SPECIFICATION

TFT LCD MODULE

MODEL NO:	TM035KVHG01
CUSTOMER:	
CUSTOMER P/N.	
VERSION	V0.1
CUSTOMER APPROVED	

■Preliminary specification
□Final specification

PREPARED BY	CHECKED BY	VERIFIED BY QA DEPT.	APPROVED BY

TIANMA MICRO-ELECTRONICS CO., LTD
Address: 8F，64th Building，Jinlong，Majialong Industrial Area, Nanshan District, Shenzhen, China Tel: +86-755-26094288 Fax: +86-755-86225774 Web: www.tianma.cn www.tianma.com

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REVISION RECORD

Version	Page	Revision Items	Name	Date
0.1		First release	JIM	2013.03.21

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1 General Specifications

TM035KVHG01 is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC, FPC, a back light unit and CTP (Capacitive Touch Panel) with Multi-Touch function. The mounting method is with tape bonding . This product accords with RoHS environmental criterion.

Item	Feature	Spec	Unit	Note
TFT LCD Module	Size	3.5	inch	
	LCD Resolution	320(RGB) x 240	--	
	Interface	TFT LCD:RGB 24 bits/CCIR66/601	--	
		CTP:I2C		
	Color Depth	16.7M	--	
	LCD Technology Type	a-Si TFT	--	
	Pixel Pitch	0.219x0.219	mm	
	Pixel Configuration	R.G.B. Vertical Stripe	--	
	LCD display Mode	TM with Normally White	--	
	Surface Treatment	CTP:6H hardness	--	
		LCD Up Polarizer:Clear Type(3H)		
	Viewing Direction	12 o'clock	--	
	Gray Scale Inversion Direction	6 o'clock	--	
	Active Area	TFT LCD: 70.08(W)x52.56(H)	mm	
		CTP:72.88(W) x 55.36(H)	mm	
	LCM (W x H x D)	79.9x68.9x4.38	mm	
	Control IC	CTP: HX8526	--	
		TFT LCD:NT39016D	--	
	CTP Touch Method	Bare finger	--	
	Number of simultaneous touches	5 points	--	
	Minimum Touch Area	Φ6	mm	
	Finger Touch Pitch	11	mm	
	CTP Structure	Glass Lens - Glass Sensor	--	
	LED Numbers	6 LEDs	pcs	

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	Weight	TBD	g	

2. Input/Output Terminals

2.1 TFT LCD Pin Assignment

Recommend connector type: Kuocera elco:6240serials

No	Symbol	I/O	Description	Remark
1,2	LED_Cathode	I	LED_Cathode	Note 2-1
3,4	LED_Anode	I	LED_Anode	Note 2-1
5	NC	-	No Connect	
6	RESET	I	Reset	
7	NC	-	No Connect	
8	YU	I	NC	Not used
9	XR	I	NC	Not used
10	YD	I	NC	Not used
11	XL	I	NC	Not used
12	D00	I	Data 00	Note 2-2
13	D01	I	Data 01	Note 2-2
14	D02	I	Data 02	Note 2-2
15	D03	I	Data 03	Note 2-2
16	D04	I	Data 04	Note 2-2
17	D05	I	Data 05	Note 2-2
18	D06	I	Data 06	Note 2-2
19	D07	I	Data 07	Note 2-2
20	D08	I	Data 08	Note 2-2
21	D09	I	Data 09	Note 2-2
22	D10	I	Data 10	Note 2-2
23	D11	I	Data 11	Note 2-2
24	D12	I	Data 12	Note 2-2
25	D13	I	Data 13	Note 2-2
26	D14	I	Data 14	Note 2-2
27	D15	I	Data 15	Note 2-2
28	D16	I	Data 16	Note 2-2
29	D17	I	Data 17	Note 2-2
30	D18	I	Data 18	Note 2-2
31	D19	I	Data 19	Note 2-2
32	D20	I	Data 20	Note 2-2
33	D21	I	Data 21	Note 2-2
34	D22	I	Data 22	Note 2-2
35	D23	I	Data 23	Note 2-2
36	HSYNC	I	Horizontal Synchronous Signal	
37	VSYNC	I	Vertical Synchronous Signal	
38	CLK	I	Data Clock	
39	NC	-	No Connect	
40	NC	-	No Connect	
41	VDD	P	power supply	
42	VDD	P	power supply	
43	SPENA	I	Serial port data enable signal	
44	NC	-	No Connect	

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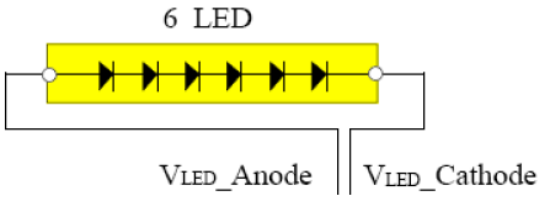
45	NC	-	No Connect	
46	NC	-	No Connect	
47	NC	-	No Connect	
48	NC	-	No Connect	
49	SPCK	I	SPI Serial Clock	
50	SPDA	I/O	SPI Serial Data Input/output	
51	NC	-	No Connect	
52	DEN	I	Data enabling signal	
53	GND	P	Ground	
54	GND	P	Ground	

I: input O: output P: power

Note 2-1: The figure below shows the connection of LED



Note 2-2:

Mode	D(23:16)	D(15:8)	D(7:0)	HSYNC	VSYNC	DEN
CCIR 656	D(23:16)	GND	GND	NC	NC	NC
CCIR 601	D(23:16)	GND	GND	HSYNC	VSYNC	NC
8 Bit RGB	D(23:16)	GND	GND	HSYNC	VSYNC	NC for HV mode
						DEN for DEN mode
24 Bit RGB	R(7:0)	G(7:0)	B(7:0)	HSYNC	VSYNC	NC for HV mode
						DEN for DEN mode

2.2 CTP Pin Assignment

Pin No.	Symbol	Description	Remark
1	VDD	CTP power supply	--
2	GND	Ground	--
3	IIC RESET (INT)	Interrupt line,active low	--
4	SCL	I2C clock input	Note 1
5	SDA	I2C data input and output	Note 1
6	Global RESET (RESET)	Reset pin,active low	--

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Note 1: On SDA and SCL there be pull-up resistors.

3. Absolute Maximum Ratings

Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD(LCD)	-0.3	5	V	
	VDD(CTP)	-0.3	7	V	
	LED_Cathode (backlight)	0	21.6	V	LED_Anode =0V
Operating Temperature	TOPR	-20	70	℃	
Storage Temperature	TSTG	-30	80	℃	Note1

Table 3.1 absolute maximum rating

Note1: 80℃ is the surface temperature of module

Electrical Characteristics

4.1 .1 Driving TFT LCD

Ta = 25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Voltage for logic circuit		VDD	3.00	3.30	3.60	V	
Power supply current		IDD		13	20	mA	
Input Signal Voltage	Low Level	VIL	0	-	0.2xVDD	V	D0~D23,HSYNC, VSYNC, SPENA,SPCK,SPDA,RESET
	High Level	VIH	0.8xVDD	-	VDD	V	

Table 4.1 LCD module electrical characteristics

Note: To test the current dissipation, use “all Black Pattern”.

4.1 .2 Driving CTP

Ta = 25℃

Item		Min	Typ	Max	Unit	Note
power supply voltage		2.7	3.3	3.5	V	DC(noise should be under 100mV)
Power supply current		--	6	10	mA	
Input Signal Voltage	Low Level	0	-	0.3xVCC	V	RESET,SCL,SDA
	High Level	0.7xVCC	-	VCC	V	

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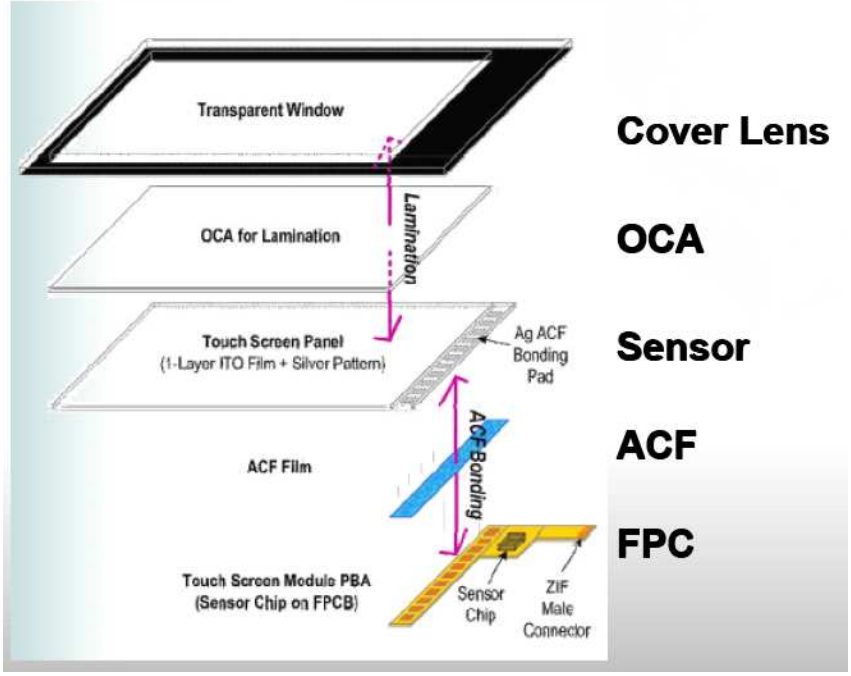
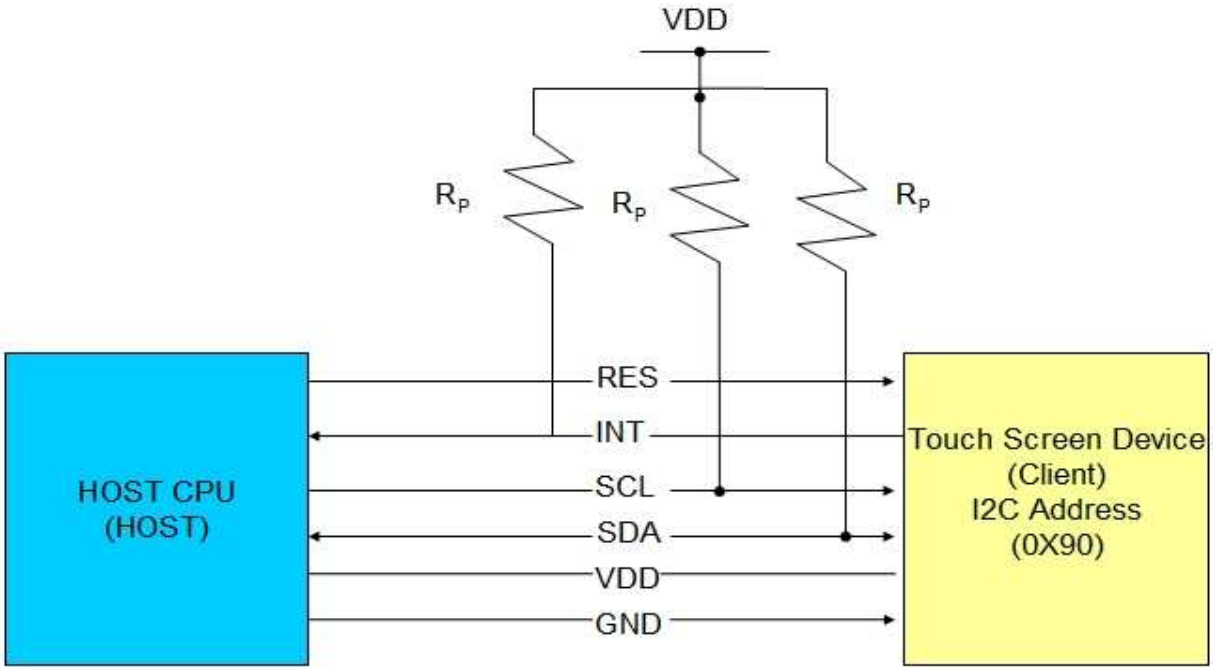


Structure of touch lens



Interface application

Rp=4.7K

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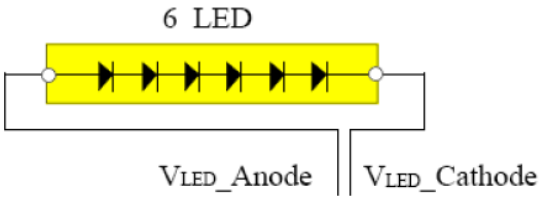
4.1.3 Driving Backlight

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Forward Voltage	VLED	I_F=20mA	16.8	19.2	21.6	V	Note 1
Forward Current	I_F	-	-	20	25	mA	
Backlight Power Consumption	WBL	I_F=20mA	--	384	--	mW	
Life Time	-	I_F=20mA	10,000	-	-	Hrs	Note 3

Table 4.1.3 LED backlight characteristics

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit.Under LCM operating, the stable forward current should be inputted.
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



LED connection of backlight

5 .Block Diagram

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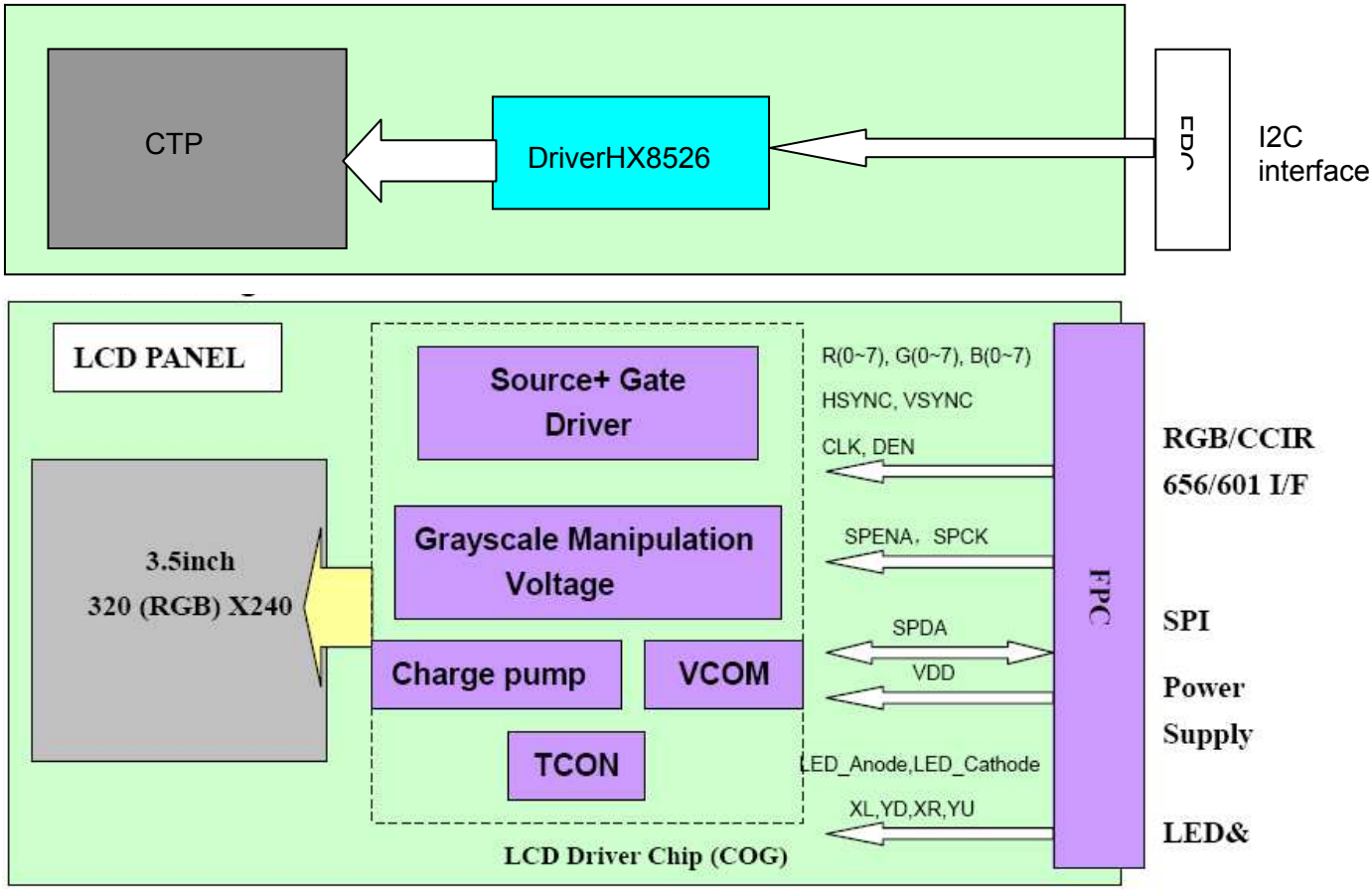

6.TFT LCDTiming Chart

Please refer to NT39016 data sheet for more information

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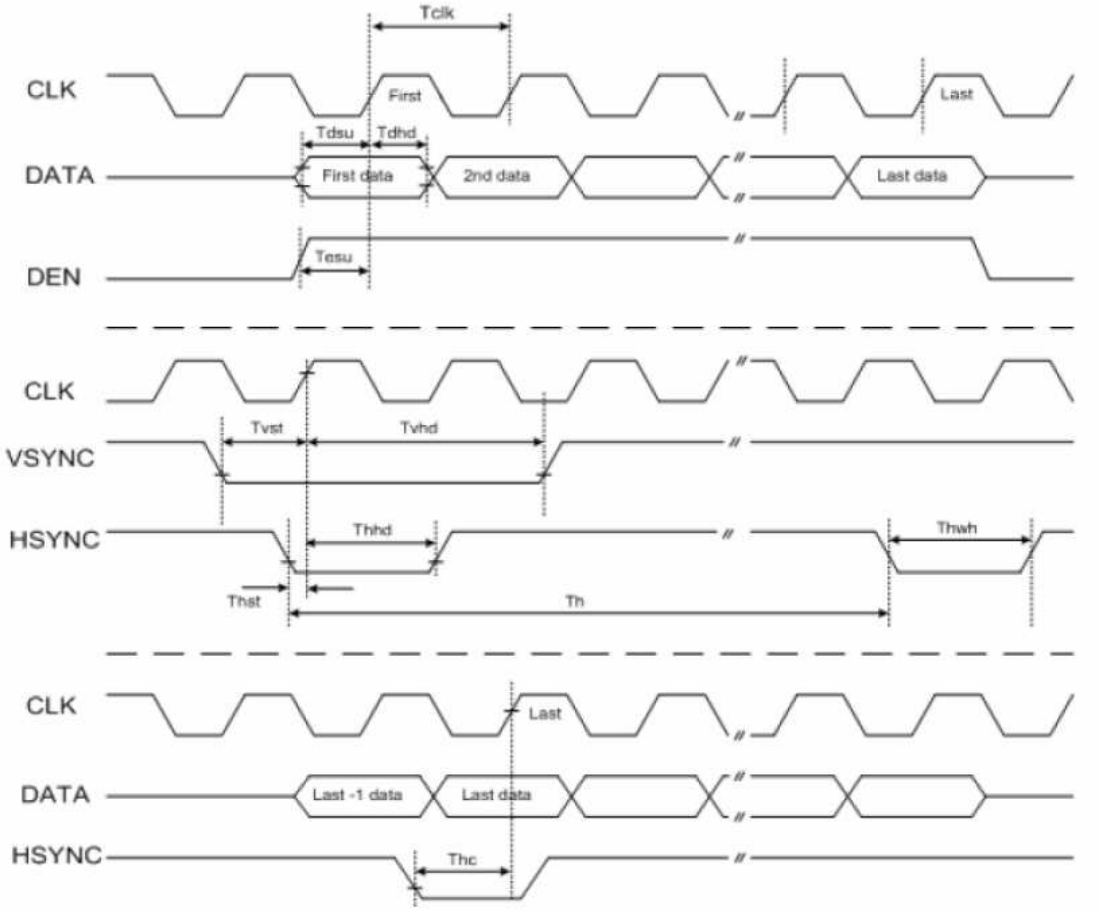
6.1 AC Electrical Characteristics(VDD=3.3V,Ta=25℃)



Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK clock time	Tclk	-	-	35.7	ns	CLK=28MHz
CLK pulse duty	Tchw	40	50	60	%	Tclk
HSYNC to CLK	Thc	-	-	1	CLK	
HSYNC width	Thwh	1	-	-	CLK	
VSYNC width	Tvwh	1	-	-	Th	
HSYNC period time	Th	60	63.56	67	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 set-up time	Tdsu	12	-	-	ns	D[23:00] to CLK
Data hold time	Tdhd	12	-	-	ns	D[23:00] to CLK
DEN setup time	Tesu	12	-	-	ns	DEN to CLK

6.2 24 Bit RGB mode for 320RGBx240

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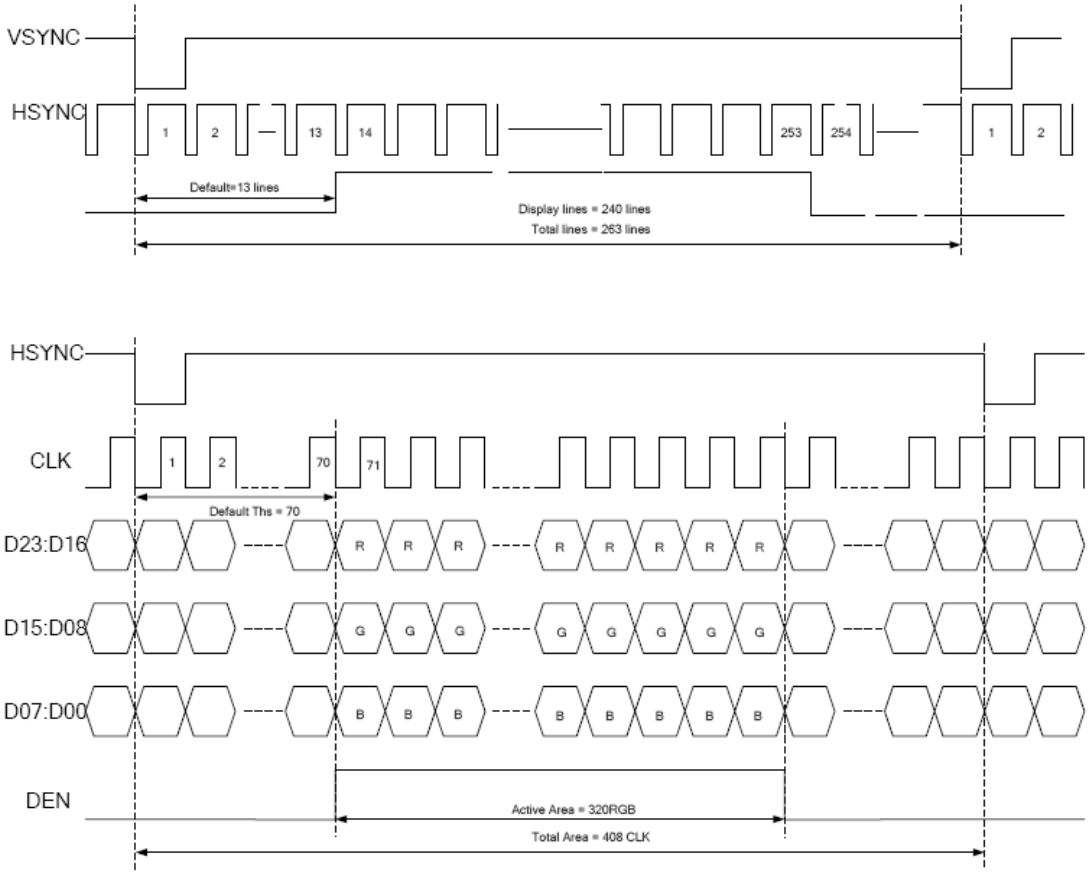

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK frequency	Fclk	-	6.4	-	MHz	VDD=3.0~3.6V
CLK cycle time	Tclk	-	156	-	ns	
Time that HSYNC to 1'st data input(NTSC)	Ths	40	70	255	CLK	

6.3 8 Bit RGB mode for 320RGBx240

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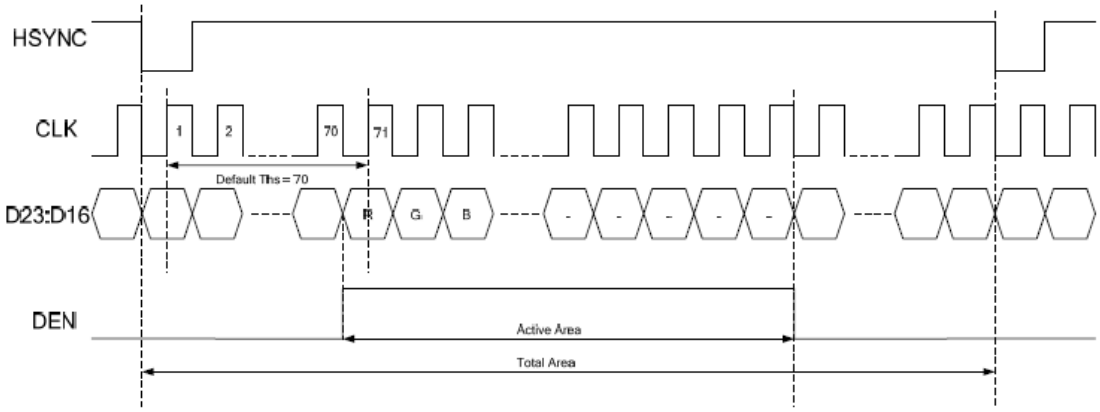
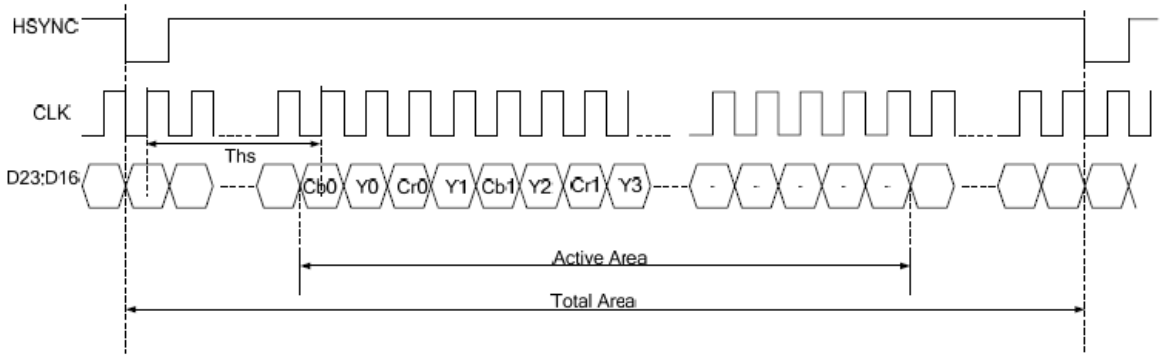


Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK frequency	Fclk	-	27	-	MHz	VDD=3.0~3.6V
CLK cycle time	Tclk	-	37	-	ns	
Time that HSYNC to 1'st data input(NTSC)	Ths	35	70	255	CLK	

6.4 ITU-R BT 601



Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK frequency	Fclk	-	24.54/27	-	MHz	VDD=3.0~3.6V
CLK cycle time	Tclk	-	40/37	-	ns	
Time from HSYNC to 1'st data input(PAL)	Ths	128	264	-	CLK	
Time from HSYNC to 1'st data input(NTSC)	Ths	128	244	-	CLK	

6.5 ITU-R BT 656

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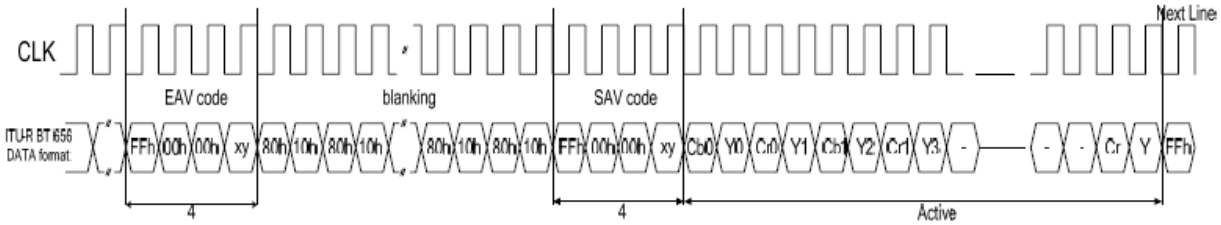
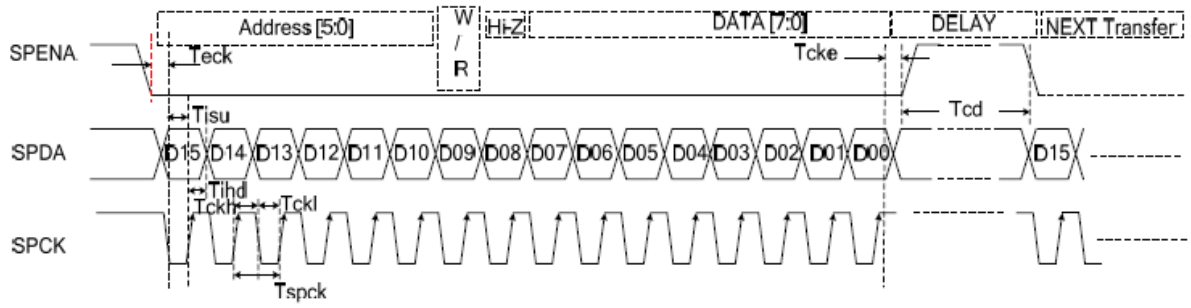


Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK frequency	Fclk	-	27	-	MHz	VDD=3.0~3.6V
CLK cycle time	Tclk	-	37	-	ns	
Time from EAV to 1'st data input(PAL)	Ths	128	288	-	CLK	
Time from EAV to 1'st data input (NTSC)	Ths	128	276	-	CLK	

6.6 3-wire serial communication AC timing



Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
SPCK cycle time	Tspck	320	-	-	ns	
SPCK pulse duty	Tscdut	40	50	60	%	
Serial data setup time	Tisu	120	-	-	ns	
Serial data hold time	Tihd	120	-	-	ns	
Serial clock high/low	Tssw	120	-	-	ns	
Chip select distinguish	Tcd	1	-	-	us	

6.7 3-wire control registers list

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3-Wire Register		Register Description		
D[15:10]	Name	Init	R/W	Function Description
000000b	R00	07h	R/W	System control register
000001b	R01	00h	R/W	Timing Controller function register
000010b	R02	03h	R/W	Operation control register
000011b	R03	CCh	R/W	Input data Format control register
000100b	R04	46h	R/W	Source Timing delay control register
000101b	R05	0Dh	R/W	Gate Timing delay control register
000110b	R06	00h	R/W	Reserved
000111b	R07	00h	R/W	Internal function control register
001000b	R08	08h	R/W	RGB Contrast control register
001001b	R09	40h	R/W	RGB Brightness control register
001010b	R0A	88h	R/W	Hue / Saturation control register
001011b	R0B	88h	R/W	R / B Sub-Contrast control register
001100b	R0C	20h	R/W	R Sub-Brightness control register
001101b	R0D	20h	R/W	B Sub-Brightness control register
001110b	R0E	10h	R/W	VCOMDC Level control register
001111b	R0F	A4h	R/W	VCOMAC Level control register
010000b	R10	04h	R/W	VGAM2 Level control register
010001b	R11	24h	R/W	VGAM3/4 Level control register
010010b	R12	24h	R/W	VGAM5/6 Level control register
011110b	R1E	00h	R/W	Reserved
100000b	R20	00h	R/W	Wide and narrow display mode control register

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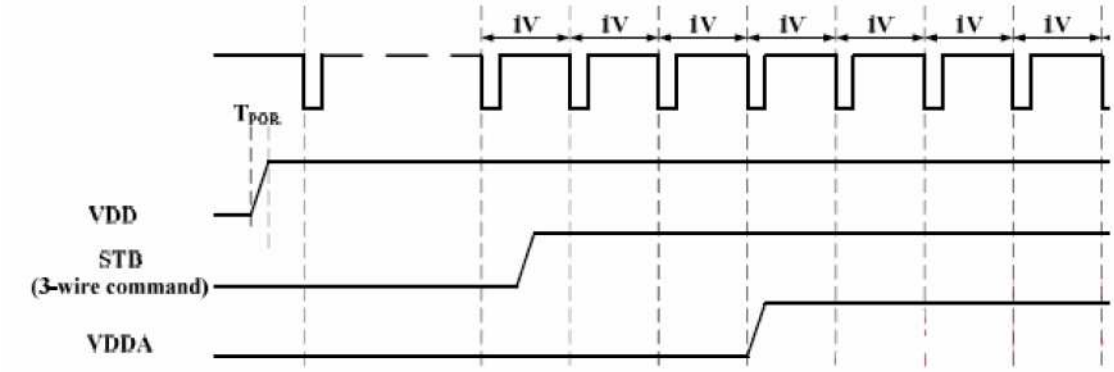
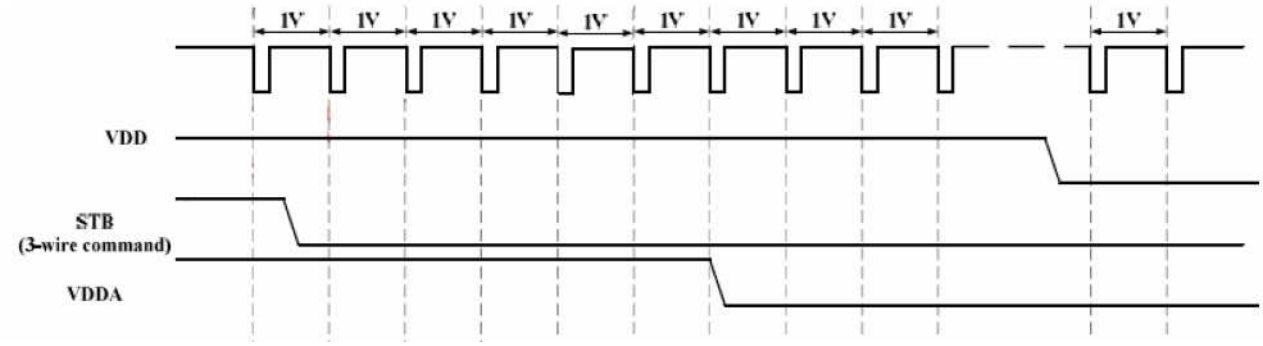
6.8 Power on/off sequence

Power on sequence



Power off sequence



7. CTP Timing

Note: Please refer to HX8526-D32 data sheet for more details.
HX8526-D32 supports the I2C interfaces, which can be used by a host processor or other devices. The I2C is always configured in the Slave mode. The data transfer format is shown in Fig 5

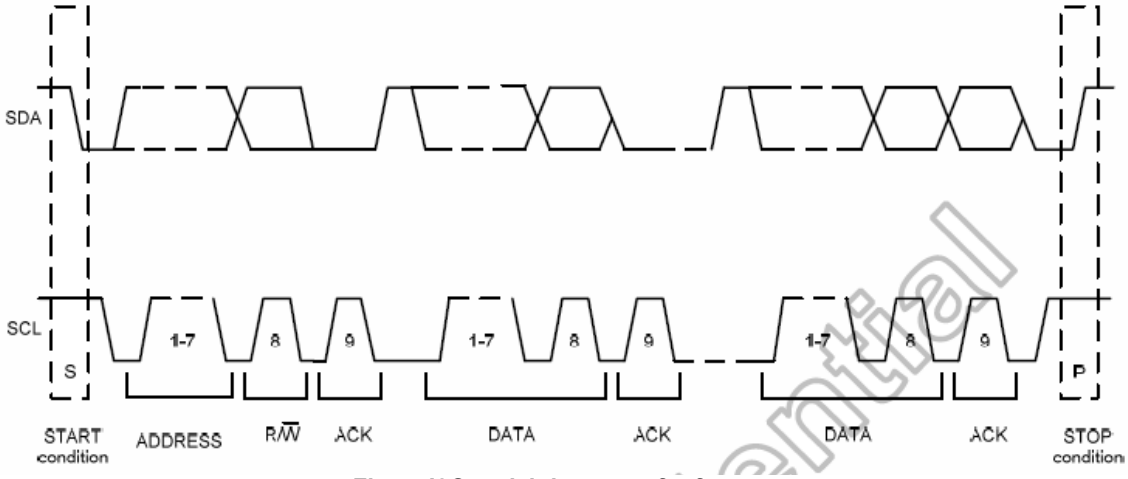


Fig 5 . I2C serial data transfer format

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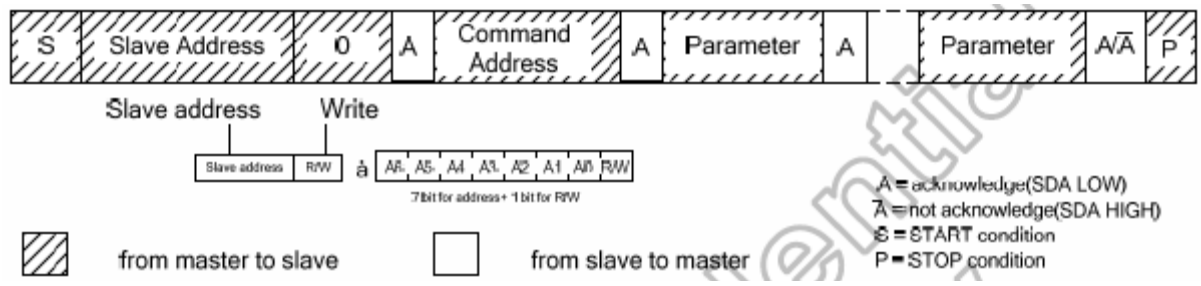

Fig 6 . Data format of writing mode

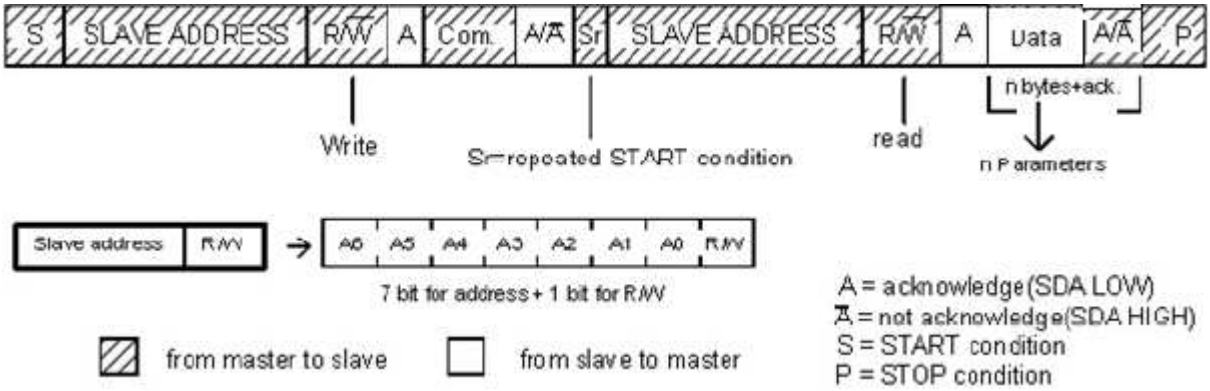

Fig 7. Data format of reading mode

COMMAND LIST(HX8526-D32)
Standard command

(Hex)	Operation Code	D7	D6	D5	D4	D3	D2	D1	D0	Function
0	No operation	0	0	0	0	0	0	0	0	-
80	Sleep IN	1	0	0	0	0	0	0	0	-
81	Sleep Out	1	0	0	0	0	0	0	1	-
82	Sense Off	1	0	0	0	0	0	1	0	-
83	Sense On	1	0	0	0	0	0	1	1	-
85	Read Event	1	0	0	0	0	1	0	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
86	Read All Events	1	0	0	0	0	1	1	0	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
	5th parameter	E3	E2	E1	E0	F1	P2	P1	P0	-
	6th parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	:	:	:	:	:	:	:	:	:	-
	(n+1)th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
87	Read Latest Event	1	0	0	0	0	1	1	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
88	Clear Stack	1	0	0	0	1	0	0	0	-

7.2 Power ON/RESET Sequence

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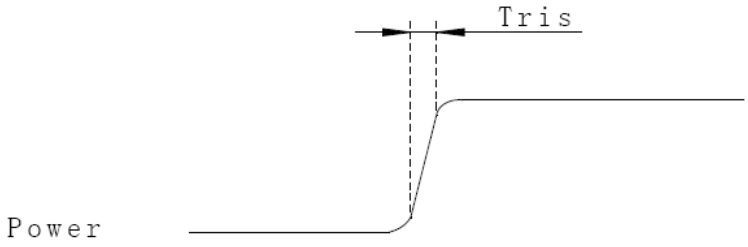
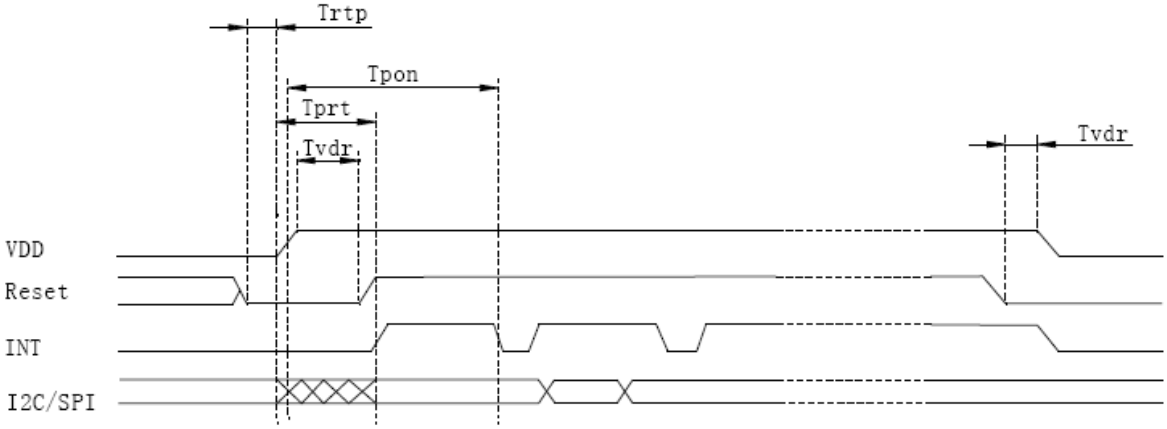
Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after IOVCC powering on (Tprt). INT signal will be sent to the host after initializing all parameters and then start to report points to the host.

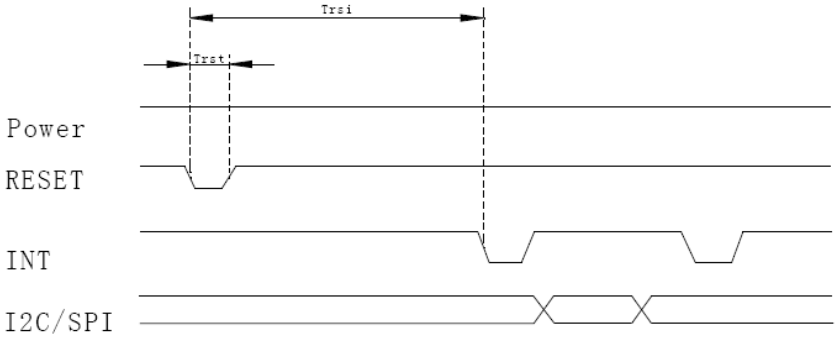


Power on Time



Power on sequence

Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.



Reset sequence

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	300	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Tprt	Reset time after IOVCC powering on	2Tris +Tvdr	--	ms
Trsi	Time of starting to report point after resetting	300	--	ms
Trst	Reset time	5	--	ms

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8.Optical Characteristics

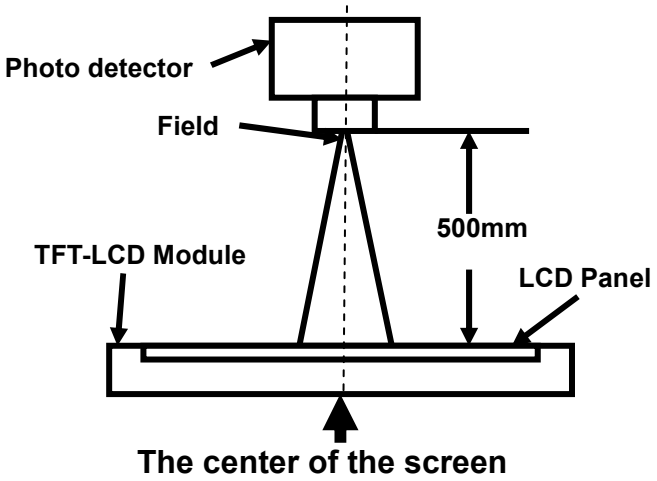
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	30	40	--	Degree	Note 2
		θB		50	60	--		
		θL		50	60	--		
		θR		50	60	--		
Contrast Ratio		CR	θ=0°	--	500	--		Note1 Note3
Response Time		T_{ON}	25℃	--	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.286	0.286	0.286		Note5 Note1
		y		0.286	0.286	0.286		
	Red	x		0.286	0.286	0.286		
		y		0.286	0.286	0.286		
	Green	x		0.286	0.286	0.286		
		y		0.286	0.286	0.286		
	Blue	x		0.286	0.286	0.286		
		y		0.286	0.286	0.286		
Uniformity		U		75	80	--	%	Note1、Note6
NTSC				45	50	--	%	
Luminance		L		320	400	--	cd/m^2	Note7
Reflectivity						4	%	Note8
HAZE						2	%	Note8

Test Conditions:

1. I_F= 20mA(one channel), the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

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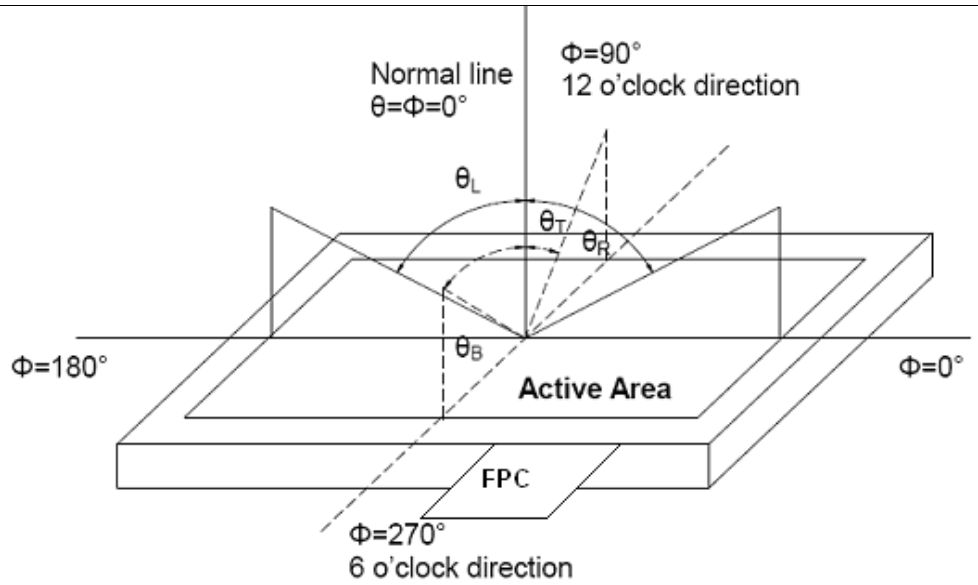
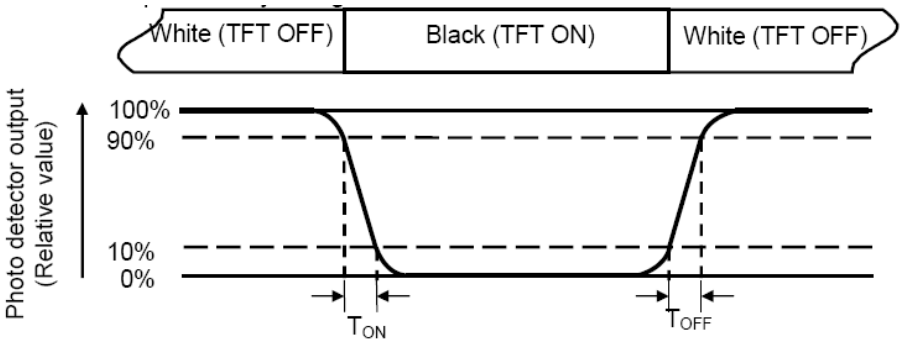


Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"White state ": The state is that the LCD should drive by Vwhite.
"Black state": The state is that the LCD should drive by Vblack.
Vwhite: To be determined Vblack: To be determined.
Note 4: 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%.



Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.
Luminance Uniformity (U) = Lmin/ Lmax
L-------Active area length W----- Active area width

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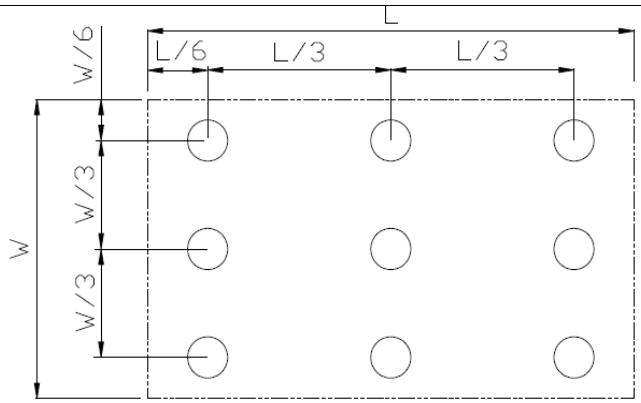
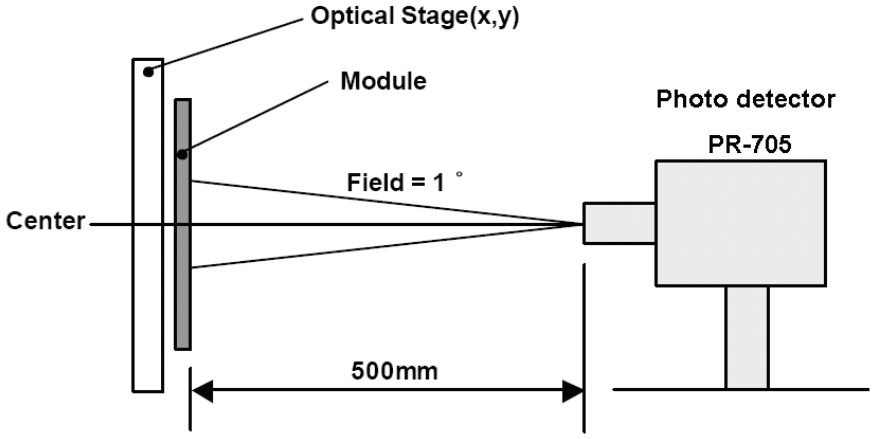


Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:
Measure the luminance of white state at center point on the CTP

Note8: Measuring equipments: DMS-501, PR-705. @550nm
Measuring condition:
- After stabilizing and leaving the panel alone at a given temperature for 30 min, the measurement should be executed,
- Measuring surroundings: a stable, windless and dark room,
- Measuring temperature: Ta=25°C,
- 30 min after lighting the back-light.



Note2: conform to National standard GB2410—80 /ASTM D1003—61(1997)

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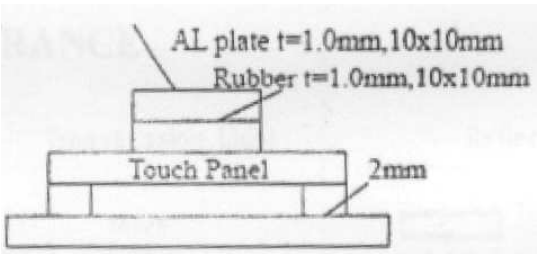
9. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta = +70℃, 120 hours	Note1,Note6,Note7 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta = -20℃, 120 hours	Note1, Note7,IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 120 hours	Note1, Note7,Note8 IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -30℃, 96 hours	Note1, Note7,EC60068-2-1 GB2423.1
5	High Temperature & Humidity Storage	Ta=+65℃、RH=90%, 120 hours	Note1,Note3, Note4,Note7 IEC60068-2-78 GB/T2423.3
6	Thermal Shock/ Solder Joint Life Test	-30℃（30min）⇔80℃（30min）,Change Time:5min,100cycle	Note1,Note9 Start with cold temperature End with high temperature, IEC60068-2-14,GB2423.22
12	ESD	C=150pF、R=330Ω Air: ±8KV Contact:±4KV 5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	Note2,Note5, IEC61000-4-2 GB/T17626.2
13	Shock Test	Half Sine Wave 60G ,6ms,±X,±Y,±Z 3times for each direction	Note2
14	Drop Test(package state)	Height:60cm, 1corner,3edges,6surfaces	Note2,IEC60068-2-32 GB/T2423.8
15	Surface hardness	6H	JIS-K5600
16	Static Load Resistance Test	After 4.5Kg load for 1min is applied to the center area (1.0cm2) of the Touch panel, the requirements in optical characteristic and electrical characteristics shall be satisfied. 	No crack after test.

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17	Drop ball test	Use the 64g steel (¢ 25) ball is dropped on the Glass surface from 70cm height at 1time(Glass side)	No crack after test.
18	Terminal Pull Test	±90° direction, weight:500g, non-operation	Function is OK

Notes:

1. The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:
   1).Air bubble in the LCD;
   2).Seal leak
   3).Non-display
   4).missing segments
   5).Glass crack
   6).CR reduction >40%
   7).IDD increase >100%
   8).Brightness reduction >50%
   9).Color coordinate tolerance >0.05
2. The samples of these tests will not be accepted if appear these defects:
   1).Air bubble in the LCD;
   2).Seal leak
   3).Non-display
   4).missing segments
   5).Glass crack
3. Each test item applies for a test sample only once, The test sample can not be used again in any other test item.
4. For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
5. 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.
6 In the test of High Temperature Operation and High Temperature & Humidity Operation ,the operation temperature is the surface temperature of module
7 High Temperature Operation、Low Temperature Operation、High Temperature Storage、Low Temperature Storage、High Temperature & Humidity Operation、High Temperature & Humidity Storage will be increased the test time to 1000hours in the same conditions to test out the ability of module, and we can not guarantee that the module will not fail during 1000hours.These items test only once
8. Thermal Shock will be changed the cycle to 1000cycles to test out the ability of module, and we can not guarantee that the module will not fail after the test. This item test only once

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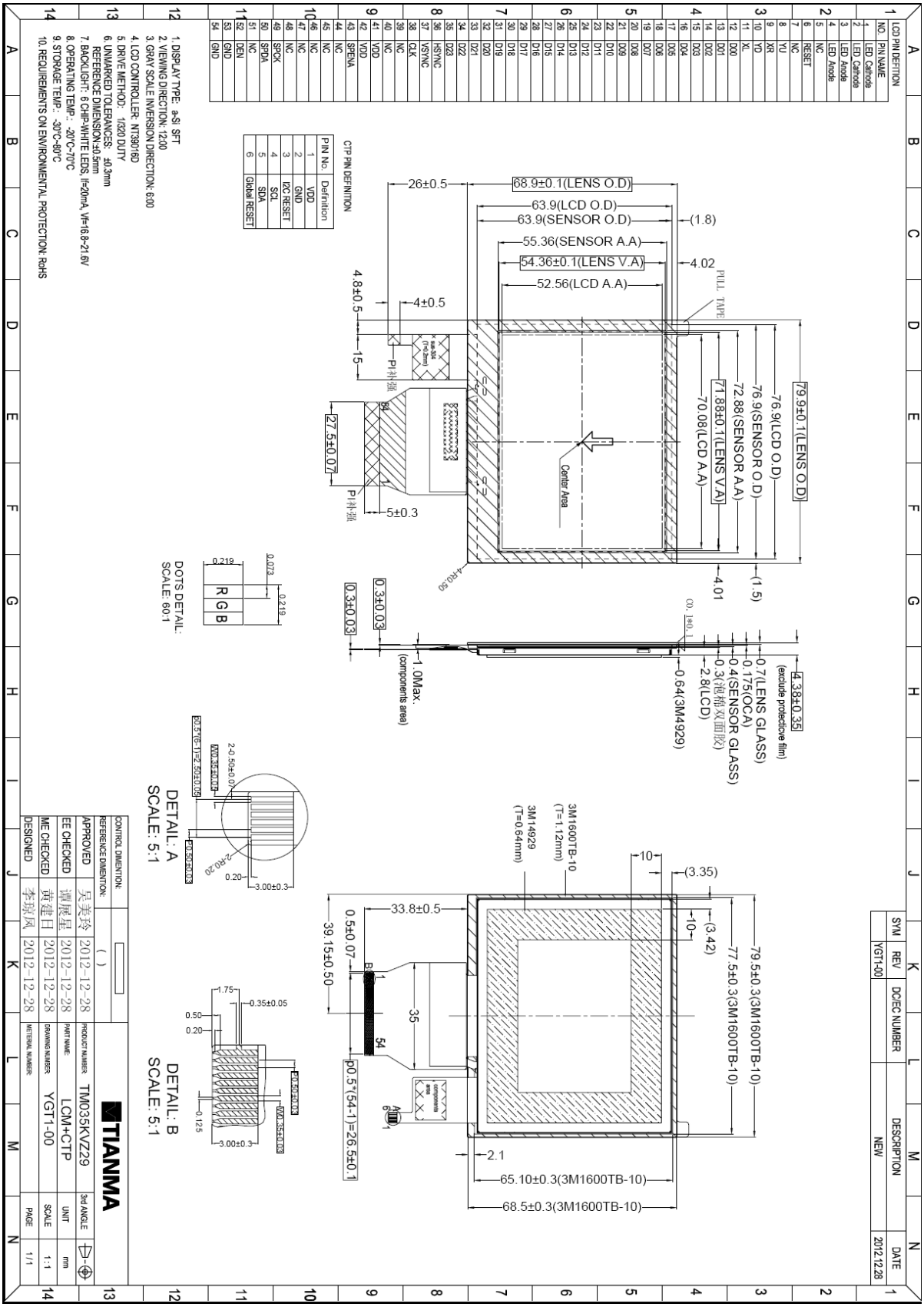
10. Mechanical Drawing



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11.Product Inspection Criteria

11.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

11.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1).

A area : center of viewing area
B area : periphery of viewing area
C area : Outside viewing area

For other defects, dividing two areas to make a judgment (according figure 2).

A zone : Inside Viewing area
B zone : Outside Viewing area
X1(A.A~V.A): 0mm X2(A.A~V.A): 0mm
Y1(A.A~V.A): 0mm Y2(A.A~V.A): 0mm

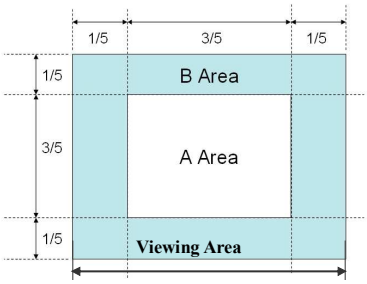

Figure 1

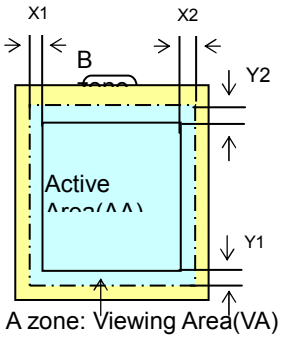

Figure 2

11.3 Inspection items and general notes

General notes	①Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. ②Viewing area should be the area which TIANMA guarantees. ③Limit sample should be prior to this Inspection standard. ④Viewing judgment should be under static pattern. ⑤Inspection conditions Inspection distance: 250 mm (from the sample) Temperature : 25±5 ºC Inspection angle : 45 degrees in 12 o′clock direction (all defects in viewing area should be inspected from this direction)	
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction

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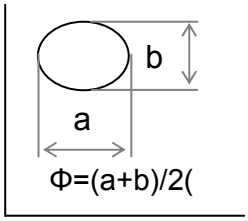
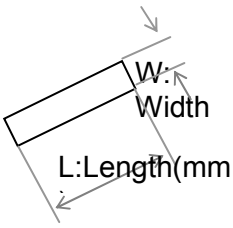
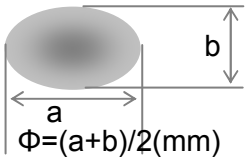
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

11.4 Outgoing Inspection level

Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 9.3 general notes	See 11.5			II	0.65
Minor Defects	See 9.3 general notes	See 11.5			II	1.5
Note：Sampling standard conforms to GB2828						

11.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	Φ≦0.10	Neglected	Neglected
			B	0.10<Φ≦0.15	2	
			C	0.15<Φ≦0.20	1	
			D	0.20<Φ	0	
			Total defective point(B,C)		3	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass		A	W≦0.01	Neglected	Neglected
			B	0.01<W≦0.03 L≦3.0	2	
			C	0.03<W≦0.05 L≦3.0	1	
			D	0.05<W	0	
			Total defective point(B,C)		3	
3	Contrast variation		A	Φ≦0.2	Neglected	Neglected
			B	0.2<Φ≦0.3	2	
			C	0.3<Φ≦0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
4	Dot defect (if TFT LCD is	TFT LCD is smaller than 3 inches	LCD Class	Defect	A area	B area
			A	Bright dot	1	Neglecte

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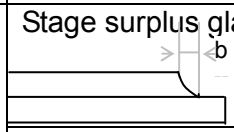
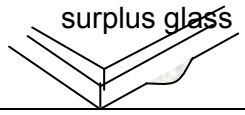
	used)			Dark dot	2		d
				Total	2		
			B	Bright dot	2		
				Dark dot	3		
				Total	4		
		TFT LCD between 3~10.4 inches	LCD Class	Defect	A area	B area	C area
			A	Bright dot	1	1	Neglected
				Dark dot	1	2	
				Total	4		
			B	Bright dot	2	2	
				Dark dot	2	3	
				Total	6		
		Notes: Bright dot: in R、G、B or dark display figure, the pixel appears bright. Dark dot: in R、G、B or white display figure, the pixel appears dark. Defect area must be less than an half size of the dot.					
5	Bubble inside cell		any size		none		none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.				
		Bubble, dent and convex	A	Φ≦0.3	Neglected		Neglected
			B	0.3<Φ≦0.7	2		
			C	0.7<Φ	0		
7	Surplus glass	Stage surplus glass 	b≦0.3mm				
		Surrounding surplus glass 	Should not influence outline dimension and assembling.				
8	Open segment or open common		Not permitted				
9	Short circuit		Not permitted				
10	False viewing direction		Not permitted				
11	Contrast ratio uneven		According to the limit specimen				
12	Crosstalk		According to the limit specimen				
13	Black /White spot(display)		Refer to item 1				
14	Black /White line(display)		Refer to item 2				

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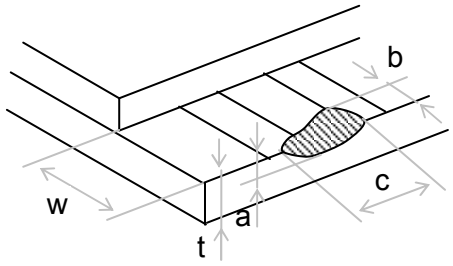
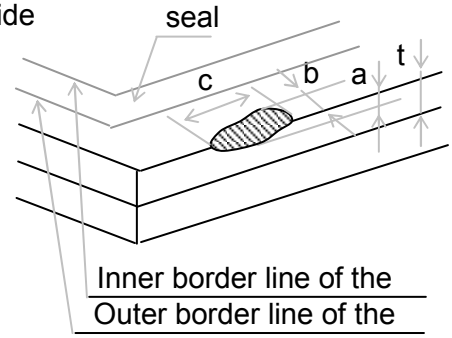
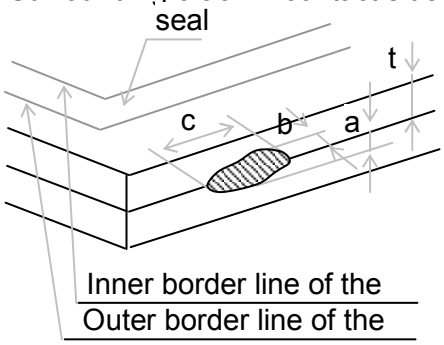
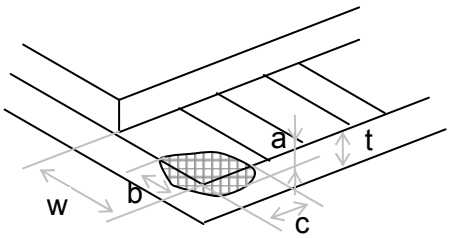
Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	①The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		②Surrounding crack—non-contact side 	b < Inner borderline of the seal		
		③ Surrounding crack— contact side 	b < Outer borderline of the seal		
		④Corner 	A	a ≦ t, b ≦ 3.0, c ≦ 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

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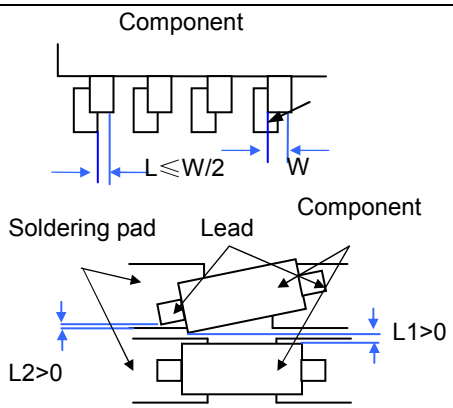
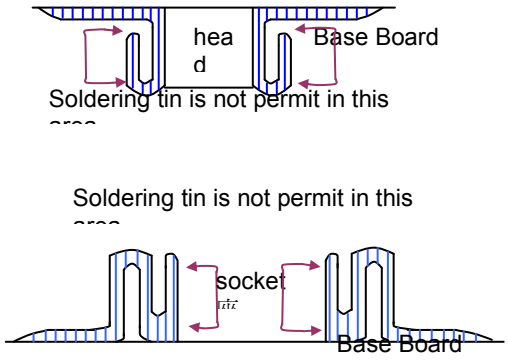
Inspection items			Judgment standard Category(application: B zone)
16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	

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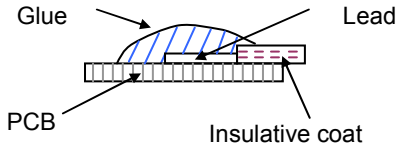
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	

12. Precautions for Use of LCD Modules

12.1 Handling Precautions

12.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol

— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer.

Especially, do not use the following:

— Water

— Ketone

— Aromatic solvents

12.1.6 Do not attempt to disassemble the LCD Module.

12.1.7 If the logic circuit power is off, do not apply the input signals.

12.1.8 To prevent destruction of the elements by static electricity, be careful to maintain

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an optimum work environment.

a. Be sure to ground the body when handling the LCD Modules.

b. Tools required for assembly, such as soldering irons, must be properly ground.

c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃

Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

12.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

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13.Packing Drawing(Reference)

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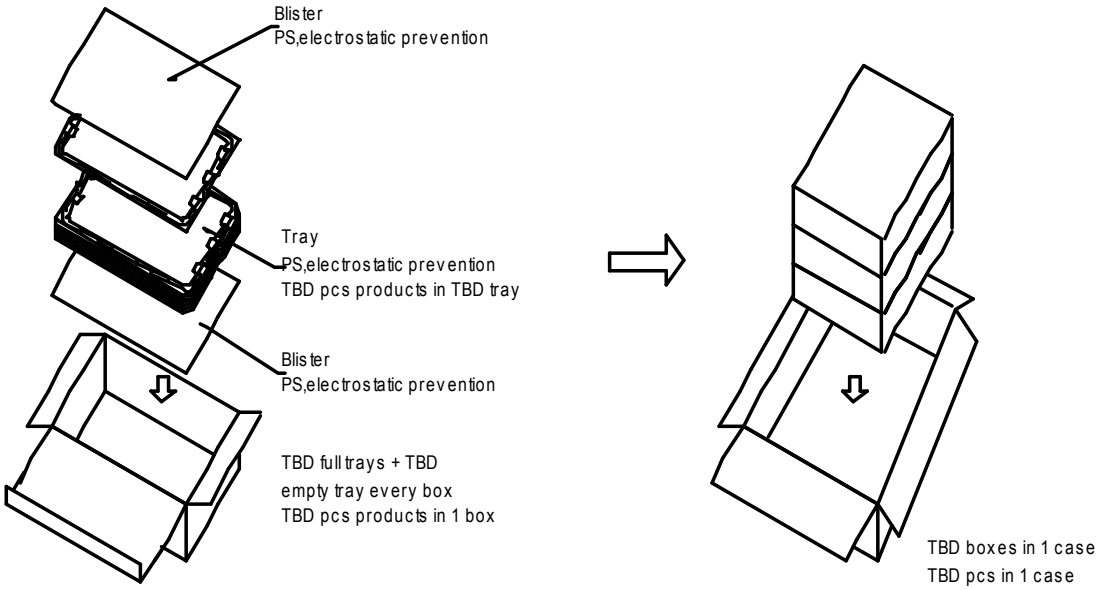
TIANMA MICROELECTRONICS CO.

Packing Standards:

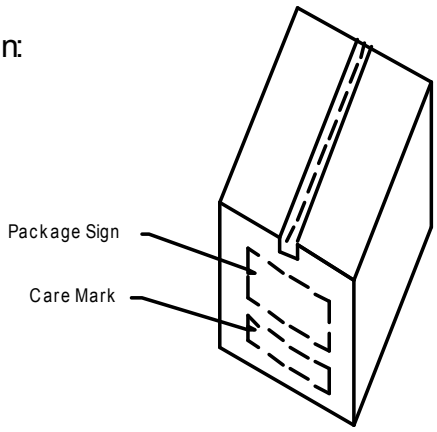
Quantity of products to be packa ged in a case: TBD pcs

Outlook size(Carton size):TBD



Package Sign:

Case Mark
Remark
BMS
P.O.No.
Part No.
QTY
CTN.No.
TTL.CTN.No.
MADE IN CHINA



Care Mark

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14. Module Part Numbering System

TM	035	K	V	Z	G	29
①	②	③	④	⑤	⑥	⑦

NO.	Explanation
①	**TIANMA module indicating**
②	**Screen inch:043=4.3inch 057=5.7inch 070=7inch 102=10.2inch**
③	**Resolution:** 480x240(Delta) A 240x400(Stripe) L 640x240(Delta) B 400x240(Stripe) M 960x240(Delta) C 480x272(Stripe) N 96x64 (Stripe) D 480x234(Stripe) O 128x128(Stripe) E 320x480(Stripe) P 128x160(Stripe) F 480x640(Stripe) Q 176x220(Stripe) G 800x480(Stripe) R 240x320(Stripe) H 800x600(Stripe) S 240x240(Stripe) V 1024x768(Stripe) T 320x320(Stripe) J others X 320x240(Stripe) K

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④

Product structure:

TSP+BL(CCFL)+FPC+M4	A
TSP+	B
BL(CCFL)+FPC+M4	C
BL(LED)+FPC+M4	D
BL(LED)+FPC+M4.Dual Display	E
FPC+M4	F
M4	G
M3	H
M2	Y
M1	J
BL(CCFL)+FPC+M4+PCB	K
BL(LED)+FPC+M4+PCB	L
TSP+BL(CCFL)+FPC+M4+PCB	M
TSP+BL(LED)+FPC+M4+PCB	N
CTP+BL(LED)+FPC+M4	V
Others	X

M1:Panel(array+CF)
M2:Panel(array+CF+LC)
M3:Panel(array+CF+LC+PLZ)
M4:Panel(array+CF+LC+PLZ+Driver)

⑤

Product assembly location:

Shenzheng Z
Shanghai H
Chengdu C
Wuhan W

⑥

Product appliction:
Industry and Automotive: G
Consume: NA

⑦

Series Number:
00,01,02,03.....

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