Data International Co., Ltd.

DATAVISION

APPROVAL SHEET

Customer	:	
Part Name	:	**TFT MODULE**
Model No.	:	**DTFS018**
Drawing No.	:	
Approved by	:	
Date	:	

Approved	Checked	Prepared	Sheet Code:
		JUN 2018.11.14	

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1. General Description

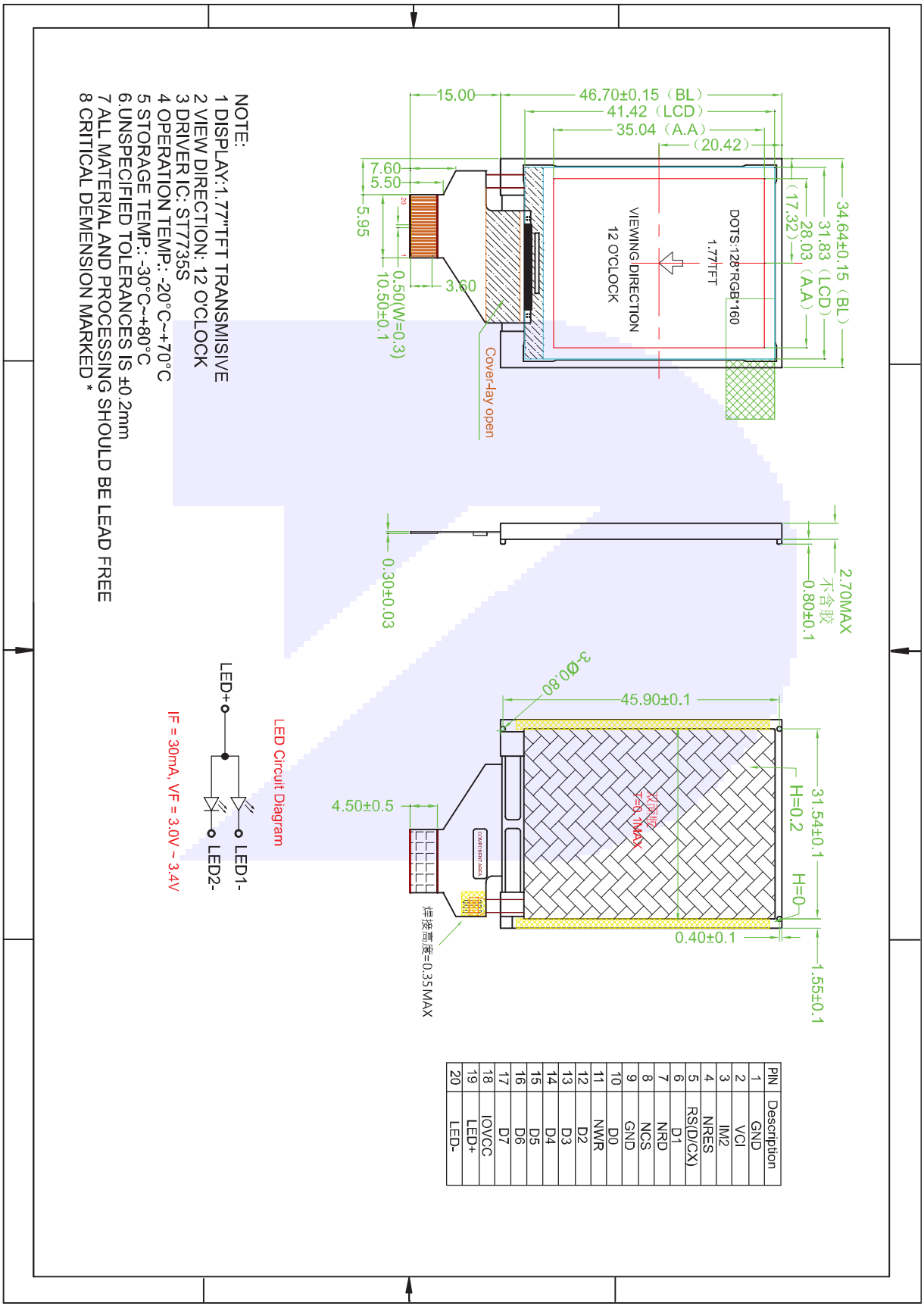
1.1 Description

The model DTFS018 is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD pane, a driving circuit and a back light system. Graphics and texts can be displayed on a QQVGA 128 (H) x RGB x 160 (V) dots with 262,144 colors by supplying 18 bits data signal (6 bits/each color).

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	1.77”	Inch
2	Number of Pixels	128 (H) x RGB x 160 (V)	Pixels
3	Active Area	28.032 (H) × 35.040 (V)	mm
4	Pixel Pitch	0.219 (H) x 0.219 (V)	mm
5	Outline Dimension	34.64 (H) × 46.70 (V) × 2.70 (T)	mm
6	Number of Colors	262K Colors	- -
7	Display Mode	TN / Normally White / Transmissive	- -
8	Viewing Direction	12 o’clock	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-Glare and Hard-coating 3H	- -
11	Contrast Ratio	500 (typical)	- -
12	Luminance (cd/m^2)	200 (typical)	cd/m2
13	Interface	8080 MCU 18 bits	- -
14	Backlight	White LED	- -
15	Driver IC	ST7735	- -
16	Operation Temperature	-20 ~ 70	°C
17	Storage Temperature	-30 ~ 80	°C
18	Weight	- -	g

2. Mechanical Specification



PIN	Description
1	GND
2	VCI
3	IM2
4	NRES
5	RS(D/CX)
6	D1
7	NRD
8	NCS
9	GND
10	D0
11	NWR
12	D2
13	D3
14	D4
15	D5
16	D6
17	D7
18	IOVCC
19	LED+
20	LED-

3. Pin Description

No.	Symbol	I/O	Function	Remark
1	GND	I	System ground.	
2	VCI	I	I/O Interface supply voltage	
3	IM2	I	MCU Parallel Interface Bus and Serial Interface select, IM2='1', Parallel Interface,IM2='0', Serial Interface	
4	NRES	I	This signal will reset the device and it must be applied to properly initialize the chip. - Signal is active low.	
5	RS (D/CX)	I	Write Enable in MCU Parallel Interface. - In 4-line SPI, this pin is used as D/CX (data/ command selection). - If not used, please fix this pin at VDDI or DGND level.	
6	D1	I/O	MCU parallel interface data bus.	
7	NRD	I	Read Enable in 8080 MCU Parallel Interface. If not used, please fix this pin at VDDI or DGND level.	
8	NCS	I	Chip Selection Pin - Low Enable.	
9	GND	I	System ground.	
10	D0	I/O	MCU parallel interface data bus.	
11	NWR	I	Write Enable in MCU Parallel Interface.- In 4-line SPI, this pin is used as D/CX (data / command selection). - If not used, please fix this pin at VDDI or DGND level.	
12	D2	I	MCU parallel interface data bus.	
13	D3	I	MCU parallel interface data bus.	
14	D4	I	MCU parallel interface data bus.	
15	D5	I	MCU parallel interface data bus.	
16	D6	I	MCU parallel interface data bus.	
17	D7	I	MCU parallel interface data bus.	
18	IOVCC	I	Power Supply for Analog, Digital System and Booster Circuit.	
19	LED+	P	Power for LED+	
20	LED-	P	Power for LED-	

4. Electrical Characteristics

4.1 Absolute Maximum Ratings

4.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, VSS=GND=0)

Item	Symbol	Unit	Spec.		Note
			Min	Max.	
Storage temperature	Tstg	°C	-30	+80	--
Operating temperature	Topr	°C	-20	+70	--

4.1.2 Electrical Absolute Maximum Ratings

(VSS=GND=0)

Item	Symbol	Unit	Spec.		Note
			Min	Max.	
Power supply logic voltage	VCI	V	-0.3	4.8	--
Power supply logic voltage	VCC	V	-0.3	4.8	--

4.2 DC Electrical Characteristics

4.2.1 Operating Conditions

(Ta=25±2°C, V_{SS}=GND=0)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCI	1.65	1.80	3.70	V	
Power supply		VCC	2.5	2.75	4.80		
Input Voltage for Logic	H Level	VIH	0.7xVCC	-	VCC	V	
	L Level	VIL	GND	-	0.3xVCC	V	
Power Supply current		IVCI.VCC	-	(5.5)	-	mA	VCC= VCI=2.8V
Power Consumption		PLCD	-	- -	-	mW	

Note1: fv = 60Hz , Ta = 25°C , Display pattern : Black pattern

4.2.2 Backlight Unit (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
LED Voltage	VF	3.0	3.2	3.4	V	
LED current	IL	--	30	--	mA	

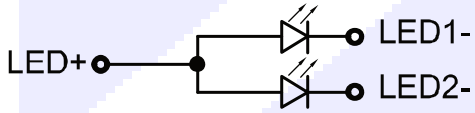
Note:

(1). Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2). Ta=25 ± 2°C

(3). Test Condition: LED current 30 mA. The LED lifetime could be decreased if operating IL is larger than 30mA.

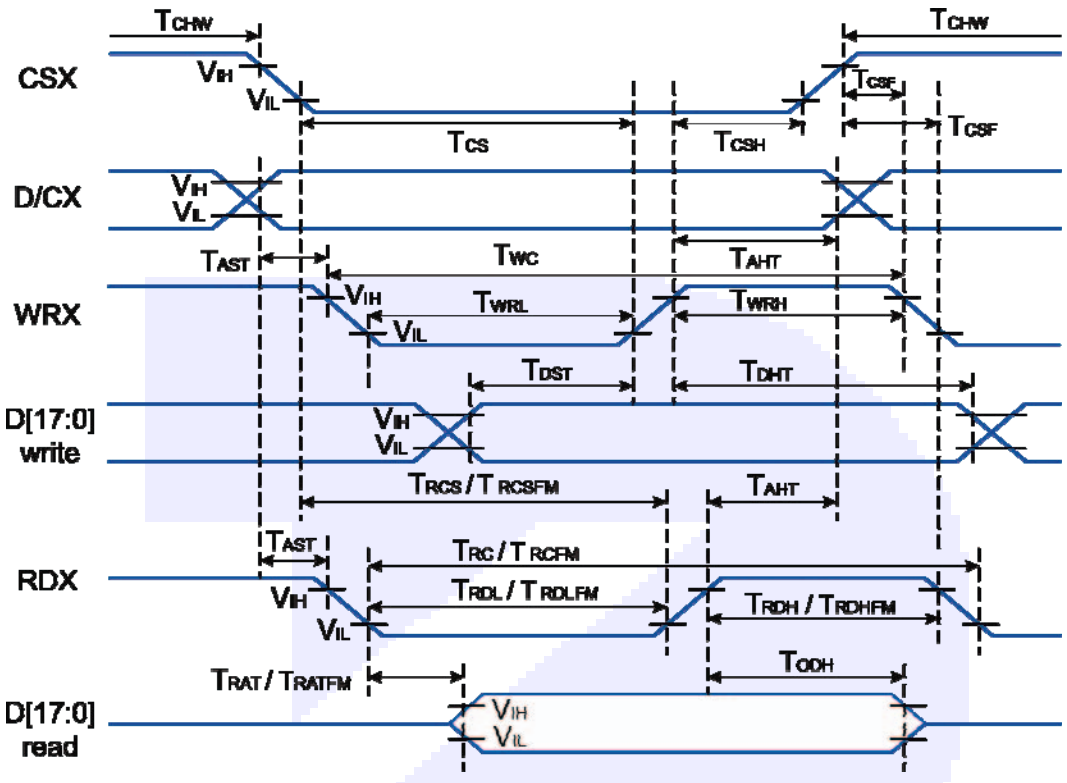
4.2.3 LED Internal Circuit Diagram



CURRENT IF=20mA

5. AC Characteristics

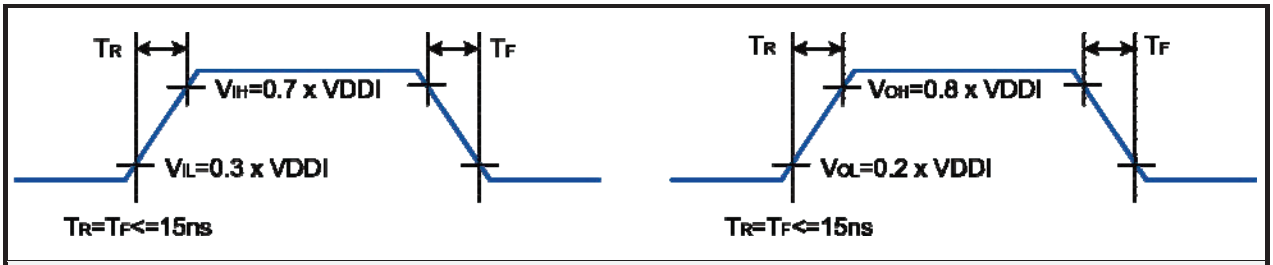
5.1 Parallel Interface Characteristics: 18, 16, 9 or 8-bit Bus (8080 Series MCU Interface)



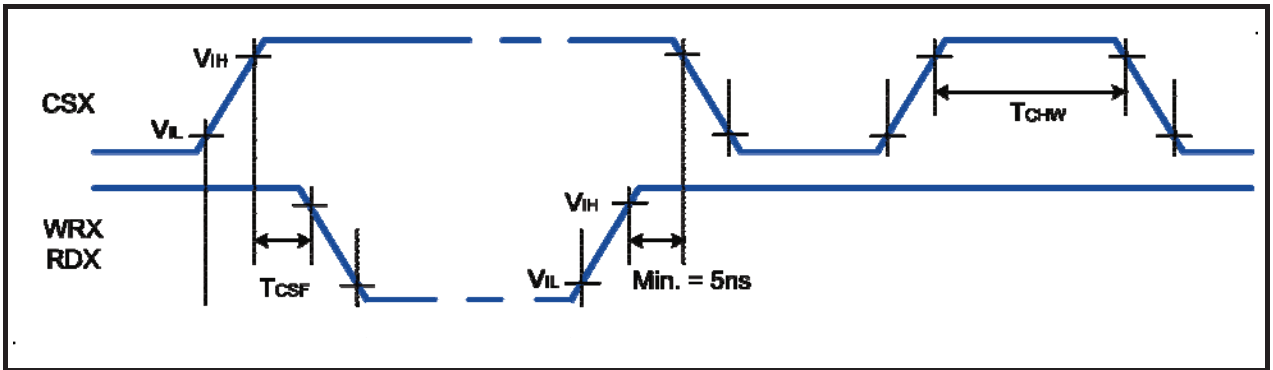
Parallel Interface Timing Characteristics (8080 Series MCU Interface)

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	TAST	Address Setup Ttime	0		ns	-
	TAHT	Address Hold Time (Write/Read)	10		ns	
CSX	TCHW	Chip Select "H" Pulse Width	0		ns	-
	TCS	Chip Select Setup Time (Write)	15		ns	
	TRCS	Chip Select Setup Time (Read ID)	45		ns	
	TRCSFM	Chip Select Setup time (Read FM)	355		ns	
	TCSF	Chip Select Wait Time (Write/Read)	10		ns	
	TCSH	Chip Select Hold Time	10		ns	
WRX	TWC	Write Cycle	66		ns	
	TWRH	Control Pulse "H" Duration	15		ns	
	TWRL	Control Pulse "L" Duration	15		ns	
RDX (ID)	TRC	Read Cycle (ID)	160		ns	When Read ID Data
	TRDH	Control Pulse "H" Duration (ID)	90		ns	
	TRDL	Control Pulse "L" Duration (ID)	45		ns	
RDX (FM)	TRCFM	Read Cycle (FM)	450		ns	When Read from Frame Memory
	TRDHFM	Control Pulse "H" Duration (FM)	90		ns	
	TRDLFM	Control Pulse "L" Duration (FM)	355		ns	
D[17:0]	TDST	Data Setup Time	10		ns	For CL=30pF
	TDHT	Data Hold Time	10		ns	
	TRAT	Read Access Time (ID)		40	ns	
	TRATFM	Read Access Time (FM)		340	ns	
	TODH	Output Disable Time	20	80	ns	

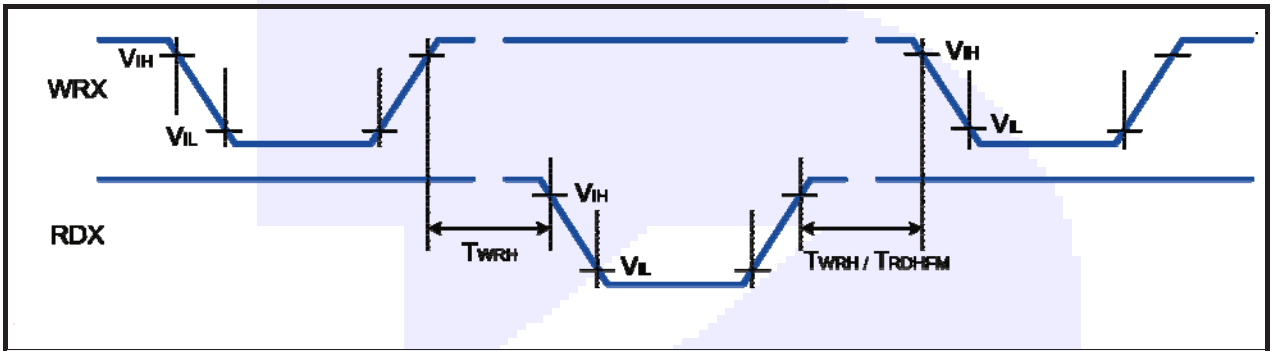
8080 Parallel Interface Characteristics



Rising And Falling Timing for Input And Output Signal



Chip Selection (CSX) Timing



Write-to-Read And Read-to-Write Timing

Note: The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

6. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		B	Note 1, Note 3, (θ = 0°, Normal Viewing Angle)	--	(200)	--	cd/m2
Contrast Ratio		CR		--	500	--	--
Response Time		Tr		--	2	4	ms
		Tf		--	6	12	ms
Luminance Uniformity		ΔL		--	80	--	%
Color Chromaticity	White	Wx		(0.283)	(0.303)	(0.323)	--
		Wy		(0.305)	(0.325)	(0.345)	--
View angle (12H)	Horizontal	ϕ L	Note2, CR≥10	--	60	--	°
		ϕ R		--	60	--	°
	Vertical	θ U		--	60	--	°
		θ L		--	35	--	°

Note：These items are measured by BM-5A (TOPCON) or CA-1000 (MINOLTA) in the dark room. (no ambient light) Measuring point：Fig.6-1 Measuring-point：1~9 points Measuring Viewing Angle：Fig.6-2：θ=ϕ=0°

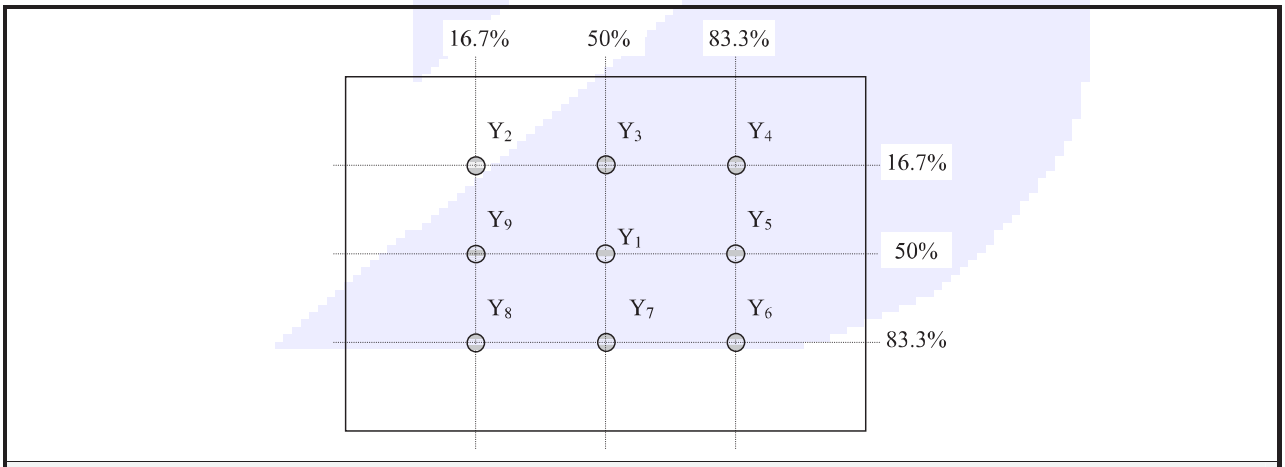


Fig.6-1 Measuring point

Note 1：Definition of contrast ratio： Measure contrast ratio on the 5 points (refer to figure 6-1, # 1~# 9 point) Contrast ratio is calculated with the following formula ：Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF

Note 2：Definition of Viewing Angle(θ, ϕ),refer to Fig.6-2 as below：

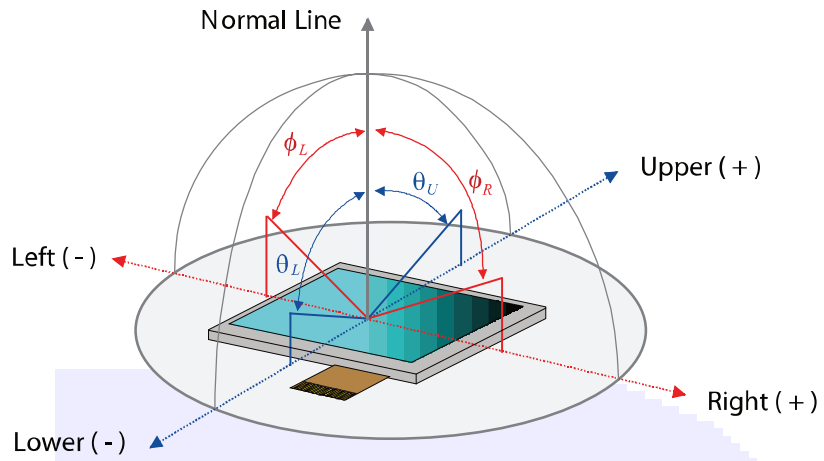


Fig.6-2 Definition Of Viewing Angle

Note 3：Definition of Response Time.

The response time is defined as the time interval between the 10% and 90% amplitudes.

Refer to figure 6-3 as below

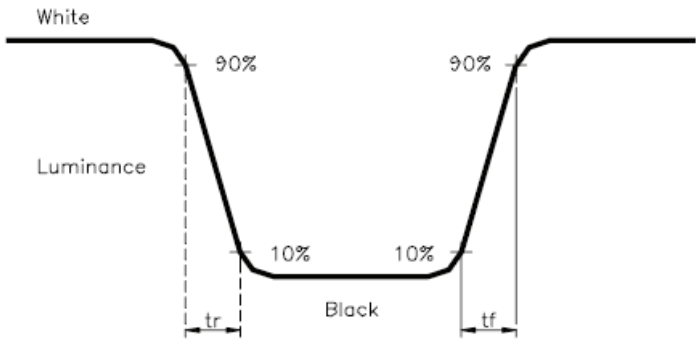


Fig.6-3 Definition of Response Time

7. Reliability

7.1 MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25°C in the room without sunlight; not include life time of backlight)

7.2 Tests

No.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70°C ± 2°C, 240hrs (Operation state).	∗ No Defect Of Operational Function In Room Temperature Are Allowable. ∗ IDD of LCD in Pre-and post-test should follow specification
2	Low Temperature Operating	-20°C ± 2°C, 240hrs (Operation state).	
3	High Temperature/Humidity Non-Operating	50°C ± 2°C, 80%, 240hrs.	
4	High Temperature Non-Operating	80°C ± 2°C, 240hrs.	
5	Low Temperature Non-Operating	-30°C ± 2°C, 240hrs.	
6	Temperature Shock Non-Operating	-30°C ←- - - - -→ 80°C (60min)- - -(5min)- - -(60min) 10 Cycles	
7	Electro-static Discharge	HBM: ± 2kv	

Note:

1. Test after 24 hours in room temperature.
2. The sampling above is individually for each reliability testing condition.
3. The color fading of polarizing filter should not care.
4. All of the reliability testing chamber above, is using D.I. water. (Min value: 1.0 M3-cm)
5. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after software resetting, it would be judged as a good part.

7.3 Color Performance

No.	ITEM	Criterion (initial)
1	Luminance	>50%
2	NTSC	>70%
3	Contrast Ratio	>50%

7.4 Shock & Vibration

Test items	Conditions
Shock (non-penetration)	Shock level:980m/s(equal to 100G) · Waveform: half sinusoidal wave,6ms ·Number of shock: one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs
Vibration (non-penetration)	Frequency range:8~33.3Hz ·Stoke: 1.3mm ·Vibration: sinusoidal wave, perpendicular axis (both x ,z axis: 2Hrs, and y axis: 4Hrs) ·Sweep: 2.9G,33.3Hz ~ 400Hz ·Cycle:15min

7.5 Judgment Standard

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

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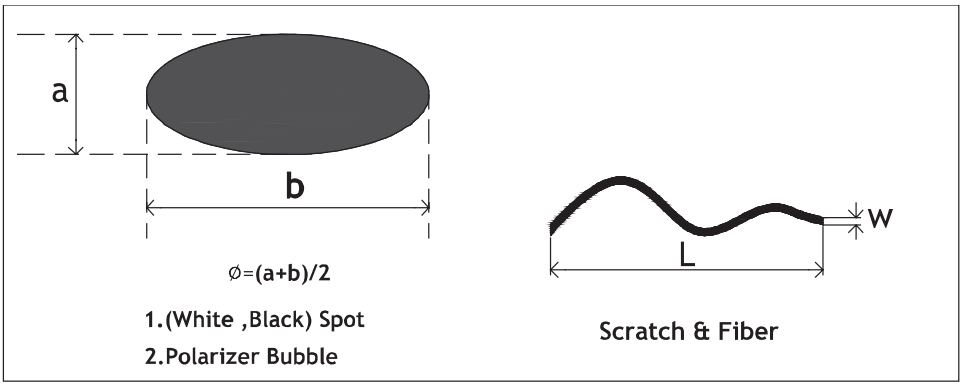
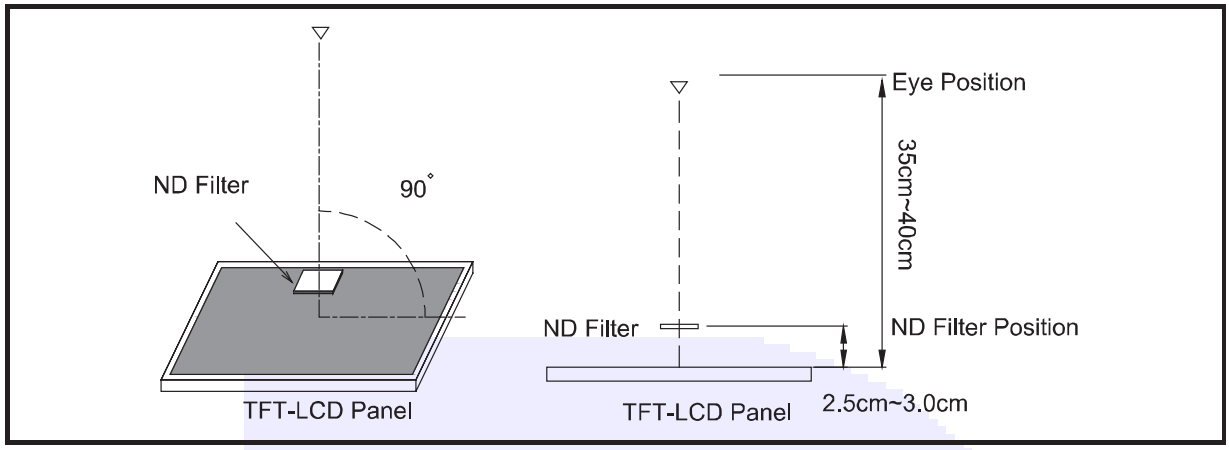
7.6 Incoming Inspection Standards

Defect type			Limit			Note
Visual Defect	Scratch		W≦0.05mm, L< 3.0mm		Ignore	Note1
			0.05mm≦W≦0.1mm 1.0mm＜L≦2.0mm		N≦4	
			5mm＜L, 0.1mm＜W		N = 0	
	Internal	Spot	ϕ＜0.20mm		Ignore	Note1
			0.20mm≦ϕ≦0.30mm		N≦3	
			0.3mm＜ϕ		N=0	
		Fiber	W≦0.1mm, L≦3mm		N≦4	Note1
			0.1mm＜W, 3mm＜L		N = 0	
		Polarizer Bubble	ϕ＜0.2mm		Ignore	Note1
			0.20mm≦ϕ≦0.30mm		N≦3	
			0.3mm＜ϕ		N=0	
		Dent	ϕ＜0.20mm		Ignore	Note1
			0.20mm≦ϕ≦0.3mm		N≦3	
			0.3mm＜ϕ		N = 0	
Electrical Defect	Bright dot		C area	O area	Total	Note2 Note3
			N≦0	N≦0	N≦0	
	Dark dot		N≦2	N≦2	N≦2	
	Total dot		N≦2	N≦2	N≦2	
	Two adjacent dot		N≦0	N≦0	N≦0	
	Zero bright dot		90%			Note4
	Three or more adjacent dot		Not allowed			
	Line defect		Not allowed			--
(1). One pixel consists of 3 sub-pixels, including r, g, and b dot. (sub-pixel = dot) (2). Panel is acceptable if distance between 2 dot defects are greater or equal to 15mm.						

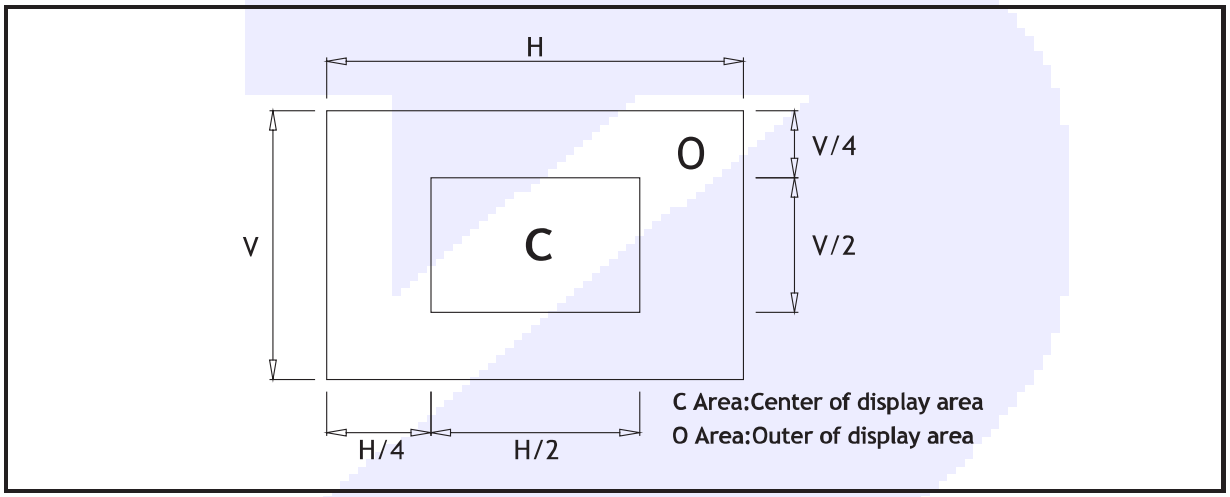
Note1： W : Width [mm], L : Length [mm], N : Number, φ: Average Diameter



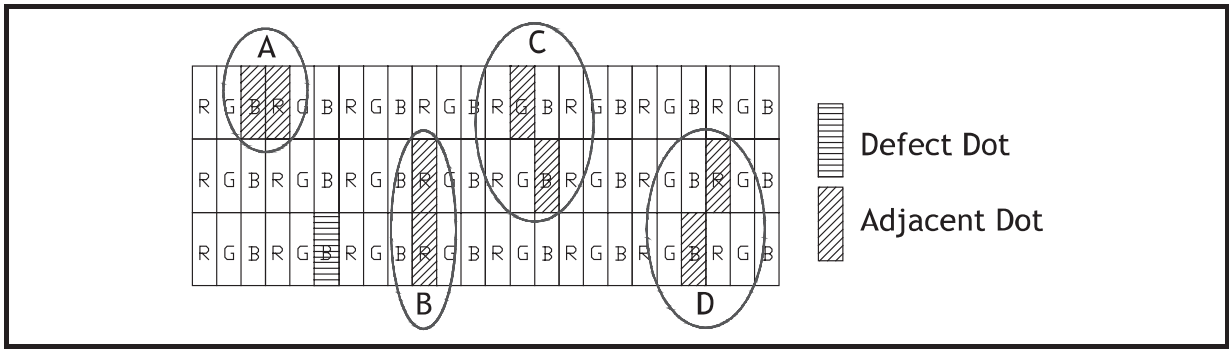
Note2：Bright dot is defined as the defective area of the dot is larger than 50% of one sub- pixel area.



Note3：



Note4：Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



Note5：Other condition

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

8. Precaution Relating Product Handing

8.1 Safety

8.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

8.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

8.2 Handling

8.2.1 Avoid any strong mechanical shock which can break the glass.

8.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

8.2.3 Do not remove the panel or frame from the module.

8.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

8.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

8.2.6 Do not touch the display area with bare hands , this will stain the display area.

8.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

8.2.8 To control temperature and time of soldering is 280 ± 10°C and 3 - 5 sec.

8.2.9 To avoid liquid (include organic solvent) stained on LCM.

8.3 Storage

8.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

8.3.2 Do not place the module near organics solvents or corrosive gases.

8.3.3 Do not crush, shake, or jolt the module.