SPECIFICATION
FOR
LCD MODULE

MODULE NO: AFY480272A0-4.3INTH-C
REVISION NO: O

Customer's Approval:

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
CHECKED BY		
APPROVED BY		

REVISION RECORD

Rev No.	Rev date	Contents	Remarks
O	2019-12-12	First release	Preliminary

CONTENTS

1. GENERAL INFORMATION

No.	Item	Contents	Unit
1	LCD size	4.3 inch (Diagonal)	/
2	Display mode	IPS/Normally black/Transmissive	/
3	Viewing direction(eye)	Free	/
4	Gray scale inversion direction	-	/
5	Resolution(H*V)	480 *272 Pixels	/
6	Module size (L*W*H)	105.50*67.20*4.85	mm
7	Active area (L*W)	95.04*53.86	mm
8	Pixel pitch (L*W)	0.198*0.198	mm
9	Interface type	RGB 24bit interface	/
10	Color Depth	16.7M	/
11	Module power consumption	TBD	W
12	Back light type	White LED	/
13	Driver IC	SC7283-G4 OR COMPATIBLE(TFT) GT911(CTP)	/
14	Weight	TBD	G

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power supply input voltage for TFT	VDD	-0.3	4.0	V	
Backlight current (normal temp.)	ILED	-	50	mA	
Operation temperature	Top	-30	+80	°C	Note1
Storage temperature	Tst	-30	+85	°C	Note1
Humidity	RH	-	90%	RH	Note1

Note1 :

1).The relative humidity and temperature range are as below sketch,90%RH Max.

2).The maximum wet bulb temperature ≦40℃ and without dewing.

Operating Range   Storage Range
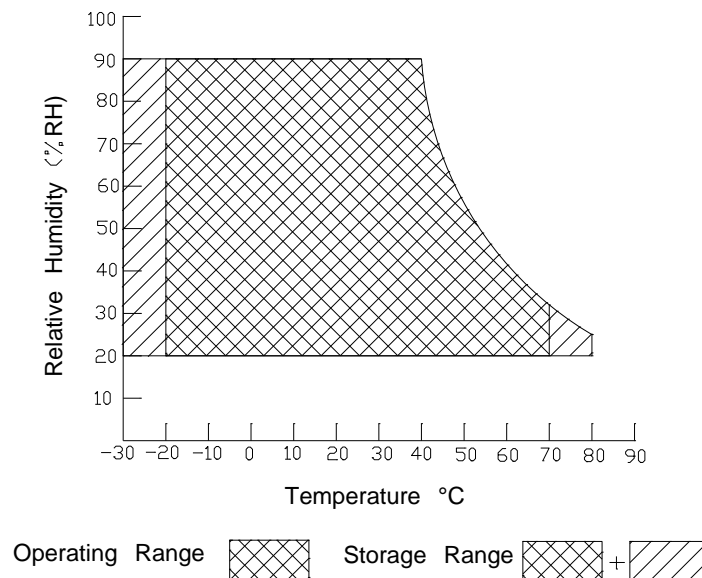
3. ELECTRICAL CHARACTERISTICS
DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VDD	3.0	3.3	3.6	V	
I/O logic voltage	VDDIO	3.0	-	3.6	V	
Input voltage 'H' level	VIH	0.7VDDIO	-	VDDIO	V	
Input voltage 'L' level	VIL	VSS	-	0.3VDDIO	V	
Power supply current	IVDD	-	-	-	mA	
TFT gate on voltage	VGH	-	-	-	V	
TFT gate off voltage	VGL	-	-	-	V	
Analog power supply voltage	AVDD	-	-	-	V	
Differential input common mode voltage	Vcom	-	-	-	V	Note1

Note1 : The value is just the reference value. The customer can optimize the setting value by the different D-IC
Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

CTP DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VCC	2.66	3.3	3.47	V	Note2
Input Power ripple	Vpp	-	-	50	mV	
I/O Signal Voltage	VCCIO	0	-	3.47	V	Note2
Input voltage 'H' level	VIH	0.7VCCIO	-	VCCIO	V	
Input voltage 'L' level	VIL	VSS	-	0.3VCCIO	V	
Operating Current (Normal Mode)	IVCC	-	-	-	mA	
Operating Current (Sleep mode)	IVCC	-	-	-	mA	

Note2 : If you need more information of CTP,please refer to our Spec of CTP.

4. BACKLIGHT CHARACTERISTICS
(at Ta=25°C,RH=60%)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED forward voltage	VF	-	18.0	19.2	V	IF=20*2mA
LED forward current	IF	-	40	-	mA	
LED power consumption	PLED	-	0.72	-	W	Note1
Number of LED	-		12		PCS	
Connection mode	-		6　in series　2 in parallel		/	
LED life-time	-	20000	-	-	Hrs	Note2

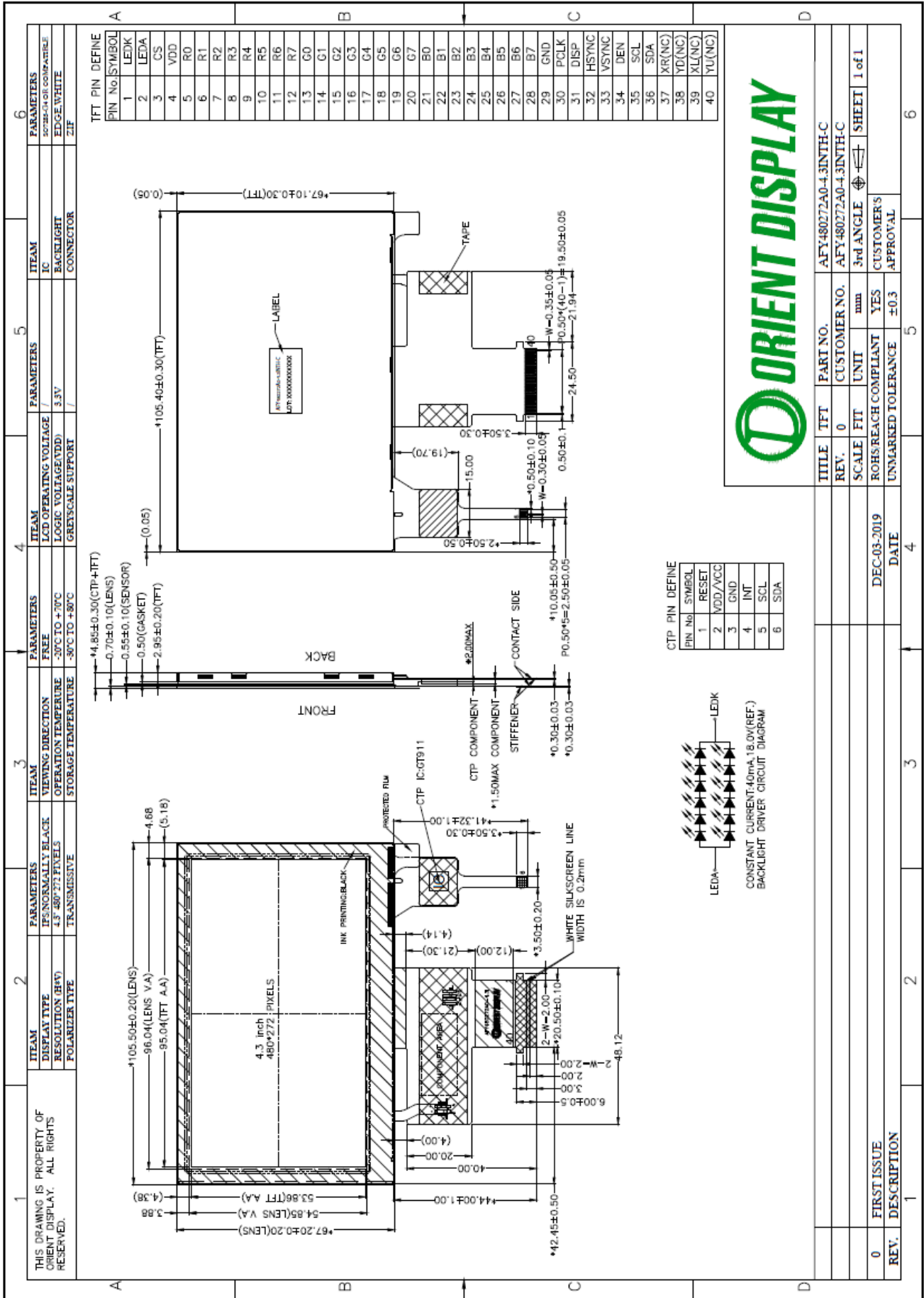Note1 : Calculator value for reference : IF*VF = PLED
Note2 : The LED life-time define as the estimated time to 50% degradation of initial brightness at Ta=25°C and
IF =40mA. The LED lifetime could be decreased if operating IF is larger than 40mA.

5. TOUCH PANEL CHARACTERISTICS
(at Ta=25°C)

Item	Description	Remark
Product Structure	G+G	
Surface Hardness	≤6H	Pencil，Loading 500g，45 deg
Ball-falling Test	≤100cm	Steel ball weight 64g
Touch Count Max	5 point	
I2C Slave Address*	0x5D	
Origin of Coordinate*	top left corner	
FW version	-	

6. EXTERNAL DIMENSIONS

TFT PIN DEFINE

PIN No.	SYMBOL
1	LEDK
2	LEDA
3	CS
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	PCLK
31	DISP
32	HSYNC
33	VSYNC
34	DEN
35	SCL
36	SDA
37	XR(NC)
38	YD(NC)
39	XL(NC)
40	YU(NC)

CTP PIN DEFINE

PIN No.	SYMBOL
1	RESET
2	VDD/VCC
3	GND
4	INT
5	SCL
6	SDA

ITEM	PARAMETERS
DISPLAY TYPE	IPS,NORMALLY BLACK
RESOLUTION (H×V)	4.3" 480*272 PIXELS
POLARIZER TYPE	TRANSMISSIVE

ITEM	PARAMETERS
VIEWING DIRECTION	FREE
OPERATION TEMPERATURE	-20°C TO +70°C
STORAGE TEMPERATURE	-30°C TO +80°C

ITEM	PARAMETERS
LCD OPERATING VOLTAGE	/
LOGIC VOLTAGE(VDD)	3.3V
GREYSCALE SUPPORT	/

ITEM	PARAMETERS
IC	/
BACKLIGHT	/
CONNECTOR	ZIF

PARAMETERS
SC7283-CH OR COMPATIBLE
EDGE,WHITE
ZIF

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ORIENT DISPLAY

TITLE	TFT	PART NO.	AFY480272A0-4.3INTH-C
REV.	0	CUSTOMER NO.	AFY480272A0-4.3INTH-C
SCALE	FIT	UNIT	mm
ROHS/REACH COMPLIANT	YES		3rd ANGLE
UNMARKED TOLERANCE	±0.3		SHEET 1 of 1

CUSTOMER'S APPROVAL

REV.	DESCRIPTION	DATE
0	FIRST ISSUE	DEC-03-2019

CONSTANT CURRENT:40mA,18.0V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM

LEDA
LEDK

CTP IC:GT911

4.3 inch
480*272 PIXELS

FRONT
BACK

LABEL

TAPE

PROTECTED FILM
INK PRINTING:BLACK

CTP COMPONENT
STIFFENER
CONTACT SIDE

WHITE SILKSCREEN LINE
WIDTH IS 0.2mm

7. ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time	Tr+ Tf	-	-	30	40	ms	FIG.1	Note 1
Contrast ratio	Cr		400	500	-	-	FIG.2	Note 2
Surface luminance	Lv	$\theta=0°$	600	900	-	cd/m^2	FIG.2	Note 3
Luminance uniformity	Yu	$\theta=0°$	75	80	-	%	FIG.2	Note 4
NTSC	-	$\theta=0°$	-	50	-	%	FIG.2	Note 5
Viewing angle	θ	$\varnothing=90°$	70	80	-	deg	FIG.3	Note 6
		$\varnothing=270°$	70	80	-	deg	FIG.3	
		$\varnothing=0°$	70	80	-	deg	FIG.3	
		$\varnothing=180°$	70	80	-	deg	FIG.3	
CIE (x,y) chromaticity	Red x	$\theta=0°$ $\varnothing=0°$ Ta=25°C	Typ -0.04	TBD	Typ +0.04	-	FIG.2 CIE1931	Note 5
	Red y			TBD		-		
	Green x			TBD		-		
	Green y			TBD		-		
	Blue x			TBD		-		
	Blue y			TBD		-		
	White x			TBD		-		
	White y			TBD		-		

Note1. Definition of response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%. For additional information see FIG1.

Note2.Definition of contrast ratio
Contrast ratio(Cr) is defined mathematically by the following formula.
For more information see FIG.2.

Contrast ratio= $\dfrac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$

Measured at the center area of the LCD

Note3.Definition of surface luminance
Surface luminance is the luminance with all pixels displaying white.
For more information see FIG.2.
Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn)

Note4.Definition of luminance uniformity
The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$Yu = \dfrac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.......,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,......,Pn)}}$

Note5. Definition of color chromaticity (CIE1931)
CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

Note6. Definition of viewing angle
Viewing angle is the angle at which the contrast ratio is greater than 10. angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.
For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible. For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON's BM-5or BM-7 photo detector or compatible.

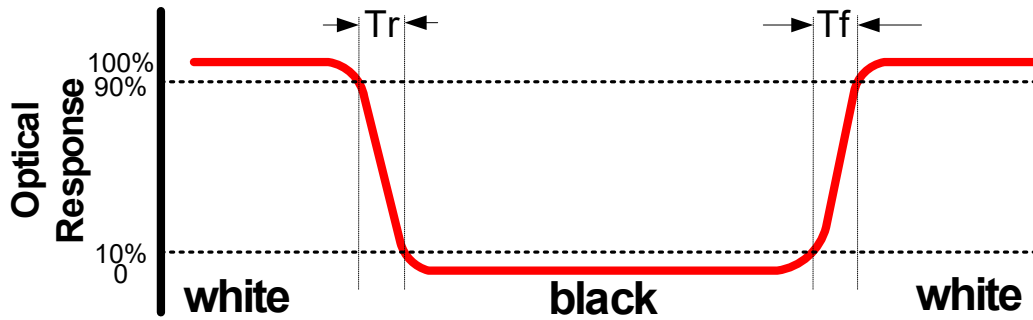# FIG.1. The definition of response Time

FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

H,V : Active area

Light spot size $\varnothing$=5mm(BM-5) or $\varnothing$=7.7mm (BM-7)50cm distance or compatible distance from the LCM surface to detector lens.

Test spot position : see Figure a.

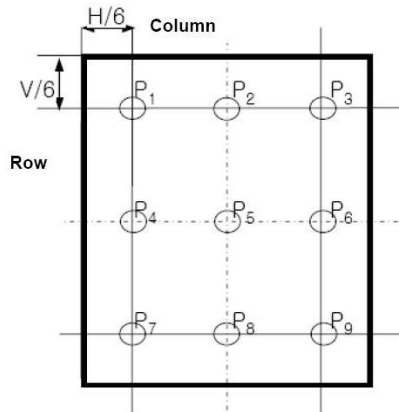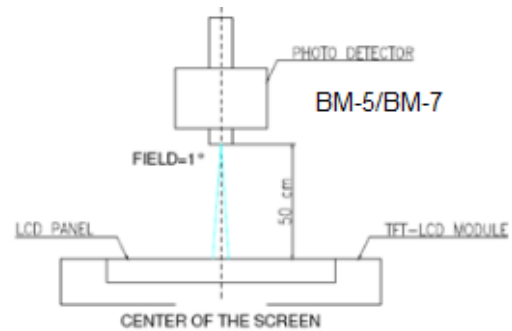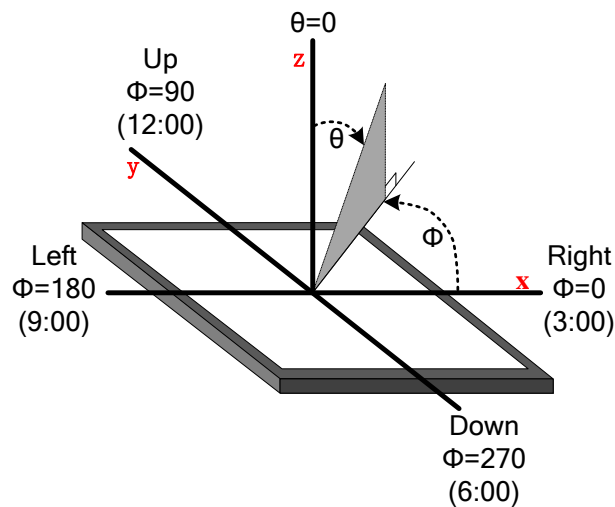measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible ,see Figure b.

Figure a

Figure b

FIG.3. The definition of viewing angle

8. INTERFACE DESCRIPTION

8.1Module Interface description

Interface No.	Name	I/O or connect to	Description
1	LEDK	P	Power for LED backlight(Cathode)
2	LEDA	P	Power for LED backlight(Anode)
3	CS	I	Chip Selected signal When CS=0,the chip is enable.
4	VDD	P	Power for LCD
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	DCLK	I	Dot clock
31	DISP	I	Set display mode. DISP=0:Standby mode. DISP=1:Normal display mode.
32	HSYNC	I	Horizontal sync input.
33	VSYNC	I	Vertical sync input
34	DE	I	Data enable
35	SCL	I	Serial Clock input Signal
36	SDA	I/O	Serial Data input Signal
37	XR	I	X-Right
38	YD	I	Y-Down
39	XL	I	X-Left
40	YU	I	Y-Up

8.2CTP Interface description

Interface No.	Symbol	I/O or connect to	Description
1	RESET	I	Reset Pin，Reset="low" Active.
2	VDD	P	CTP Power Supply
3	GND	P	CTP Ground.
4	INT	I	State change interrupt Signal.
5	SCL	I	I2C Serial O'clock input signal
6	SDA	I/O	I2C Serial data Input signal.

9. AC CHARACTERISTICS

AC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip)

9.1 System Operation AC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

9.2 System Bus Timing for SPI-3 Interface
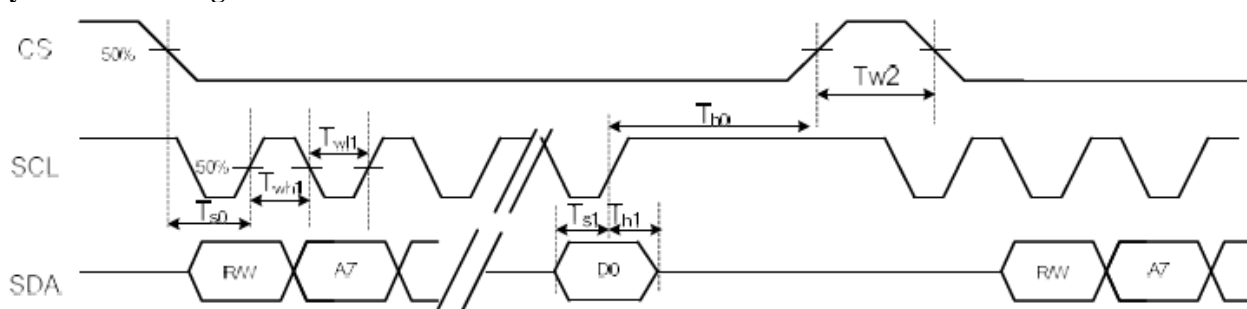
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	Ts0	50	-	-	ns	
Serial Data Input Setup Time	Ts1	50	-	-	ns	
CS Input Hold Time	Th0	50	-	-	ns	
Serial Data Input Hold Time	Th1	50	-	-	ns	
SCL Write Pulse High Width	Twh1	50	-	-	ns	
SCL Write Pulse Low Width	Twl1	50	-	-	ns	
SCL Read Pulse High Width	Trh1	300	-	-	ns	
SCL Read Pulse Low Width	Trl1	300	-	-	ns	
CS Pulse High Width	Tw2	400	-	-	ns	

9.3 System Bus Timing for RGB Interface
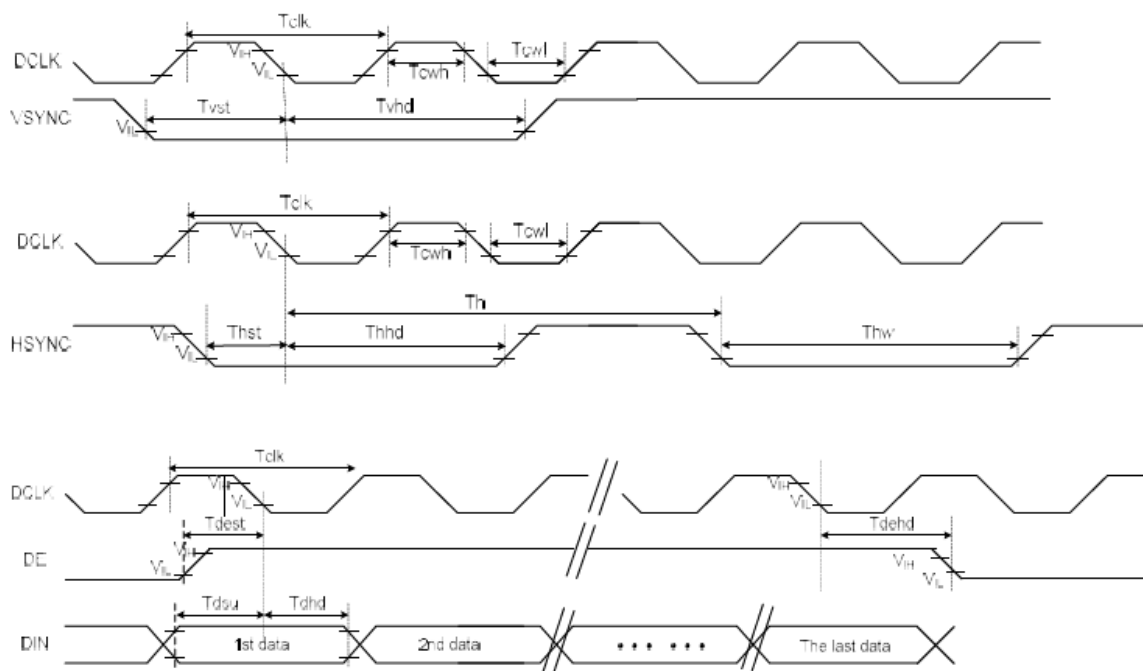
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	Thst	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	
DE Setup Time	Tdest	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

9.4 CTP I2C 通讯

GT911 提供标准的 I²C 通讯接口,由 SCL 和 SDA 与主 CPU 进行通讯。在系统中 GT911 始终作为从设备,所有通讯都是由主 CPU 发起,建议通讯速度为 400Kbps 或以下。 其支持的 I²C 硬件电路支持时序如下:
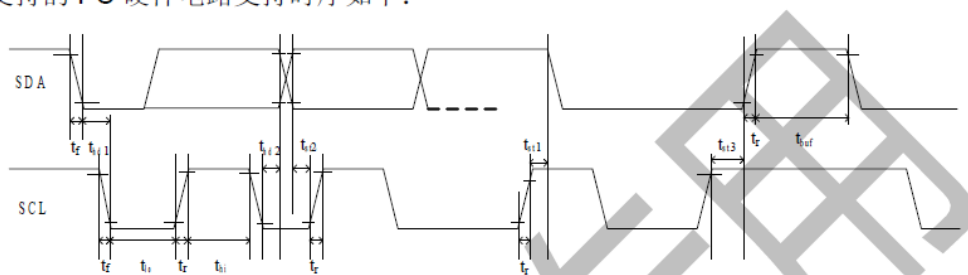
测试条件:**3.3V** 通讯接口,**400KHz** 通讯速度,上拉电阻 **2K**

Parameter	Symbol	MIN	Max	Unit
SCL low period	t_{lo}	0.9	0.9	us
SCL high period	t_{hi}	0.8	0.8	us
SCL setup time for START condition	t_{st1}	0.4	0.4	us
SCL setup time for STOP condition	t_{st3}	0.4	0.4	us
SCL hold time for START condition	t_{hd1}	0.3	0.3	us
SDA setup time	t_{st2}	0.4	0.4	us
SDA hold time	t_{hd2}	0.4	0.4	us

GT911 的 I²C 从设备地址有两组，分别为 0xBA/0xBB 和 0x28/0x29。主控在上电初始化时控制 Reset 和 INT 口状态进行设定，设定方法及时序图如下：

上电时序图：
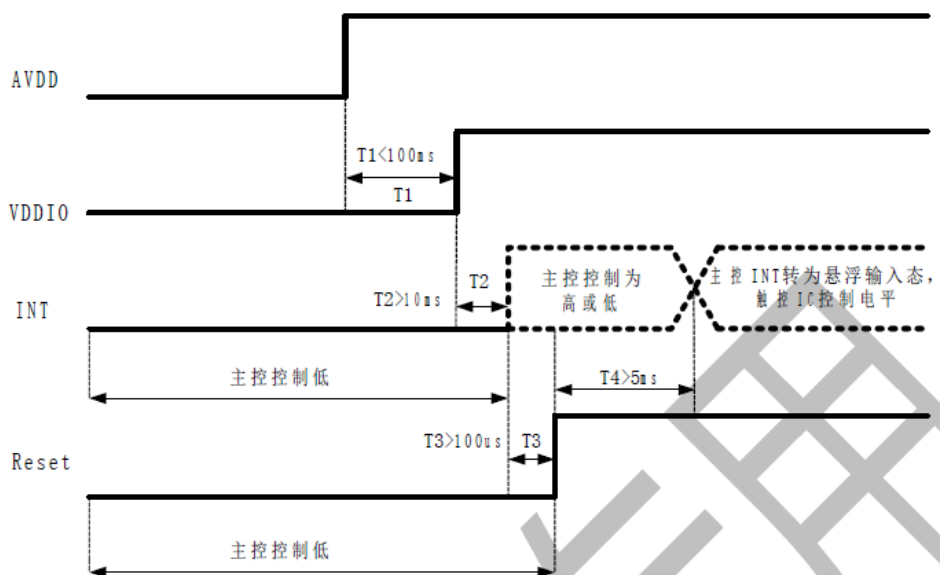
设定地址为 **0x28/0x29** 的时序：
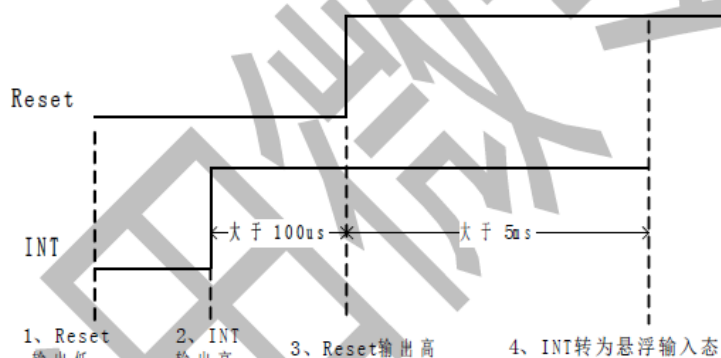
设定地址为 **0xBA/0xBB** 的时序：
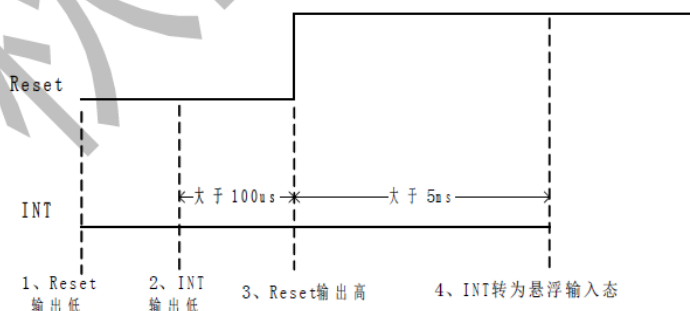
a) 数据传输(以设备地址为 0xBA/0xBB 为例)

通讯总是由主 CPU 发起，有效的起始信号为：在 SCL 保持为"1"时，SDA 上发生由"1"到"0"的跳变。地址信息或数据流均在起始信号之后传输。

所有连接在 I²C 总线上的从设备，都要检测总线上起始信号之后所发送的 8 位地址信息，并做出正确反应。在收到与自己相匹配的地址信息时，GT911 在第 9 个时钟周期，将 SDA 改为输出口，并置"0"，作为应答信号。若收到不与自己匹配的地址信息，即非 0XBA 或 0XBB，GT911 将保持闲置状态。

SDA 口上的数据按 9 个时钟周期串行发送 9 位数据：8 位有效数据+1 位接收方发送的应答信号 ACK 或非应答信号 NACK。数据传输在 SCL 为"1"时有效。

当通讯完成时，由主 CPU 发送停止信号。停止信号是当 SCL 为"1"时，SDA 状态由"0"到"1"的跳变。
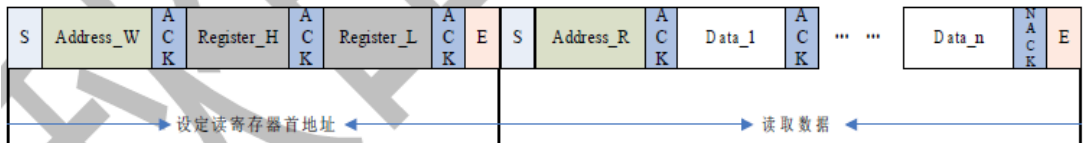
b) 对 GT911 写操作(以设备地址为 0xBA/0xBB 为例)

S	Address_W	ACK	Register_H	ACK	Register_L	ACK	Data_1	ACK	··· ···	Data_n	ACK	E
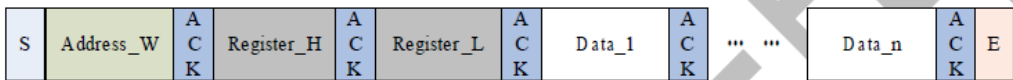
<div align="center">写操作时序图</div>

上图为主 CPU 对 GT911 进行的写操作流程图。首先主 CPU 产生一个起始信号，然后发送地址信息及读写位信息"0"表示写操作:0XBA。

在收到应答后，主 CPU 发送寄存器的 16 位地址，随后是 8 位要写入到寄存器的数据内容。

GT911 寄存器的地址指针会在写操作后自动加 1，所以当主 CPU 需要对连续地址的寄存器进行写操作时，可以在一次写操作中连续写入。写操作完成，主 CPU 发送停止信号结束当前写操作。

c) 对 GT911 读操作(以设备地址为 0xBA/0xBB 为例)

S	Address_W	ACK	Register_H	ACK	Register_L	ACK	E	S	Address_R	ACK	Data_1	ACK	··· ···	Data_n	NACK	E

<div align="center">设定读寄存器首地址 ←——————→   ←——————→ 读取数据</div>

<div align="center">读操作流程图</div>

上图为主 CPU 对 GT911 进行的读操作流程图。首先主 CPU 产生一个起始信号，然后发送设备地址信息及读写位信息"0"表示写操作：0XBA。

在收到应答后，主 CPU 发送首寄存器的 16 位地址信息，设置要读取的寄存器地址。

在收到应答后，主 CPU 重新发送一次起始信号，发送读操作：0XBB。收到应答后，主 CPU 开始读取数据。

GT911 同样支持连续的读操作，默认为连续读取数据。主 CPU 在每收到一个 Byte 数据后需发送一个应答信号表示成功接收。在接收到所需的最后一个 Byte 数据后，主 CPU 发送"非应答信号 NACK"，然后再发送停止信号结束通讯。
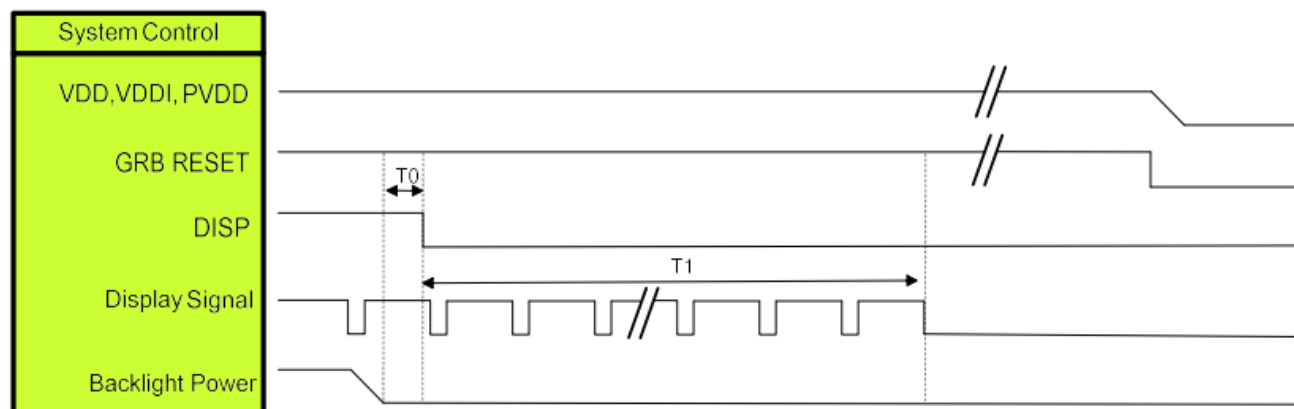
10. POWER SEQUENCE

TFT Module POWER SEQUENCE

To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VDD, DGND→VDDA; Power OFF:AGND→VDD, DGND

In order to prevent SC7283-G4 from power ON reset fail, the rising time (tPOR) of the digital power supply VDD should be maintained within given specifications. The power ON/OFF timing sequence is illustrated as below:
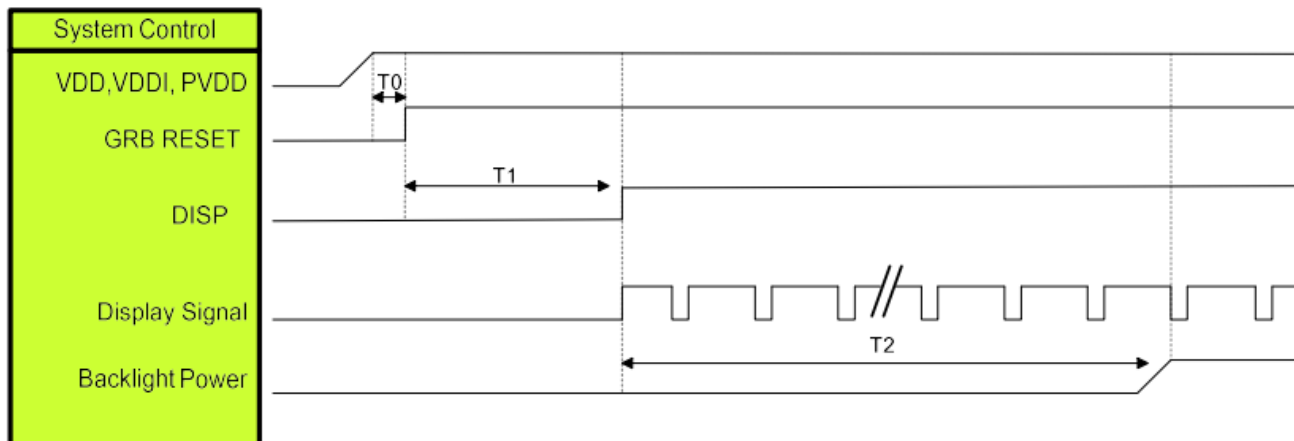
Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	80	ms

CTP POWER SEQUENCE(Ignored,if you need to understand it and we can provide expatiation for you.)

11. RELIABILITY TEST CONDITIONS

No.	Test item	Test condition	Inspection after test
11.1	High temperature storage test	+85°C/240 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects : 1.Current changing value before test and after test is 50% larger; 2. Function defect : Non-display,abnormal-display,missing lines, Short lines,ITO corrosion; 3.Visual defect : Air bubble in the LCD,Seal leak,Glass crack.
11.2	Low temperature storage test	-30°C/240 hours	
113	High temperature operating test	+80°C/120 hours	
11.4	Low temperature operating test	-30°C/120 hours	
11.5	Temperature cycle storage test	-30°C ~ 25°C ~ +80°C/10cycles (30min.) (10min.) (30min.)	
11.6	High temperature high humidity test	+50°C*90% RH/120 hours	
11.7	Vibration test	Frequency : 250 r/min Amplitude : 1 inch Time: 45min	
11.8	Drop test	Drop direction: 1 corner/3 edges/6 sides 10 time Packing weight(kg) — Drop height(cm) 〈11 — 80±1.6 11≦G〈21 — 60±1.2 21≦G〈31 — 50±1.0 31≦G〈40 — 40±0.8	
11.9	ESD test	Air discharge: ±8KV, 10time Contact discharge: ±4KV, 10time	

Remark :
1.The test samples should be applied to only one test item.
2.Sample size for each test item is 3~5pcs.
3.For High temperature high humidity 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 judged as a good part.
5.B/L 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 B/L has.
6.Failure judgment criterion: Basic specification, Electrical characteristic, Mechanical characteristic, Optical characteristic.

12. INSPECTION CRITERION

Refer to 《Inspection Criterion for TFT》 V2.3

13. HANDLING PRECAUTIONS

13.1 Mounting method

The 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.

13.2 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) , Sulfur (S)
If goods were sent without being silicon 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 (Cl), Sulfur (S) from customer, Responsibility is on customer.

13.3 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.

13.4 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.

13.5 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.
●.When fixed patterns are displayed for a long time,remnant image is likely to occur.

13.6 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.
●.Storing in an ambient temperature 10°C to 30°C, and in a relative humidity of 45% to 75%. Don't expose to sunlight or fluorescent light.
●.Storing 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.

13.7 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.

14. PRECAUTION FOR USE

14.1 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.

14.2 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 ODNA, 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.

15. PACKING SPECIFICATION

Please consult our technical department for detail information.

16.HSF COMPLIANCE

●.This products complies with ROHS 2011/65/EU and 2015/863/EU、REACH 1907/2006/EC requirements, and the packaging complies with 94-62-EC.