

SMC0700A-800480 Series

MCU Interface TFT LCD Module USER MANUAL

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Reference Controller Datasheet

MCU Interface LCD Module Selection Guide

SSD1963

Part A: MCU Parallel TFT LCD Module

>> Model No.

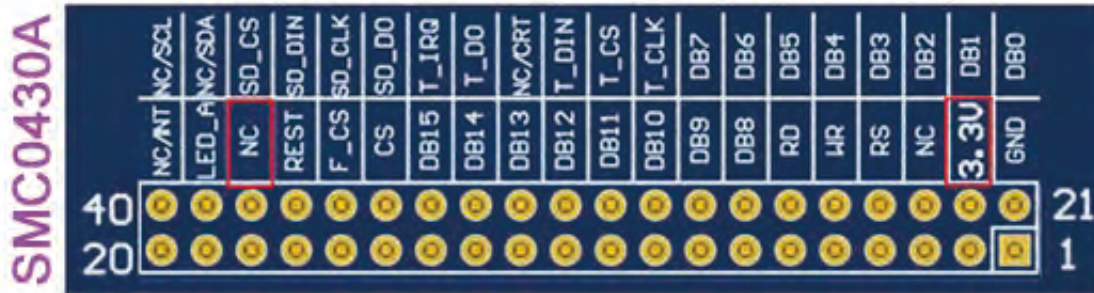
1. SMC0430A-480272-RTP/CTP
2. SMC0430A-800480-RTP/CTP (IPS)
3. SMC0500A-800480-RTP/CTP
4. SMC0700A-800480-RTP/CTP

>> Product Parameters

Model No.	Model Size	Resolution	Display Type	PCB Size	Active Area
SMC0430A-480272	4.3"	480*272	TN	120.00*74.00	95.04*53.86
SMC0430A-800480	4.3"	800*480	IPS	120.00*74.00	95.04*53.86
SMC0500A-800480	5.0"	800*480	TN	133.50*84.00	108.00*64.80
SMC0700A-800480	7.0"	800*480	TN	181.00*108.00	154.08*85.92
Display Color	RGB 65K color				
Controller	SSD1963				
Module Interface	16Bit Parallel Interface				
Operating Temperature	-10℃~60℃				
Storage Temperature	-20℃~70℃				
Operating Voltage	4.3": 2.8-3.3V		5.0": 2.8-3.3V		7.0": 5.0V
IO Voltage	3.3V				



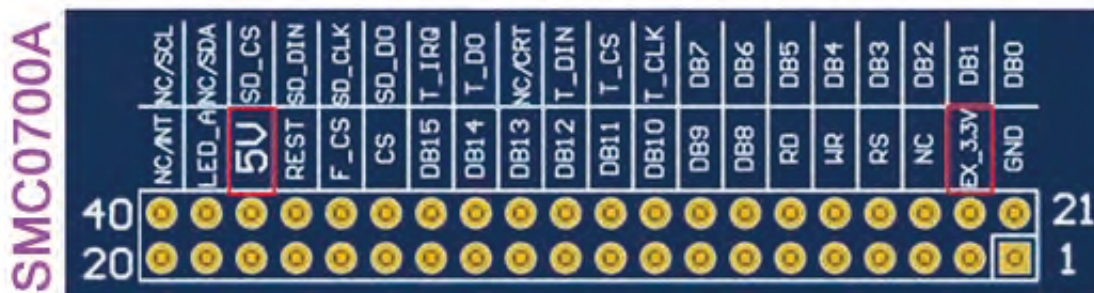
>> Interface Description



Interface for SMC0430A SSD1963 MCU Parallel TFT LCD Module



Interface for SMC0500A SSD1963 MCU Parallel TFT LCD Module



Interface for SMC0700A SSD1963 MCU Parallel TFT LCD Module

Notice:

- A. "T_" are related pins of the resistive touch screen;
- B. "SD_" are related pins of SD card;
- C. "F_" are related pins of SPI FLASH;
- D. "NC_" is the related pin of the capacitive touch screen;
- E. The rest are related pins of the LCD screen;
- F. SPI FLASH is not soldered, please solder it yourself if you need it.



No.	Pin ICON	Pin Description
1	GND	Module Power Ground Pin
2	3.3V/EX_3.3V	SMC0430A/SMC0500A: 3.3V; SMC0700A: NC / 3.3V.
3	NC	Undefined, reserved
4	RS	LCD register / data selection control pin (high level: register, low level: data)
5	WR	LCD write control pin
6	RD	LCD read control pin
7-14	DB8-DB15	LCD data bus high 8-bit pin
15	CS	LCD reset control pin (low level enable)
16	F_CS	SPI FLASH chip selection pin (low level enable)
17	REST	LCD reset control pin (low level reset)
18	NC/5.0V	SMC0430A/SMC0500A: NC; SMC0700A: 5.0V.
19	LED_A	LED Backlight control Pin (If you need it, can connect it)
20	NC/INT	RTP: Undefined, reserved / CTP: Interrupt detection pin
21~28	DB0~DB7	LCD data bus low 8-bit pin
29	T_CLK	RTP: Touch Panel SPI bus clock control pin
30	T_CS	RTP: Touch screen IC chip select control pin (Low level enable)
31	T_DIN	RTP: Touch Panel SPI bus write data pin
32	NC/CRT	RTP: Undefined, reserved / CTP: Reset control pin (low level reset)
33	T_DO	RTP: Touch Panel SPI bus read data pin
34	T_IRQ	RTP: Interrupt detection pin (Low level enable)
35	SD_DO	SD: SDIO bus read data pin
36	SD_CLK	SD: SDIO bus clock control pin
37	SD_DIN	SD: SDIO bus write data pin
38	SD_CS	SD: SD chip select control pin (Low level enable)
39	NC/SDA	RTP: Undefined, reserved / CTP: IIC bus data control Pin
40	NC/SCL	RTP: Undefined, reserved / CTP: IIC bus clock control Pin



>> Program wiring instructions

LCD Pin (RTP)	SMC0430A/SMC0500A		SMC0700A	
	STM32F103RCT6	STM32F407VET6	STM32F103RCT6	STM32F407VET6
3.3V/5.0V	3.3V	3.3V	5.0V	5.0V
GND	GND	GND	GND	GND
DB0-DB1	PB0~PB15	PD14-PD15	PB0~PB15	PD14-PD15
DB2-DB3		PD0- PD1		PD0- PD1
DB4-DB12		PE7- PE15		PE7- PE15
DB13-DB15		PD8- PD10		PD8- PD10
WR	PC7	PD5	PC7	PD5
RD	PC6	PD4	PC6	PD4
RS	PC8	PD11	PC8	PD11
REST	PC4	复位引脚	PC4	复位引脚
CS	PC9	PD7	PC9	PD7
LED_A	PC10	PB15	PC10	PB15
T_IRQ	PC1	PB1	PC1	PB1
T_DIN	PC3	PB2	PC3	PB2
T_DO	PC2	PC4	PC2	PC4
T_CS	PC13	PC13	PC13	PC13
T_CLK	PC0	PB0	PC0	PB0

Note:

A. Power Supply of Display

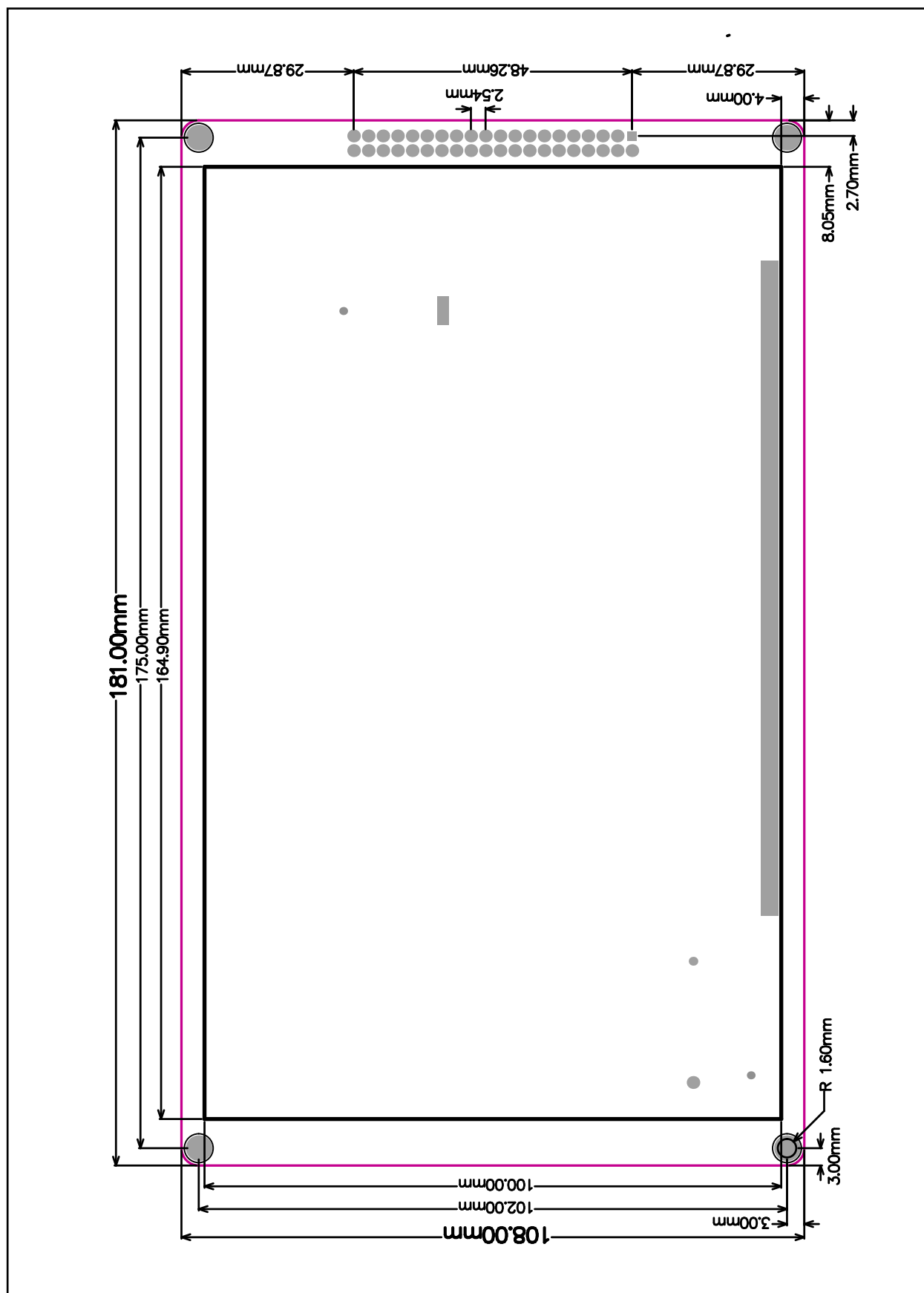
SMC0430A/SMC0500A: The 3.3V power supply must be connected to 2.8V~3.3V, and 5.0V cannot be connected;

SMC0700A: The power supply must be connected to 5.0V, otherwise the backlight will not light;

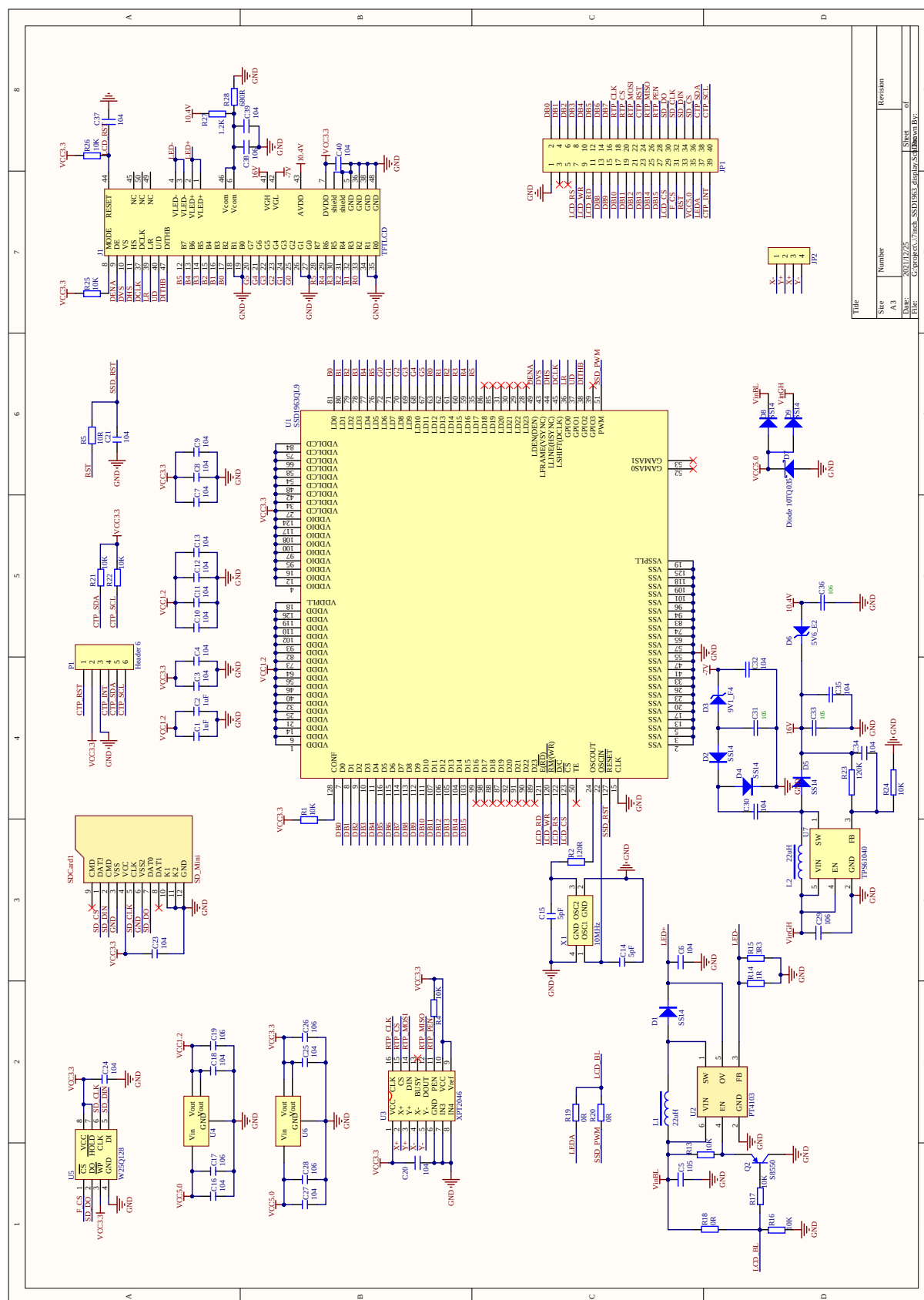
B. There are three ways to control the backlight: always on, SSD1963 PWM control brightness, and pin control. By default, pin control is used. Only need to input a high level on the LED_A pin to enable the backlight drive circuit, light the backlight, and input a low level to turn off the backlight. By inputting a PWM signal, the backlight brightness can be adjusted.

C. Since the power consumption of the product is 200-400mA when the backlight is the brightest, be sure to use a stable power supply and a qualified power supply line.

>> Outline Drawing



>> Diagram of LCD Module



Part B: SPEC for TFT LCD Panel

1. General Description

- 7.0”(diagonal), 800 x RGB x 480 dots, colors, Transmissive, TFT LCD module.
- Viewing Direction: 6 o'clock.
- Driving IC:EK971BB3、EK9716BD3 or equivalent TFT controller/driver.
- RGB(18)bits data bus (I80 system interface).
- Logic voltage: 3.0V (typ.).
- Touch panel.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter		Specifications	Unit
Outline dimensions		165(W) x 100(H) x 3.5(D) (Exclude FPC, cables of touch panel and backlight)	mm
Color TFT 800xRGBx480			mm
			mm
	LCD active area	154.08(W) x 85.92(H)	mm
	Display format	800x RGB x 480	dots
	Color configuration	RGB stripes	-
	Dot pitch	0.1926(RGB)(W) x 0.1790(H)	mm
Weight		TBD	grams

Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
TFT Gate on voltage	VGH	17.5	18.5	19.5	V	
TFT Gate off voltage	VGL	-7.5	-6.5	-5.5	V	
TFT Common electrode voltage	VCOM	2.8	3.0	3.2	V	
Analog power supply voltage	AVDD	9.6	9.8	10.0	V	

第三角法

DATE日期

2017.02.28

REF备注

DATE日期

DESCRIPTION描述

NAME姓名

165.00±0.30

156.70

154.21A

89.10

85.92A

100.00±0.30

65.52

48

50

喷码 *****

下铁架0.3MM

背光电路图 (CIRCUIT DIAGRAM) :

Vf

Ir

X

Y

LV

Δ

Forward Voltage

Reverse Current

色坐标 CIE

亮度均匀度 Luminance Uniformity

寿命 LifeSpan

光衰 Light Decay

Min

Max

Typ

Unit

Condition

8.60

10.5

9.60

V

μA

mA

0.25

0.315

0.315

--

--

--

80

-20

-30

Topr

Tstg

Tstg

Operating Temperature

Storage Temperature

Test Temperature

10. Steel Box (铁箱)

2

9. Reflective (反光贴)

1

8. Thin Board (下板底板)

1

7. Thin Board (上板盖板)

1

6. Diffuser Tape (扩散胶条)

1

5. PCB (电路板)

1

4. FPC (连接线)

1

3. Light Guide (导光板)

1

2. Housing (外壳)

1

1. SMD LED020

18

NEL

TITLE

QUANTITY

1. 颜色:白色;

2. 单位:mm;

3. 未按比例出图;

4. Δ为更改标记;

5. 标示请贵司确认;

6. 尺寸测量方法:

7. 未注尺寸公差±0.20,未注圆角R0.2;

8. ()为参考尺寸,□为重点控制尺寸;

9. 所有材料均符合“RoHS”要求。

CUSTOMER'S NAME客户名称

CUSTOMER'S CODE客户编号

EDITION版数

BRT.CODE背光代码

PRODUCT CODE产品代码

EDITION版数

确认

* 注意：本产品在不良条件下使用时，可能会出现亮度不均匀、暗斑等现象，这是由于LED芯片本身特性所致，不属于产品质量问题。本公司对LED产品的亮度指标不作任何保证，敬请谅解。

Figure 1: Outline Drawing

3. Interface signals

Table 2: Pin assignment

Pin No	Symbol	Description
1	V_{LED+}	Power supply for backlight
2	V_{LED+}	Power supply for backlight
3	V_{LED-}	The backlight ground
4	V_{LED-}	The backlight ground
5	GND	Ground
6	VCOM	For external VCOM DC input
7	DVDD	Digital Power
8	MODE	DE/SYNC mode select MODE3=H: DE mode(normally pull high) MODE3=L: HSD/VSD mode
9	DE	Data enable signal
10	VS	Vertical sync input.Negative polarity
11	HS	Horizontal sync input.Negative polarity
12	B7	Blue data Input
13	B6	Blue data Input
14	B5	Blue data Input
15	B4	Blue data Input
16	B3	Blue data Input
17	B2	Blue data Input
18	B1	Blue data Input
19	B0	Blue data Input
20	G7	Green data Input
21	G6	Green data Input
22	G5	Green data Input
23	G4	Green data Input
24	G3	Green data Input
25	G2	Green data Input
26	G1	Green data Input
27	G0	Green data Input
28	R7	Red data Input
29	R6	Red data Input
30	R5	Red data Input
31	R4	Red data Input
32	R3	Red data Input
33	R2	Red data Input
34	R1	Red data Input
35	R0	Red data Input
36	GND	Ground
37	DCLK	Clock input
38	GND	Ground
39	SHLR	Source right or left sequence control SHLR=H: right

		shift, Left Right SHLR=L: left right, Right Left
40	U/D	Gate up or down scan control UPDN=H: up shift, Down Up UPDN=L: down shift, Up Down
41	VGH	Positive Power for TFT
42	VGL	Negative Power for TFT
43	AVDD	Analog Power
44	RESET	Global reset pin.Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (RC circuit :R=10K Ω , C=1uF))
45	NC	Not connect
46	VCOM	For external VCOM DC input
47	DITHB	Dithering setting DITH="H" 6-bit resolution (last 2 bits of input data turncated) DITH="L" 8-bit resolution (default setting)
48	GND	Ground
49	NC	Not connect
50	NC	Not connect

4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VDD)	VCC	-0.3	+5.0	V	1

Note:

- 1.VCC, GND must be maintained.
- 2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

4.2 Environmental Condition

Table 4

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-20°C	+70°C	-30°C	+80°C	Dry
Humidity (Note 1)	80% max. RH for Ta $\leq$ 40°C < 50% RH for 40°C < Ta $\leq$ Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

5. Electrical Specifications

Typical Electrical Characteristics

At Ta = 25 °C, VCC=IOVCC= 3.0V to 3.6V, GND=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (logic)	VDD-GND		3.0	3.3	3.6	V
Supply current (Logic & LCD)	ICC	VCC=3.3V	-	8	15	mA
Supply voltage of white LED21 star backlight	VLED =V(LED+)- V(LED-)	Forward current =140 mA Number of LED dies =21	9.6	9.8	10.0	V
Luminance (on the module surface)			-	350	-	cd/m ²

6. Optical Characteristics

Table 7: Optical specifications

Items		Symbol	Condition	Specifications			Unit	Note
				Min.	Typ.	Max.		
Contrast Ratio		CR		-	300	-	-	
Response Time		T _R		-	10	20	ms	
		T _F		-	15	20	ms	
Chromaticity	Red	X _R		0.604	0.634	0.664	-	
		Y _R		0.298	0.328	0.358	-	
	Green	X _G		0.264	0.294	0.324	-	
		Y _G		0.547	0.577	0.607	-	
	Blue	X _B		0.107	0.137	0.167	-	
		Y _B		0.104	0.134	0.164	-	
	White	X _W	0.272	0.302	0.332	-		
		Y _W	0.305	0.335	0.365	-		
Viewing angle	Hor.	φ1(3 o'clock)	Center CR≥10	-	45	-	deg.	
		φ2(9 o'clock)		-	45	-		
	Ver.	θ2(12 o'clock)		-	35	-		
		θ1(6 o'clock)		-	15	-		
NTSC ratio					61.5		%	

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):

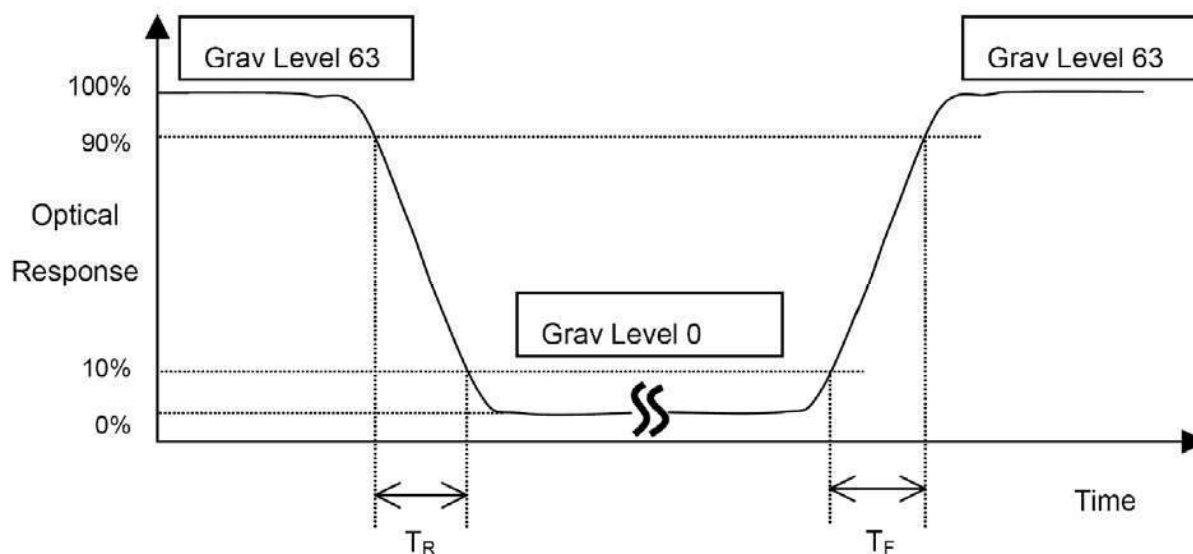


Figure 3

Note 3: Viewing Angle

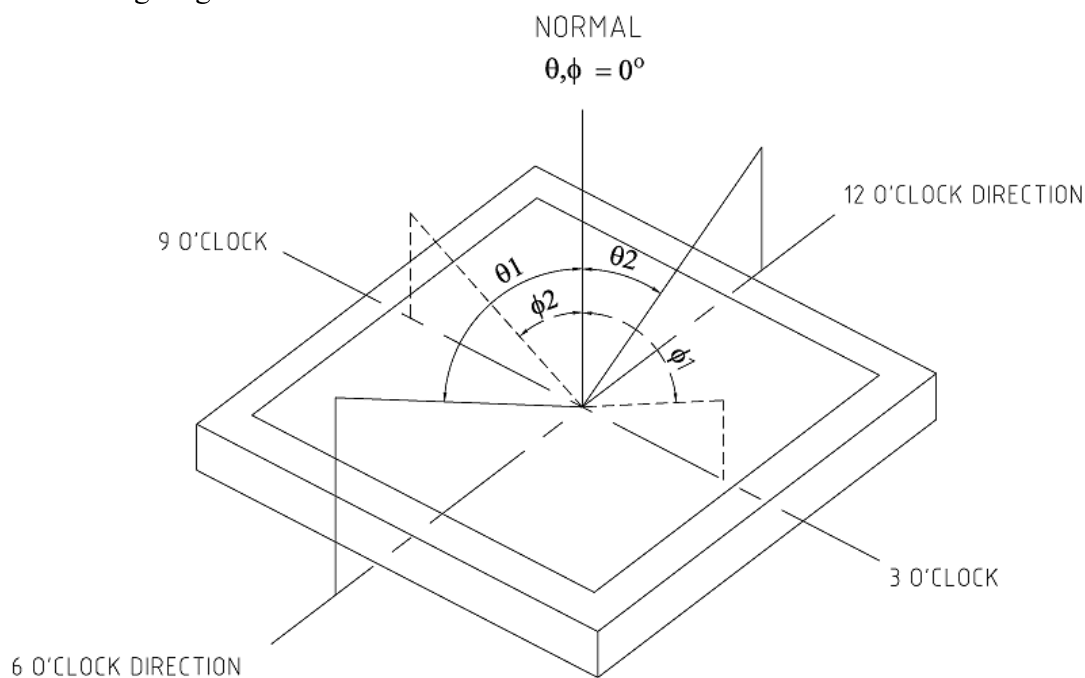


Figure 4

The above “Viewing Angle” is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 12 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.

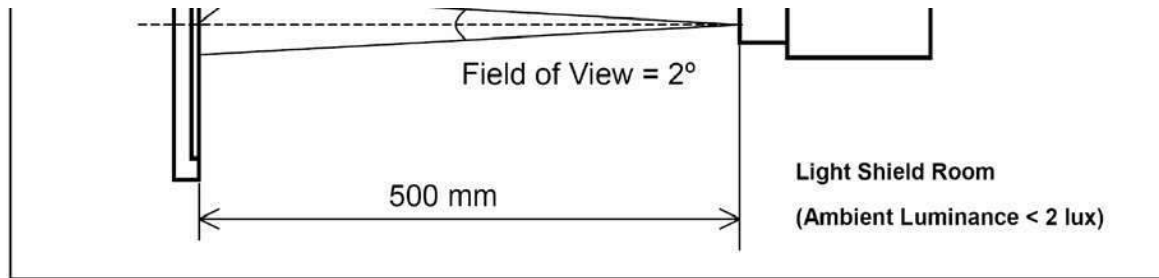


Figure 5

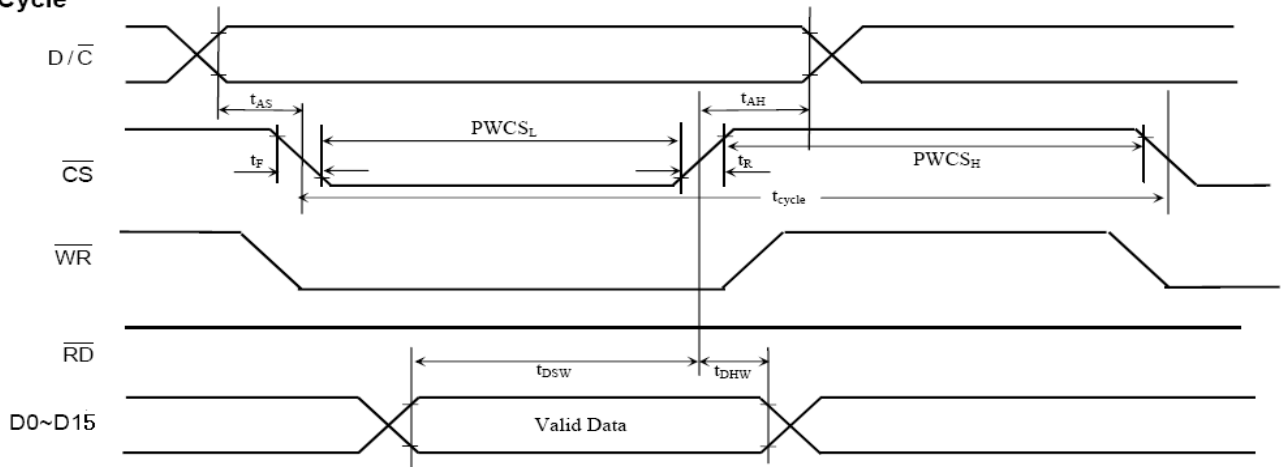
7. Timing Characteristics

7.1 80-system Bus Interface Timing Characteristics of IC

Table 8: Normal Write Mode (VCC = IOVCC=2.4~3.3V)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	100	-	-	ns
t_{cycle}	Clock Cycle Time (read cycle)	1000	-	-	ns
t_{AS}	Address Setup Time	0	-	-	ns
t_{AH}	Address Hold Time	0	-	-	ns
t_{DSW}	Data Setup Time	5	-	-	ns
t_{DHW}	Data Hold Time	5	-	-	ns
t_{ACC}	Data Access Time	250	-	-	ns
t_{OH}	Output Hold time	100	-	-	ns
$PWCS_L$	Pulse Width /CS low (write cycle)	50	-	-	ns
$PWCS_H$	Pulse Width /CS high (write cycle)	50	-	-	ns
$PWCS_L$	Pulse Width /CS low (read cycle)	500	-	-	ns
$PWCS_H$	Pulse Width /CS high (read cycle)	500	-	-	ns
t_R	Rise time	-	-	4	ns
t_F	Fall time	-	-	4	ns

Write Cycle



Read Cycle

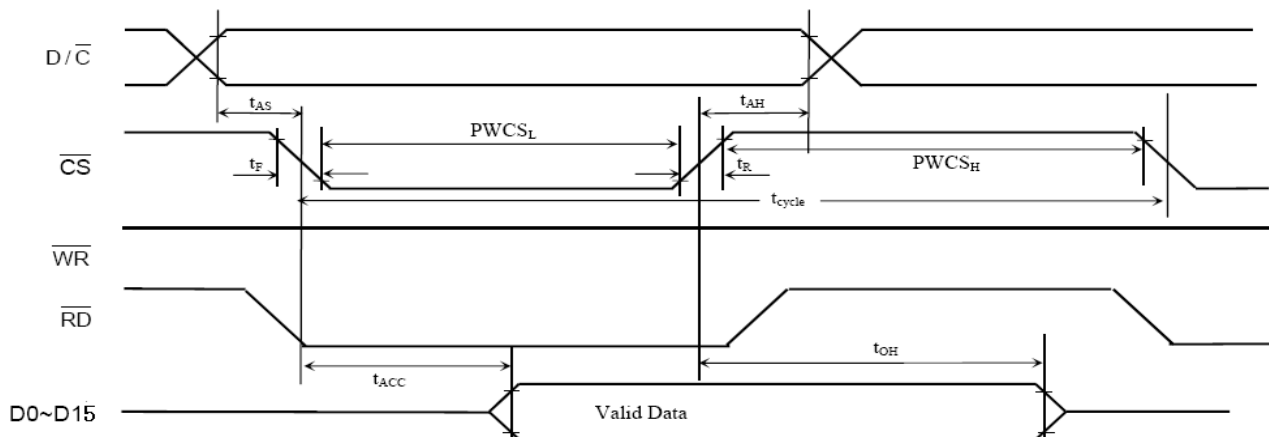


Figure 7. 80-system Bus Timing

7.2 Reset Operation of IC

Table 9: Reset Timing Characteristics ($V_{CC} = I/OV_{CC} = 2.4 \sim 3.3V$)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	tRES	ms	1	-	-
Reset rise time	trRES	μs	-	-	10

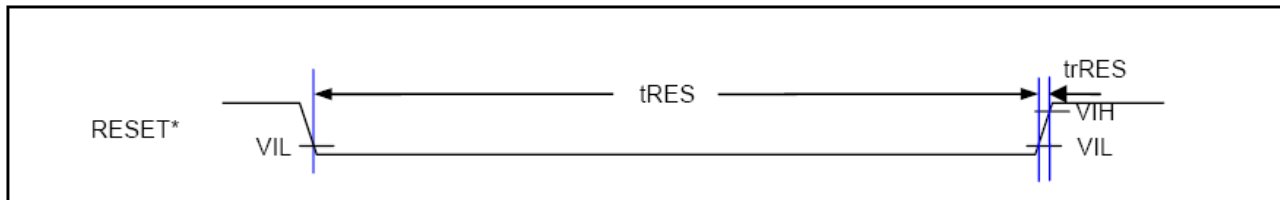


Figure 8: Reset Timing

8. Reliability Test Item

Test Item	Sample Type	Test Condition	Test result determinant gist
High temperature storage	Normal temperature	70±3℃;96H	the inspection of appearance and function character.
	Wide temperature	80±3℃;96H	
Low temperature storage	Normal temperature	-20±3℃;120H	
	Wide temperature	-30±3℃;120H	
High temperature /humidity storage	Normal temperature	50℃±3℃,90%±3%RH;96H	
	Wide temperature	60℃±3℃,90%±3%RH;96H	
High temperature operation	Normal temperature	60±3℃;96H	no objection of the function character; no fatal objection of the appearance.
	Wide temperature	70±3℃;96H	
Low temperature operation	Normal temperature	0±3℃;96H	
	Wide temperature	-20±3℃;96H	
High temperature /humidity operation	Normal temperature	40℃±3℃,90%±3%RH;96H	
	Wide temperature	50℃±3℃,90%±3%RH;96H	
Temperature Shock	Normal temperature	-20±3℃,30min→70±3℃,30min;10cycle	inspect the objections appearance、function & the whole structure
	Wide temperature	-30±3℃,30min 80±3,30min;10cycle	The inspection of appearance、function & the whole structure

9. Suggestions for using LCD modules

9.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don't disassemble the LCM.
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 assembling, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
9. Do not alter, modify or change the the shape of the tab on the metal frame.
10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

9.2 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container.