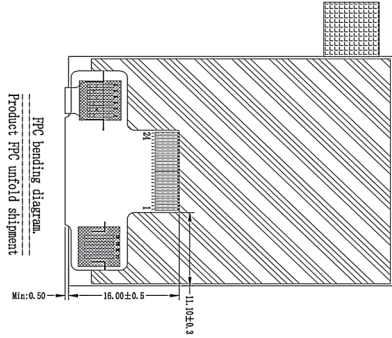
Side View



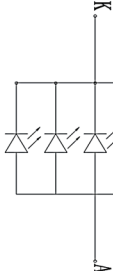
Rear View



Rear View



No.	Pin Name
1	GND
2	IO/DD
3	VDD
4	/CS
5	/RST
6	D/C
7	/MR
8	/RD
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	LED_A
18	LED_K
19	LED_K
20	GND
21	NC
22	NC
23	NC
24	NC



B/L Circuit

- NOTES:
1. DISPLAY TYPE: 1.77", TFT-LCD 65K/Colors
 2. DISPLAY MODE: T/N NORMALLY WHITE/Anti-glare
 3. VIEWING DIRECTION: 12:00
 4. DRIVER IC: ST7735S (COG)
 5. VDD 3.3V(TYP)/IOVDD:1.8V-3.3V
 6. OPERATING TEMP: -20° C TO 70° C
 7. BACK LIGHT: LED WHITE, 5 LED, 100mA, 3.2±0.3V
 8. Module Brightness: 1000cd/m2(TYP)
 9. RoHS COMPLIANT.

GENERAL	TOL	ALL UNITS	DATE	MODEL NUMBER :	SHEET: 1 OF 1
DVN:	0.30	MM			
CHK:					
APP:					
DID NOT SCALE THIS DRAWING.				PROJECTION	DATE:



Absolute Maximum Ratings(Ta=25°C)

Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25°C)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V _{CC}	-0.3	4.6	V	1, 2

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged.
Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. V_{CC} > V_{SS} must be maintained.

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. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
The phenomenon 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.

Electrical Specifications and Instruction Code

Electrical characteristics(Vss=0V ,Ta=25°C)



Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	Ta=25°C	2.6	2.8	3.0	V	
		VDDI/O	Ta=25°C	1.65	2.8	3.3	V	
Input voltage	‘H’	V _{IH}	V _{CC} =2.8V	0.8V _{CC}	-	V _{CC}	V	
	‘L’	V _{IL}	V _{CC} =2.8V	0	-	0.2V _{CC}	V	
Current Consumption		I _{CC1}	Normal mode	-	2	-	mA	1
		I _{CC2}	Sleep mode	-	-	-	mA	1

Note:

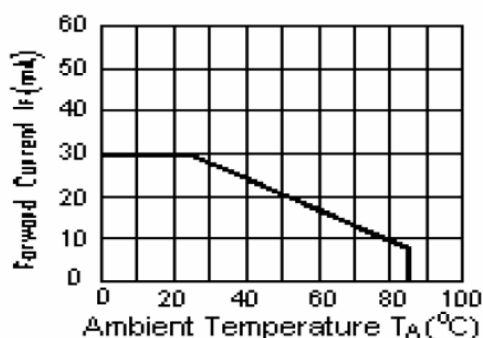
1: Tested in 1×1 chessboard pattern.

LED backlight specification(VSS=0V ,Ta=25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _f	I _f =20X5mA	-	3.2	-	V	
Uniformity	Δ Bp	I _f =20X5mA	80			%	
Luminance for LCD	L _v	I _f =20X5mA	-	1000		Cd/m ²	
Life for the LED	life	I _f =20X5mA	-	20000	-	hours	1

Note:

1: The "LED Life time" is defined as the module brightness decrease to 50% original brightness at T=25°C and I_{LED} =15X5mA. The LED Life time could be decreased if operating I_{LED} is larger than 15X5mA



I_{LED} VS TEMP



Interface signals

Pin No.	Symbol	Description
1	GND	Ground
2	IOVDD	Supply voltage
3	VDD	Supply voltage
4	/CS	Chip select
5	/RST	Reset
6	D/C	Display data/command selection, serial clock
7	/WR	Write enable in MCU interface,
9~16	DB0-DB7	Data
17	LEDA	Backlight Anode
18	LEDK	Backlight cathode
19	LEDK	Backlight cathode
20	GND	Ground
21	NC	NC
22	NC	NC
23	NC	NC
24	NC	NC



Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$ $\Phi=0^\circ$	-	1000	-	Cd/m ²	1
Uniformity	Δ Bp		80	-	-	%	1,2
Viewing Angle	3:00	Cr $\geq$ 10	35	45	-	Deg	3
	6:00		20	30	-		
	9:00		35	45	-		
	12:00		35	45	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	300	500		-	4
Response Time	T _r		-	10	-	ms	5
	T _f		-	10	-	ms	
Color of CIE Coordinate	W	x	0.23	0.28	0.33	-	1,6
		y	0.28	0.33	0.38	-	
	R	x	0.46	0.51	0.56	-	
		y	0.29	0.34	0.39	-	
	G	x	0.26	0.31	0.36	-	
		y	0.51	0.56	0.61	-	
	B	x	0.10	0.15	0.20	-	
		y	0.09	0.14	0.19	-	
NTSC Ratio	S		50	60	-	%	

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

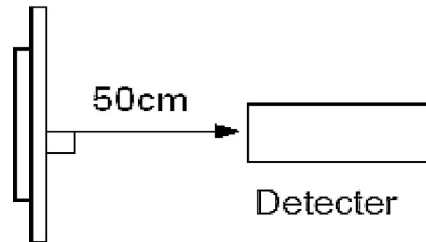
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

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 5 minutes while

backlight turning on.

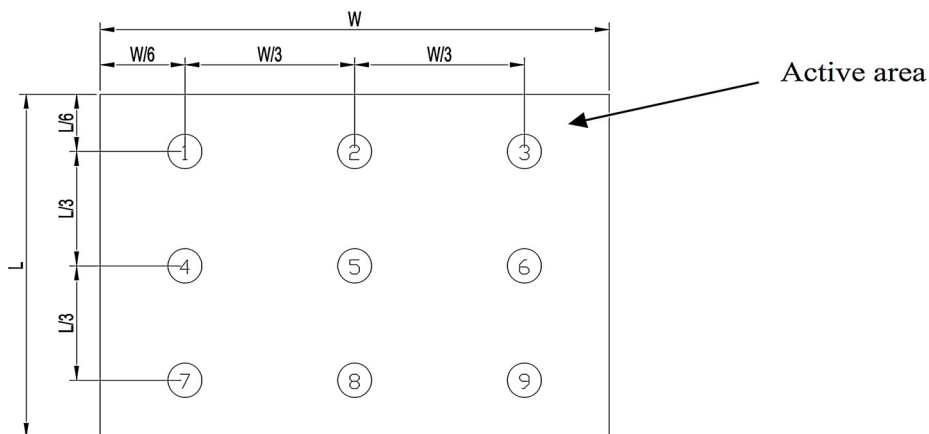


Note 2: The luminance uniformity is calculated by using following formula.

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

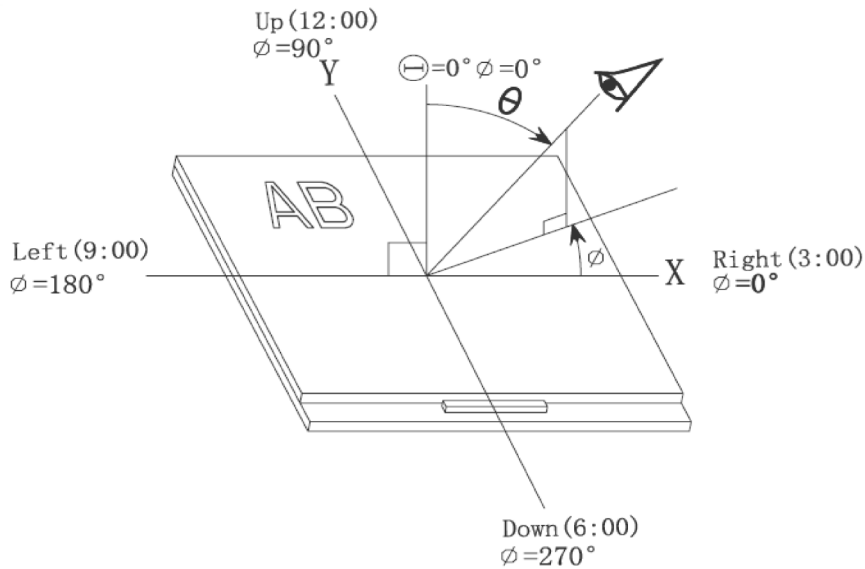
$Bp \text{ (Max.)}$ = Maximum brightness in 9 measured spots

$Bp \text{ (Min.)}$ = Minimum brightness in 9 measured spots.

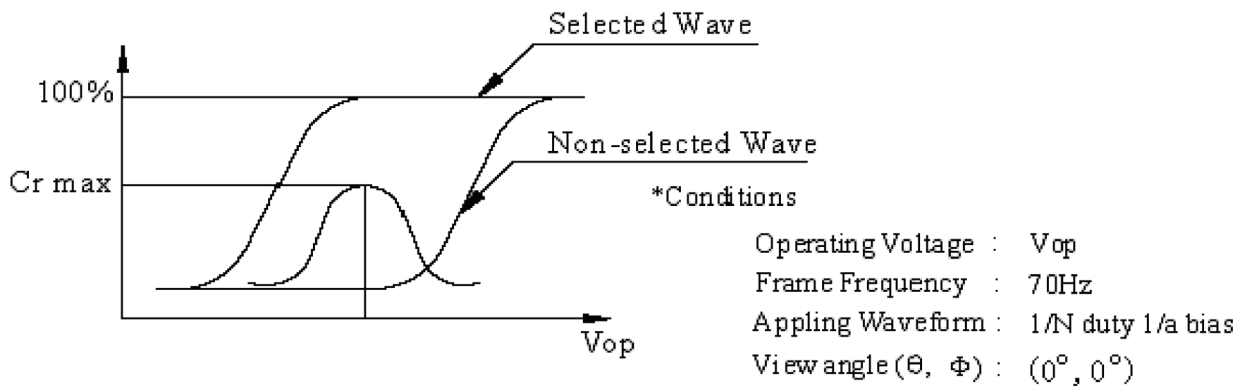


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



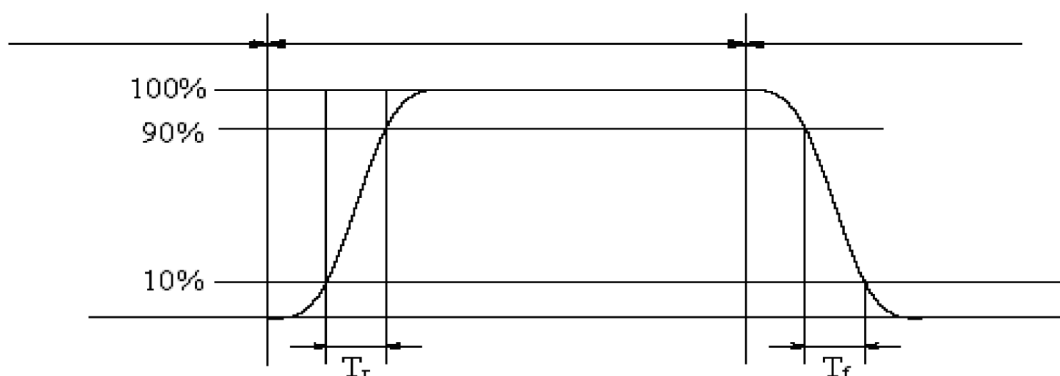
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

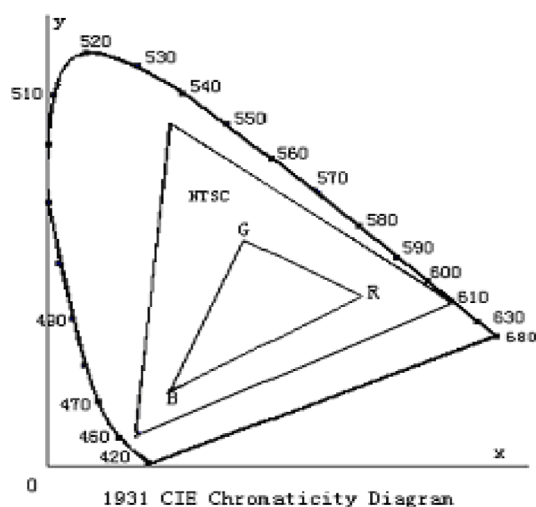
Note 5: Definition of Response time. (Test LCD using DMS501):

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 as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

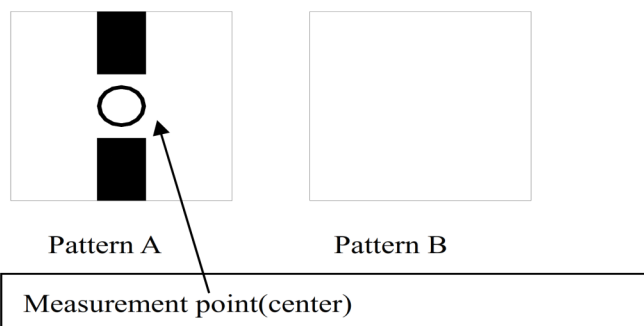


Color gamut:

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

Note 7: Definition of cross talk.

Cross talk ratio(%)= | pattern A Brightness-pattern B Brightness | /pattern A Brightness*100



Electric volume value=3F+/-3Hex