Thin Film Transistor LCD MODULE
MODEL: AWY-480800T43N01
Customer's No.:

Acceptance

Microtips Technology

Approved and Checked by

Approved by	Checked by		Made by
樺 叡 2012/03/18 NICK	樺 叡 2012/03/18 JOE		樺 叡 2013/03/18 TOM

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Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2013-03-18	NEW ISSUE	

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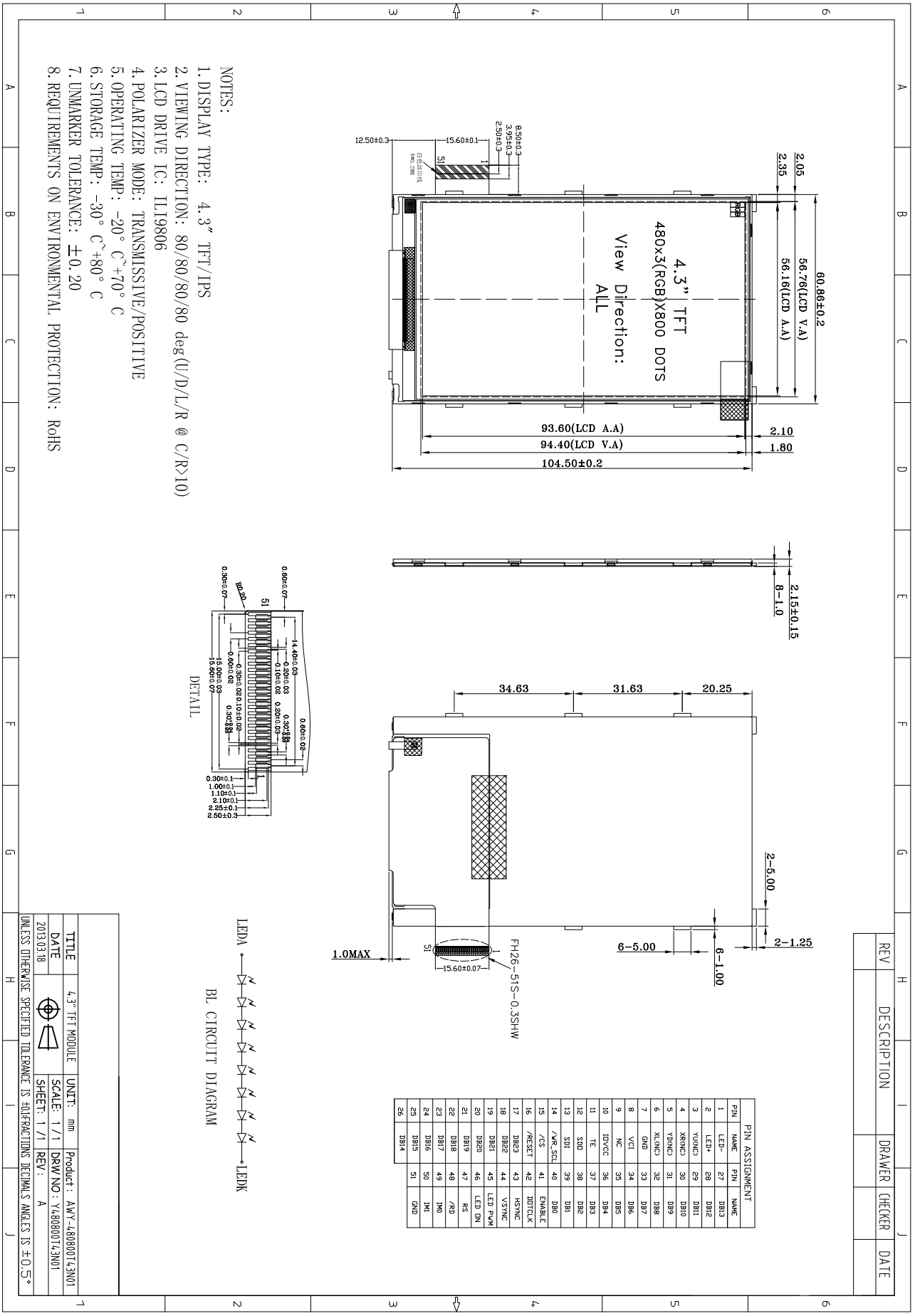
1. Numbering System

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	4.3”TFT	--
Dot arrangement	480(RGB)×800	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Transmission / Normally Black	--
Viewing Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Driver IC	ILI9806	--
Module size	60.86(W)×104.5(H)×2.15(T)	mm
Active area	56.16(W)×93.6(H)	mm
Dot pitch	0.117(W)×0.117(H)	mm
Interface	i80-system 8/16 bit MCU interface	--
Operating temperature	-20 ~ +70	℃
Storage temperature	-30 ~ +80	℃
Back Light	8 White LED In Serial	--
Weight	TBD	g

3. External Dimensions



4. Interface Description

Pin	Symbol	Description.
1	LED-	LED backlight (Cathode).
2	LED+	LED backlight (Anode).
3	YU(NC)	NC.
4	XR(NC)	
5	YD(NC)	
6	XL(NC)	
7	GND	Power ground
8	VCI	A supply voltage to the analog circuit.
9	NC	NC.
10	IOVCC	A supply voltage to the logic circuit.
11	TE	Tearing effect output pin to synchronize MCU to frame writing.
12	SDO	Serial output signal in SPI I/F.
13	SDI	Serial input signal in SPI I/F.
14	/WR_SCL	Writes strobe signal to write data when WRX is “Low” in MPU I/F. A synchronous clock signal in SPI I/F.
15	/CS	Chip select input pin (“Low” enable) in MPU I/F and SPI I/F.
16	/RESET	Reset input pin, Active “L”.
17	DB23	24-bit parallel bi-directional data bus for MPU system: 8-bit I/F: DB[7:0] is used. 16-bit I/F: DB[15:0] and DB[8:1] is used. 24-bit I/F: DB[23:0] is used. 24-bit input data bus for RGB I/F. 16-bit/pixel: DB[20:16]=R[4:0], DB[13:8]=G[5:0] and DB[5:1]=B[4:0]; 18-bit/pixel: DB[21:16]=R[5:0], DB[13:8]=G[5:0] and DB[5:0]=B[5:0]; 24-bit/pixel: DB[23:16]=R[7:0], DB[15:8]=G[7:0] and DB[7:0]=B[7:0]. Connect unused pins to GND.
18	DB22	
19	DB21	
20	DB20	
21	DB19	
22	DB18	
23	DB17	
24	DB16	
25	DB15	
26	DB14	
27	DB13	
28	DB12	
29	DB11	
30	DB10	
31	DB09	
32	DB08	
33	DB06	
34	DB07	
35	DB05	
36	DB04	
37	DB03	
38	DB02	
39	DB01	
40	DB00	
41	ENABLE	Data enable signal in RGB I/F mode

42	DOTCLK	Pixel clock signal in RGB I/F.
43	HSYNC	Horizontal sync signal in RGB I/F.
44	VSYNC	Vertical sync signal in RGB I/F.
45	LEDPWM	Connect to the external LED driver. If not used, please open this pin.
46	LEDON	Connect to the external LED driver. If not used, please open this pin.
47	RS	Display data / command selection in 80-series MPU I/F. RS = ”0” : Command RS = ”1” : Display data or Parameter
48	/RD	Reads strobe signal to write data when RD is “Low” in MPU interface.
49	IM0	System interface Mode IM[1,0]=00, i80-system 8-bit MPU interface : DB[7:0] is used. IM[1,0]=01, i80-system 16-bit MPU interface : DB[15:0] is used. IM[1,0]=10, i80-system 24-bit MPU interface : DB[24:0] is used. IM[1,0]=11, RGB+SPI interface
50	IM1	
51	GND	Power ground

5. Absolute Maximum Ratings

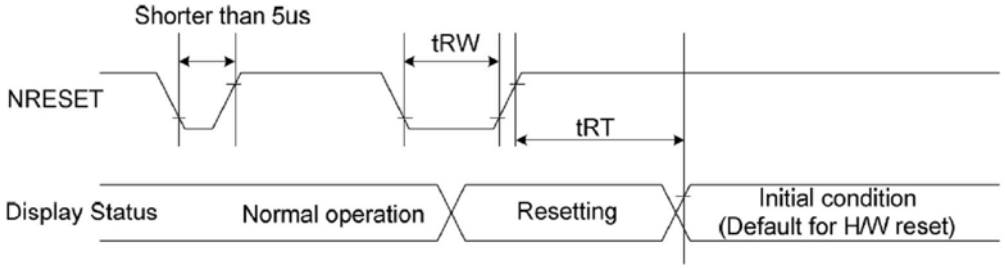
Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	4.6	V
Analog Supply Voltage	VCC	-0.3	4.6	V
Input Voltage	Vin	-0.3	IOVCC+0.3	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	-
Analog Supply Voltage	VCC	2.5	2.8	3.3	V	-
Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	Digital input pins
Input Low Voltage	V_{IL}	-0.3	-	0.3IOVCC	V	Digital input pins
Output High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	Digital output pins
Output Low Voltage	V_{OL}	0	-	0.2IOVCC	V	Digital output pins
I/O Leak Current	ILI	-1.0	-	1.0	mA	-

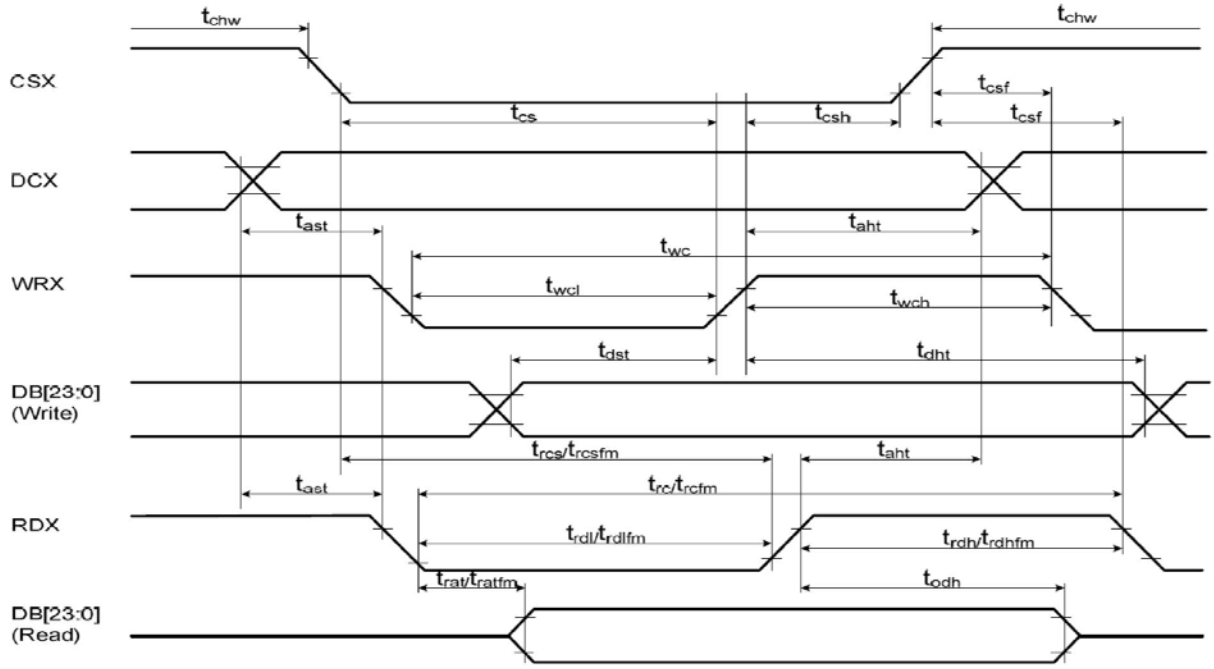
7. Timing Characteristics

7.1 Reset Timing Characteristics



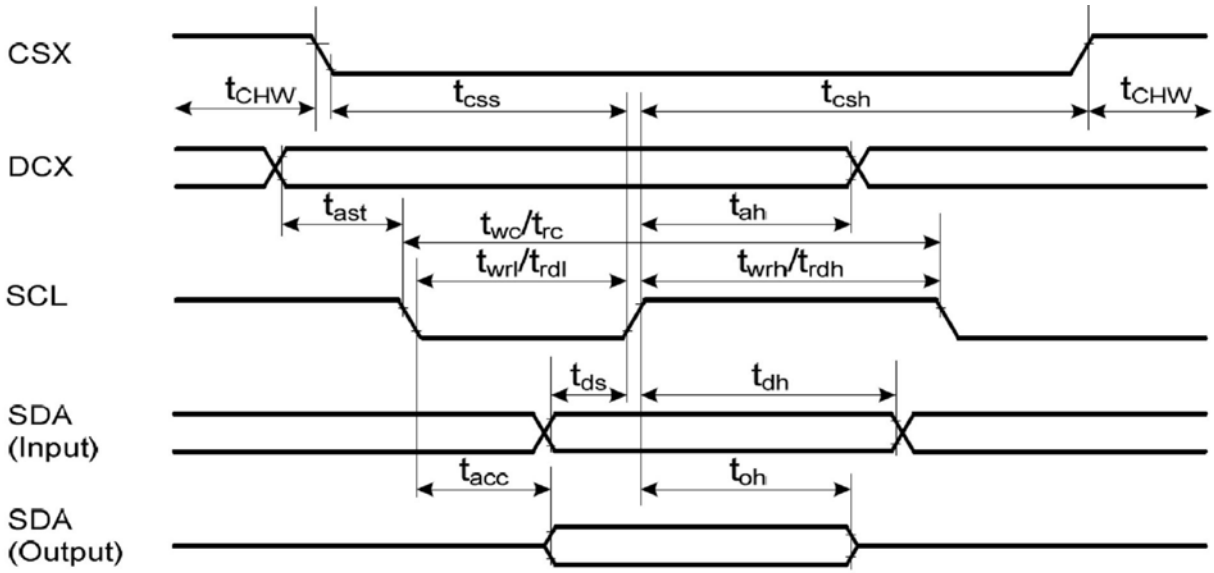
Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		us
	tRT	Reset cancel		5 (note 1,5)	ms
				120 (note 1,6,7)	ms

7.2 i80-System Interface Timing Characteristics



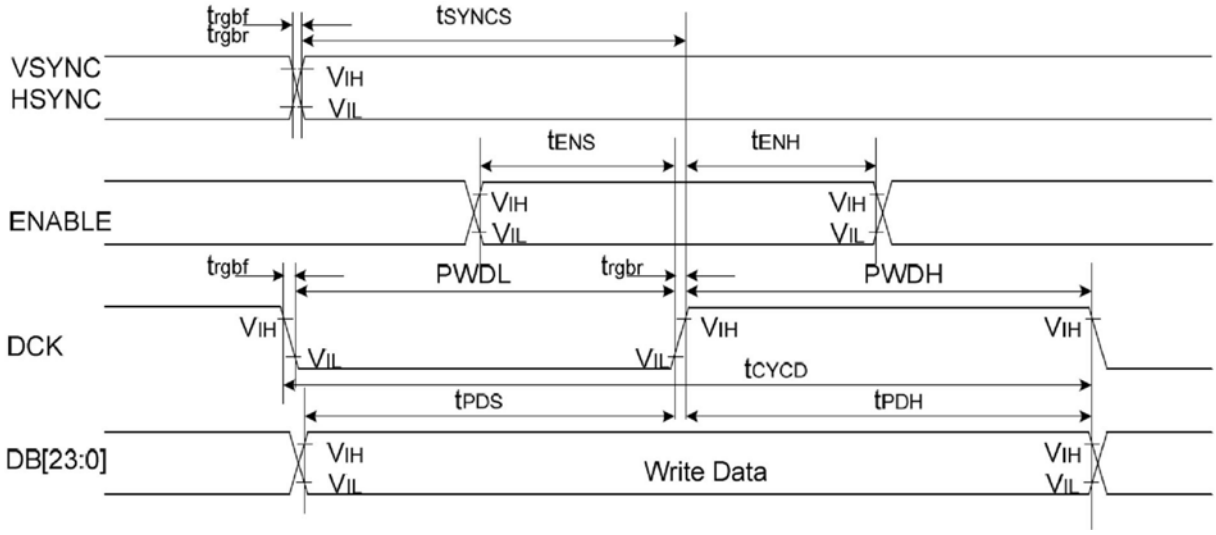
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	-
	taht	Address hold time (Write/Read)	10	-	ns	-
CSX	tchw	CSX "H" pulse width	0	-	ns	-
	tcs	Chip Select setup time (Write)	10	-	ns	-
	trcs	Chip Select setup time (Read ID)	45	-	ns	-
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	-
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	-
WRX	twc	Write cycle	30	-	ns	-
	twrh	Write Control pulse H duration	10	-	ns	-
	twrl	Write Control pulse L duration	10	-	ns	-
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	When read from the Frame Memory
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	When read ID data
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB[17:0], DB[15:0], DB[8:0] DB[7:0]	tdst	Write data setup time	10	-	ns	CL = 30pF (maximum) CL = 8pF (minimum)
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trodh	Read output disable time	20	80	ns	

7.3 Display Serial Interface Timing Characteristics (3-line SPI system)



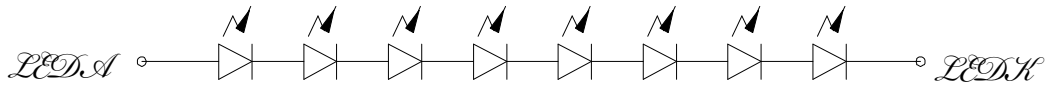
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	15	-	ns	
	tcsh	Chip select hold time (Read)	15	-	ns	
	tCHW	CS "H" pulse width	40	-	ns	
SCL	twc	Serial clock cycle (Write)	30	-	ns	
	twrh	SCL "H" pulse width (Write)	10	-	ns	
	twrl	SCL "L" pulse width (Write)	10	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL "H" pulse width (Read)	60	-	ns	
	trdl	SCL "L" pulse width (Read)	60	-	ns	
DCX	tas	DCX setup time	10	-	ns	
	tah	DCX hold time (Write/Read)	10	-	ns	
SDA (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA (Output)	tacc	Access time (Read)	10	50	ns	CL = 30pF (maximum)
	toh	Output disable time (Read)	15	50	ns	CL = 8pF (minimum)

7.4 Parallel 24/18/16-bit RGB Interface Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC/ HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	5	-	ns	24/18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	5	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	5	-	ns	
	t_{ENH}	ENABLE hold time	5	-	ns	
DB [17:0]	t_{POS}	Data setup time	5	-	ns	
	t_{PDH}	Data hold time	5	-	ns	
DCK	PWDH	DCK high-level period	13	-	ns	
	PWDL	DCK low-level period	13	-	ns	
	t_{CYCD}	DCK cycle time	28	-	ns	
	t_{rgbr} , t_{rgbf}	DCK,HSYNC,VSYNC rise/fall time	-	15	ns	

8. Backlight Charasterics



Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	24.0	25.6	28.0	V	If=20mA
Supply Current	If	-	120	160	mA	-
Luminous Intensity for LCM	-	200	250	-	Cd/m^2	If=20mA
Uniformity for LCM	-	80	-	-	%	If=20mA
Life Time	-	20000	-	-	Hr	If=20mA
Backlight Color	White					

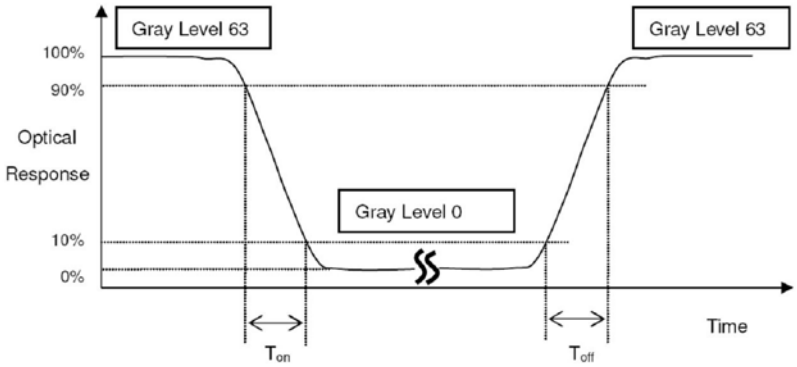
9. Optical Characteristics

Item		Symbol	Conditions	Specifications Min.	Typ.	Max.	Unit	Note
Transmittanc (without DBEF)		T%	Viewing normal angle $\theta_X = \theta_Y = 0°$		4.2	-	%	All left side data are based on CMO's following condition –
Contrast Ratio		CR		-	800	-		
Response Time (by Quick)		T_{R+} T_F		-	35		ms	1.CG : NTSC 57% 2.LC : 1-Domain IPS
Viewing Angle	Hor.	θ_{X+}	Center CR>10	-	80	-	deg.	3.Light Source : CMO LED BLU 4.Film : Nitto CVS1774HC 5.Vwhite > 4.7V , Vdark < 0.2V 6.Machine : DMS 803
		θ_{X-}		-	80	-		
	Ver.	θ_{Y+}		-	80	-		
		θ_{Y-}		-	80	-		
CIE1931 Chromaticity	Red	Rx	Viewing normal angle $\theta_X = \theta_Y = 0°$		0.627			Under C light Simulation
		Ry			0.316			
	Green	Gx			0.301			
		Gy			0.558			
	Blue	Bx			0.138			
		By			0.120			
	White	Wx			0.299			
		Wy			0.327			

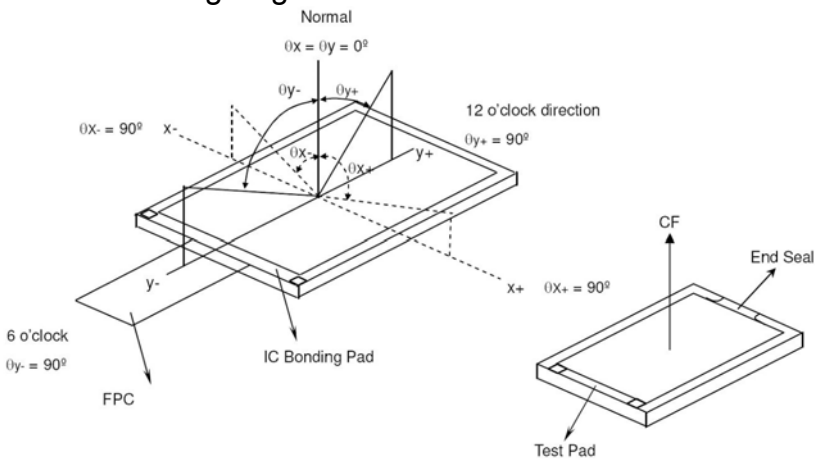
*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.
Contrast Ratio (CR) = L63 / L0.
L63: Luminance of gray level 63. L 0: Luminance of gray level 0. CR = CR (5).
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (Ton, Toff):

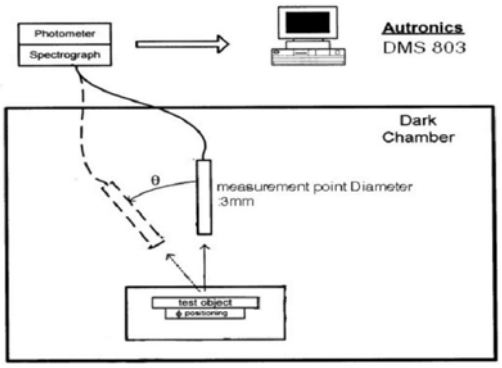


*Note(3) Definition of Viewing Angle

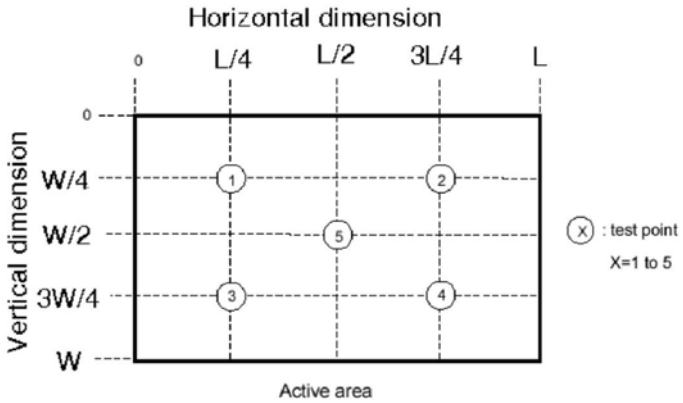


*Note (4) Measurement Set-Up:

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.



*Note (5)



10. Reliability Test Conditions And Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80℃±2℃×200Hours	Inspection after 2~4hours storage at room temperature,the samples should be free from defects: 1,Air bublle in the LCD. 2,Sealleak. 3,Non-display. 4,Missing segments. 5,Glass crack. 6,Current IDD is twice higher than initial value. 7,The surface shall be free from damage. 8,The electric charateristic requirements shall be satisfied.
②	Low Temperature Storage	-30℃±2℃×200Hours	
③	High Temperature Operating	70℃±2℃×120Hours	
④	Low Temperature Operating	-20℃±2℃×120Hours	
⑤	Temperature Cycle(Storage)	-20℃ (30min) ⟺ 25℃ (5min) ⟺ 70℃ (30min) 1cycle Total 10cycle	
⑥	Damp Proof Test (Storage)	50℃±5℃×90%RH×120Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

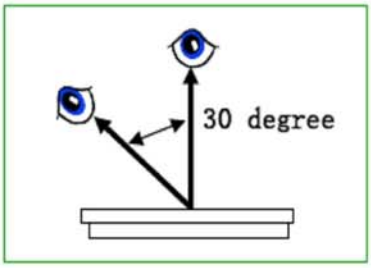
REMARK:
1,The Test samples should be applied to only one test item.
2,Sample side for each test item is 5~10pcs.
3,For Damp Proof Test,Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting,it would be judge as a good part.
5,EL evaluation should be excepted from reliability test with humidity and temperature:Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6,Failure Judgment Criterion:Basic Specification Electrical Characteristic,Mechanical Characteristic,Optical Characteristic.

11. Inspection Standard

This standard apply to TFT module specification.

1. Inspection condition:

Under daylight lamp 20~40W, product distance inspector'eye 30cm,incline degree 30° 。



2. Inspection standard

<table>
<tr><th>NO.</th><th>Item</th><th>Inspection standard</th><th>Rate</th></tr>
<tr><td>2.1</td><td>Dot</td><td>Case of Dot defect is below
① Bright Dot (whit spot) : "0"
② Dark Dot (black spot) : "0" (In case of Dark Dot on Main TFT LCD)
- NG if there's full Dot defect.
- Damaged less than the size of sub-pixel is not counted as defect
- Dots darker than the size of sub-pixel are not defined as bright dot defect
<table>
<tr><th>area
size（mm）</th><th>Acceptable number</th></tr>
<tr><td>Φ≤0.10</td><td>ignore</td></tr>
<tr><td>0.10＜Φ≤0.15</td><td>3</td></tr>
<tr><td>0.15＜Φ≤0.20</td><td>2</td></tr>
<tr><td>0.25＜Φ≤0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table></td><td rowspan="2">minor</td></tr>
<tr><td>2.2</td><td>line</td><td>
<table>
<tr><th colspan="2">Size（mm）</th><th>Acceptable number</th></tr>
<tr><td>ignore</td><td>W≤0.03</td><td>ignore</td></tr>
<tr><td>L≤4.0</td><td>0.03＜W≤0.04</td><td>2</td></tr>
<tr><td>L≤4.0</td><td>0.04＜W≤0.05</td><td>1</td></tr>
<tr><td></td><td>0.05＜W</td><td>Treat with dot non-conformance</td></tr>
</table></td></tr>
</table>

12. Handling Precautions

12.1 Mounting method

The LCD panel of SC LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent
[recommended below] and wipe lightly
Isopropyl alcohol
Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:
Water
Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:
Soldering flux
Chlorine (Cl) , Salfur (S)

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (CI), Salfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

12.4 packing

Module employ LCD elements and must be treated as such.
Avoid intense shock and falls from a height.
To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.

An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.

If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.

Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.

Storing with no touch on polarizer surface by the anything else.

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.

When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution For Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

When a question is arisen in this specification

When a new problem is arisen which is not specified in this specifications

When an inspection specifications change or operating condition change in customer is reported to GT LCD , and some problem is arisen in this specification due to the change

When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.