晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-320240LQTZQW-T20H
APPROVED BY	
DATE	

☐ Approved For Specifications
☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/12/17	--	New Release.	Mark

1 General Description and Features

3.5 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 3.5” TFT-LCD panel, a driver circuit and backlight unit.

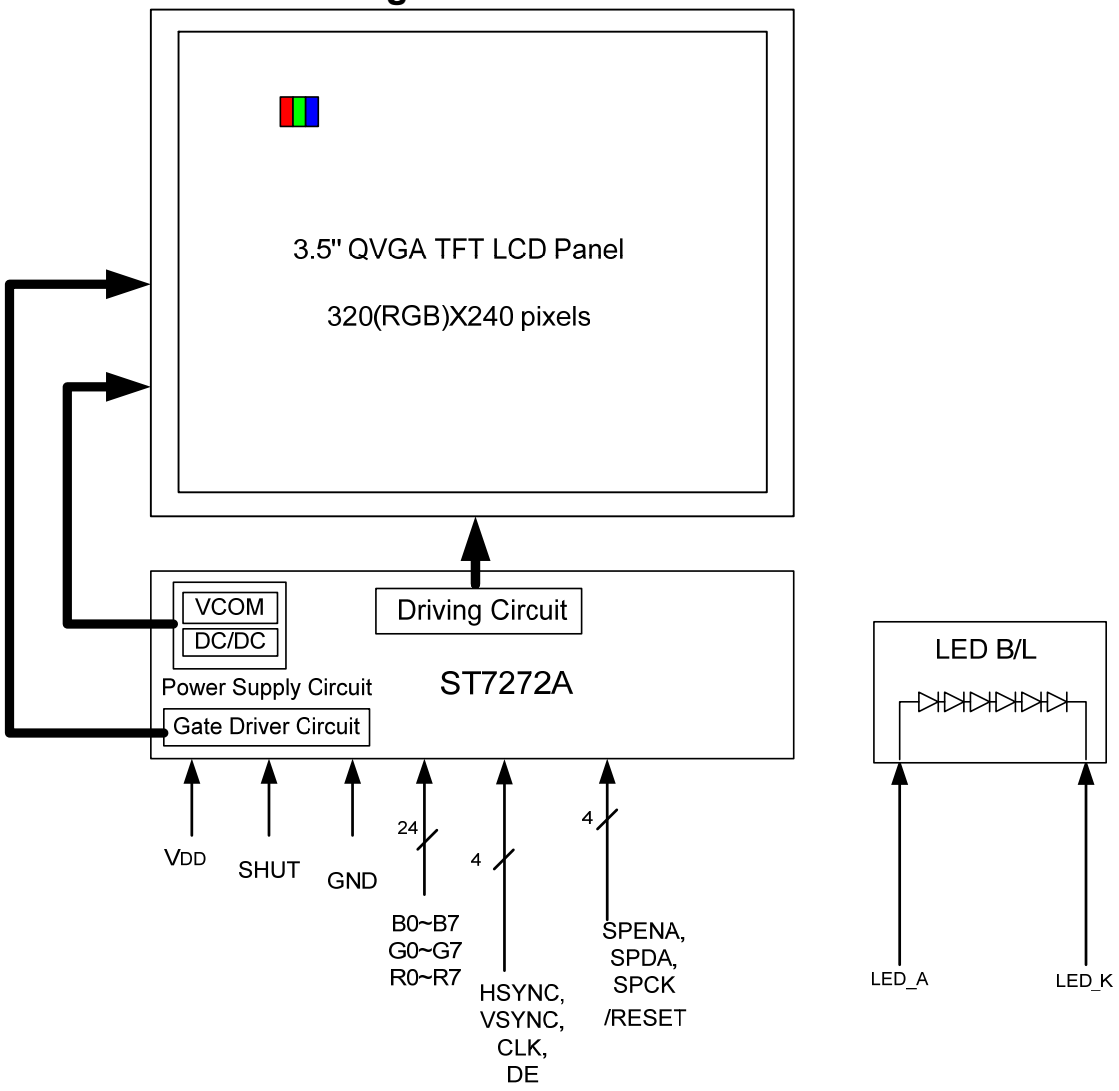
1.1 Construction: 3.5” IPS TFT-LCD, White LED Backlight.
1.2 Resolution (pixel): 320(R.G.B) X240.
1.3 Number of the Colors: 16.7M Dithering (R, G, B 8 bit digital each).
1.4 LCD type: Transmissive Color TFT LCD
1.5 24Bit RGB Interface/3-wire SPI interface
1.6 Interface: 50 pin.
1.7 Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.
1.8 Touch Panel
Controller IC: ST1633i
Interface: I2C

2 Physical specifications

Item	Specifications	unit
Display Resolution	320(RGB)(W) x 240(H)	dot
Active area	70.08 x 52.56	mm
Screen size	3.5(Diagonal)	inch
Pixel pitch	0.219 (W) x 0.219 (H)	mm
Color configuration	R.G.B – Vertical stripe	
Overall Dimension	76.9(W) x 63.9(H) x 4.95(T)	mm
Input interface	digital 24-bits RGB	
Backlight unit	White LED	
Display Mode	Normally Black	

Note 1: Requirements on Environmental Protection: RoHS

3 Functional Block Diagram



4 Electrical Specifications

TFT LCD Panel FPC Descriptions

Pin no	Symbol	I/O	Description	Remark
1	LED_K	P	LED backlight Cathode	
2	LED_K	P	LED backlight Cathode	
3	LED_A	P	LED backlight Anode	
4	LED_A	P	LED backlight Anode	
5	NC	--	No Connect	
6	RESET	I	low active; internal initialization procedure is executed	
7	SPENA	I	Serial communication chip selection	
8	SPCK	I	SPI Serial Clock input	
9	SPDA	I/O	SPI Serial Data input and output	
10	NC	--	No Connect	
11	B7	I	Blue Data Bit 7	
12.	B6	I	Blue Data Bit 6	
13.	B5	I	Blue Data Bit 5	
14.	B4	I	Blue Data Bit 4	
15.	B3	I	Blue Data Bit 3	
16.	B2	I	Blue Data Bit 2	
17.	B1	I	Blue Data Bit 1	
18.	B0	I	Blue Data Bit 0	
19.	G7	I	Green Data Bit 7	
20.	G6	I	Green Data Bit 6	
21.	G5	I	Green Data Bit 5	
22.	G4	I	Green Data Bit 4	
23.	G3	I	Green Data Bit 3	
24.	G2	I	Green Data Bit 2	
25.	G1	I	Green Data Bit 1	
26.	G0	I	Green Data Bit 0	
27.	R7	I	Red Data Bit 7	
28.	R6	I	Red Data Bit 6	
29.	R5	I	Red Data Bit 5	
30.	R4	I	Red Data Bit 4	
31.	R3	I	Red Data Bit 3	

32.	R2	I	Red Data Bit 2	
33.	R1	I	Red Data Bit 1	
34.	R0	I	Red Data Bit 0	
35.	CLK	I	Data Clock	
36.	HSYNC	I	Horizontal Synchronous Signal	
37.	VSYNC	I	Vertical Synchronous Signal	
38.	DEN	I	Data enabling signal	
39.	VDD	P	Power supply (3.3V)	
40	VDD	P	Power supply (3.3V)	
41	VDD	P	Power supply (3.3V)	
42	VDD	P	Power supply (3.3V)	
43	NC	--	Must keep floating.	
44	NC	--		
45	NC	--		
46	NC	--		
47	Shutdown	I	High level: Normal display mode Low level: Standby mode	
48	NC	--	No Connect	
49	GND	P	Ground	
50	GND	P	Ground	

Note 2-1:
I/O definition: I – Input O – Output P – Power/Ground

5 Basic Display Color and Gray Scale

	Display	MSB							LSB	MSB							LSB	MSB							LSB	Gray scale Level
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3…L251
		H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3…L251
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
	Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:								:								:								L3…L251
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255

6 Absolute Maximum Ratings

(The following are maximum values which, if exceeded, may cause operation or damage to the unit.)

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	VDD	-0.3	4.0	V	
Operating Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	

Note:

*1. Non-condensation.

*2. Temp.≤ 60℃,90%RH Max.

Temp. > 60℃,Absolute humidity shall be less than 90%RH.

7 Electrical Characteristics

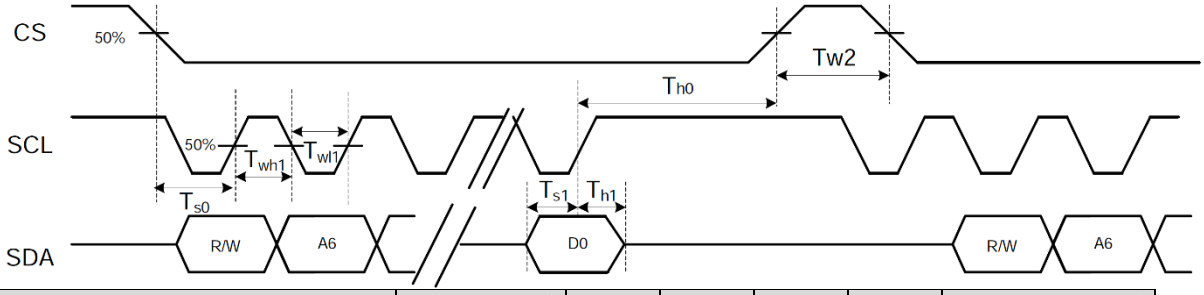
7.1 DC Electrical characteristic of the LCD

Typical operating conditions (GND=0V, Ta=25℃)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VDD	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	V_{IH}	0.7*VDD	-	VDD	V	
	L Level	V_{IL}	0	-	0.3*VDD	V	
Supply Current		RUN Mode	--	20	--	mA	FR=60Hz
		Standby mode	--	.	50	uA	

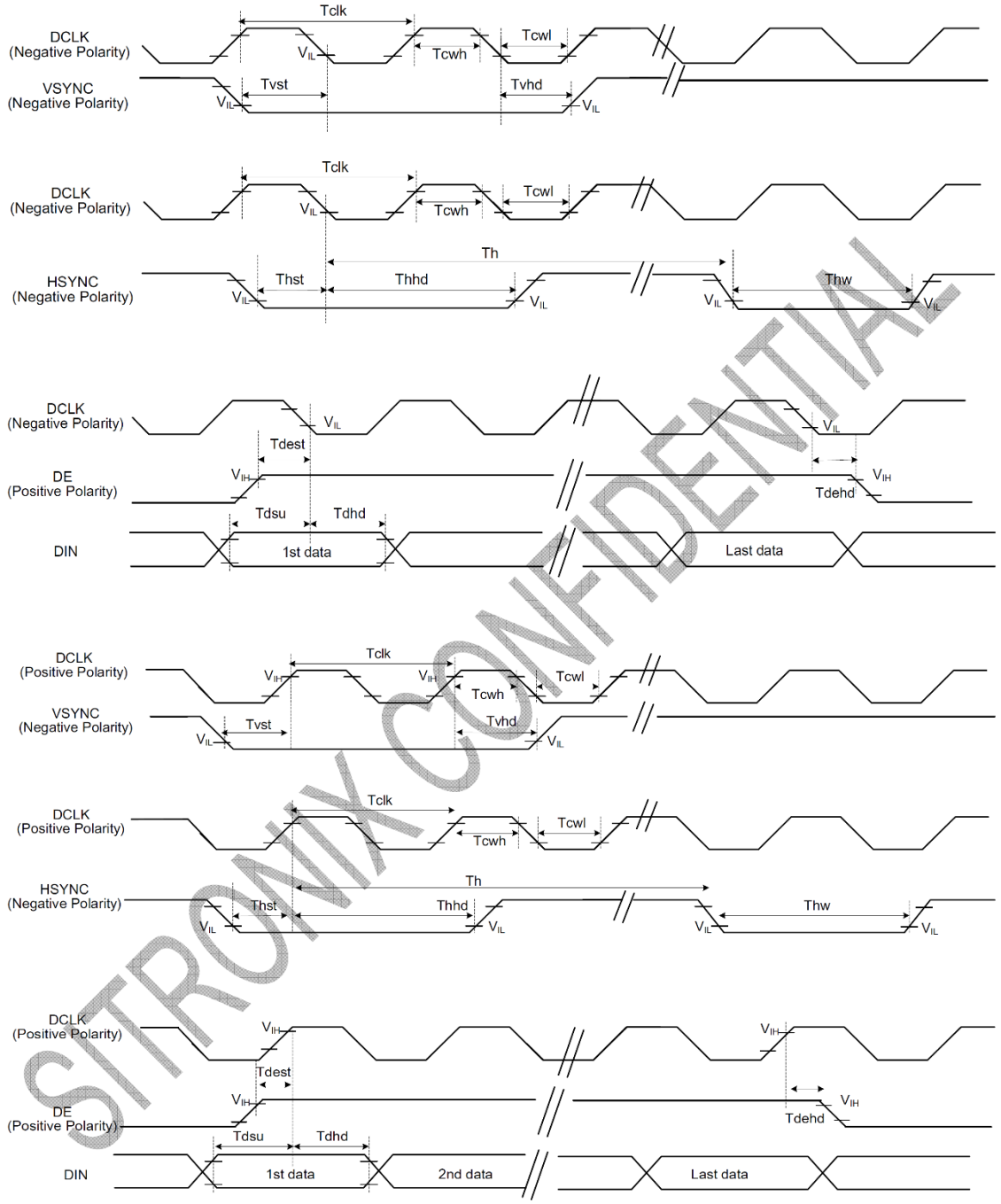
7.2 AC Electrical characteristic of the LCD

7.2.1 System Bus Timing of 3-Wire SPI interface



Item	Symbol	Min	Typ	Max	Unit	Conditions
CS Input Setup Time	T_{s0}	50	-	-	ns	
Serial Data Input Setup Time	T_{s1}	50	-	-	ns	
CS Input Hold Time	T_{h0}	50	-	-	ns	
Serial Data Input Hold Time	T_{h1}	50	-	-	ns	
SCL Write Pulse High Width	T_{wh1}	50	-	-	ns	
SCL Write Pulse Low Width	T_{wl1}	50	-	-	ns	
SCL Read Pulse High Width	T_{rh1}	300			ns	
SCL Read Pulse Low Width	T_{rl1}	300			ns	
CS Pulse High Width	T_{w2}	400	-	-	ns	

7.2.2 System Bus Timing for RGB Interface



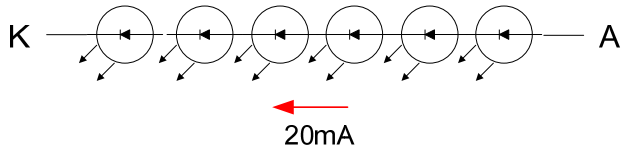
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tclk	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	Thst	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	

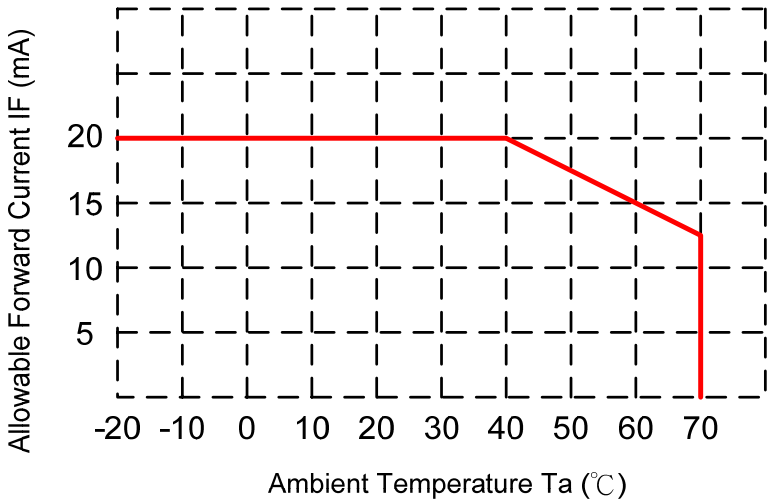
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	
DE Setup Time	Tdest	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

7.3 Electrical characteristic of LED Back-light

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	IF	-	20	--	mA	
Forward voltage	VF	-	18		V	
Power consumption	WBL	-	360	-	mW	
Operating Life time			36		kHrs	Ta=25℃

Note1: The figure below shows the connection of backlight LED.
Note2: Optical performance should be evaluated at Ta=25℃ only.
Note3: IF LED is driven by high current, high ambient temperature & humidity condition, the life time of LED will be reduced.
Note4: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

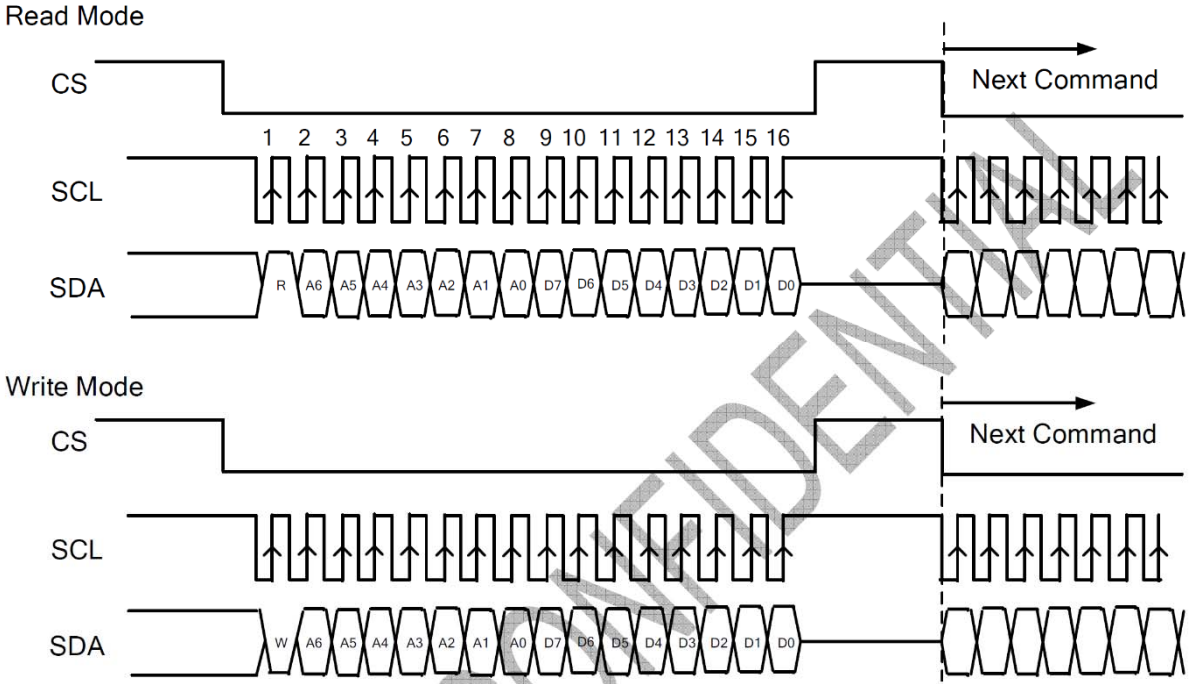




8 Communication Interface

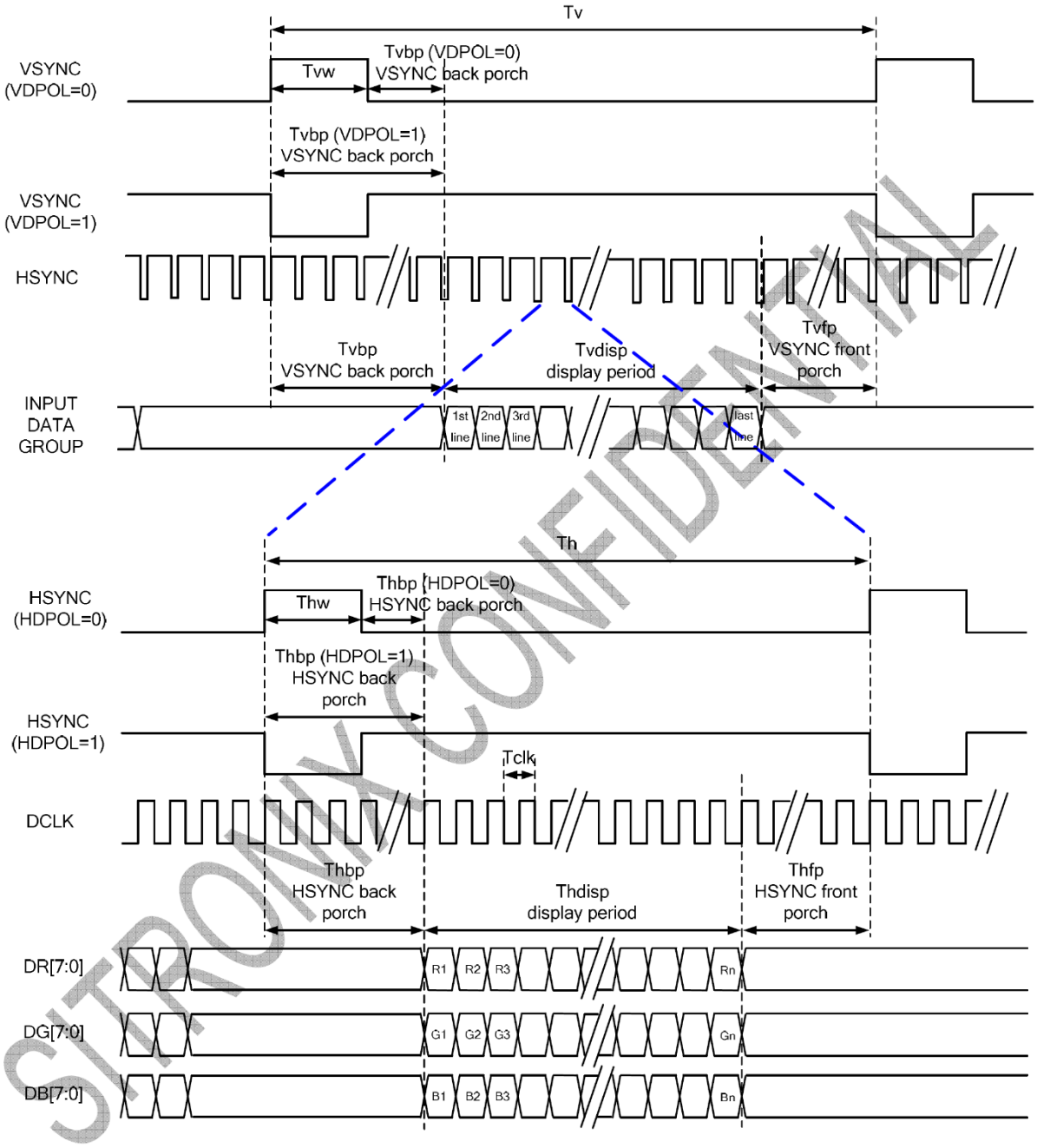
8.1 3-wire Serial Interface

R/W: Read/Write mode control bit.
R/W=1: Read mode
R/W=0: Write mode

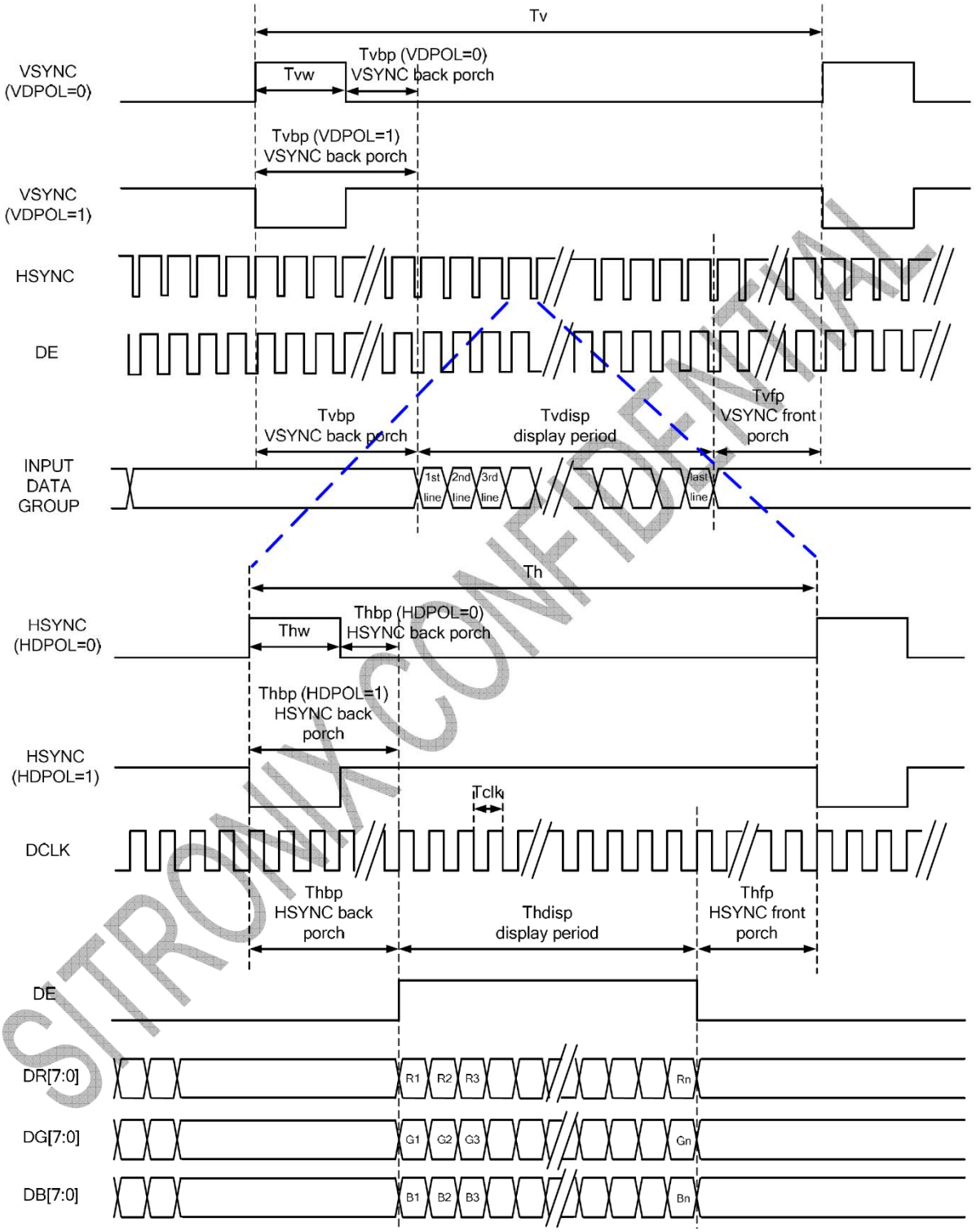


a. Each serial command consists of 16 bits of data which is loaded one bit a time at the rising edge of serial clock SCL.
b. Command loading operation starts from the falling edge of CS and is completed at the next rising edge of CS.
c. The serial control block is operational after power on reset, but commands are established by the VSYNC signal. If command is transferred multiple times for the same register, the last command before the VSYNC signal is valid.
d. If less than 16 bits of SCL are input while CS is low, the transferred data is ignored.
e. If 16 bits or more of SCL are input while CS is low, the previous 16 bits of transferred data before then rising edge of CS pulse are valid data.
f. Serial block operates with the SCL clock
g. Serial data can be accepted in the power save mode.
h. After power on reset or GRB reset, it is required 100ms delay to begin SPI communication.

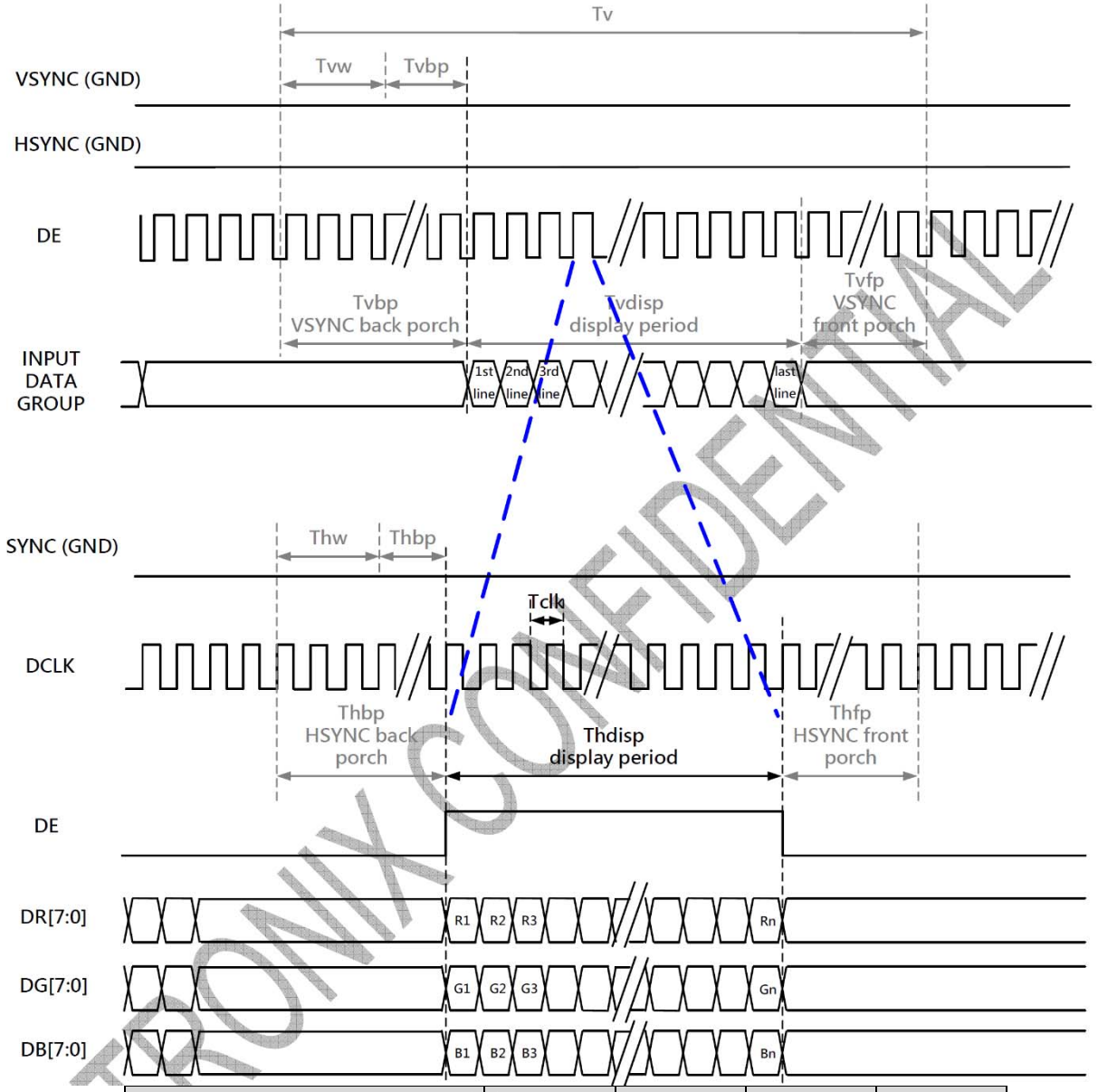
8.2 RGB Interface
8.2.1 SYNC Mode



8.2.2 SYNC-DE Mode



8.2.3 DE Mode



RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: “Input” means these signals are driven by host side.

8.2.4 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Serial 8-bit RGB Input Timing Table							
Item		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Remark**
DCLK Frequency		Fclk	5	6	8	MHz	
DCLK Period		Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Back Porch	Thbp	3	43	43	DCLK	
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Back Porch	Tvbp	2	12	12	HSYNC	
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note:
It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

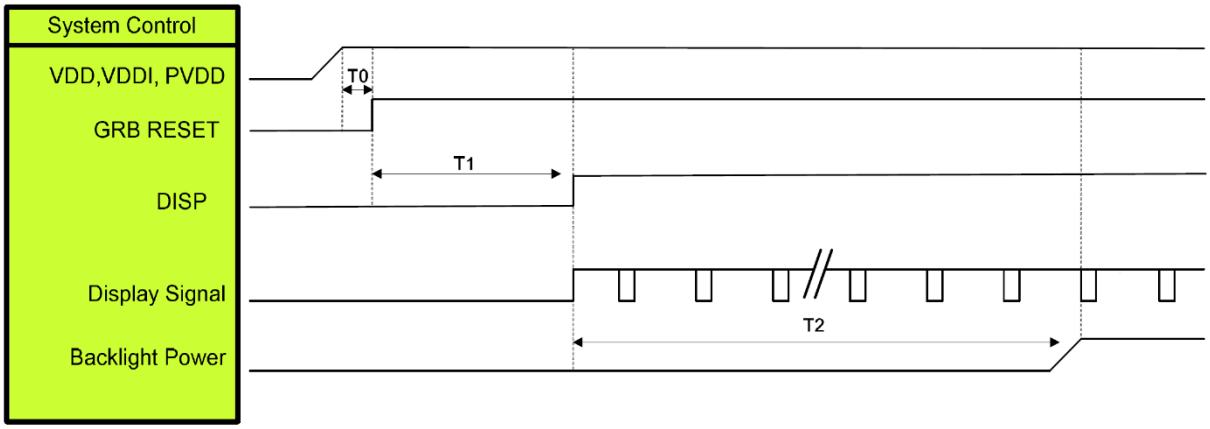
8.2.5 Serial 8-bit RGB Input Timing Table

Serial 8-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Serial 8-bit RGB Input Timing Table							
Item		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Remark**
DCLK Frequency		Fclk	15	18	21	MHz	
DCLK Period		Tclk	47	55	66	ns	
HSYNC	Period Time	Th	965	1011	1078	DCLK	
	Display Period	Thdisp		960		DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Back Porch	Thbp	3	43	43	DCLK	
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Back Porch	Tvbp	2	12	12	HSYNC	
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note:
It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

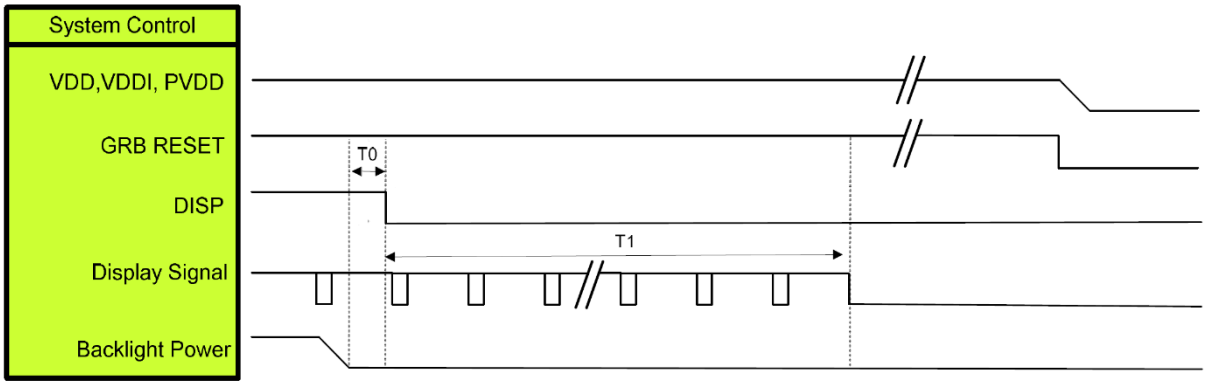
8.3 Power on sequence



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

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

8.4 Power off sequence



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

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

9 Optical specification

9.1 Optical characteristic of the LCD

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Normal viewing angle	640	800	–		(1)(2)
Response time		T_R+T_F		–	30	40	msec	(1)(3)
White luminance (Center)		Y_L		270	340	–	cd/m^2	(1)(4)
Color chromaticity (CIE1931)	White	W_x		-0.06	0.317	+0.06		(1)(4)
		W_y			0.339			
	Red	R_x			0.646			
		R_y			0.332			
	Green	G_x			0.323			
		G_y			0.567			
	Blue	B_x			0.134			
		B_y			0.121			
Viewing angle	Hor.	$Θ_L$	CR>10	70	80	–		
		$Θ_R$		70	80	–		
	Ver.	$Θ_U$		70	80	–		
		$Θ_D$		70	80	–		

Measuring Condition

■Measuring surrounding：dark room

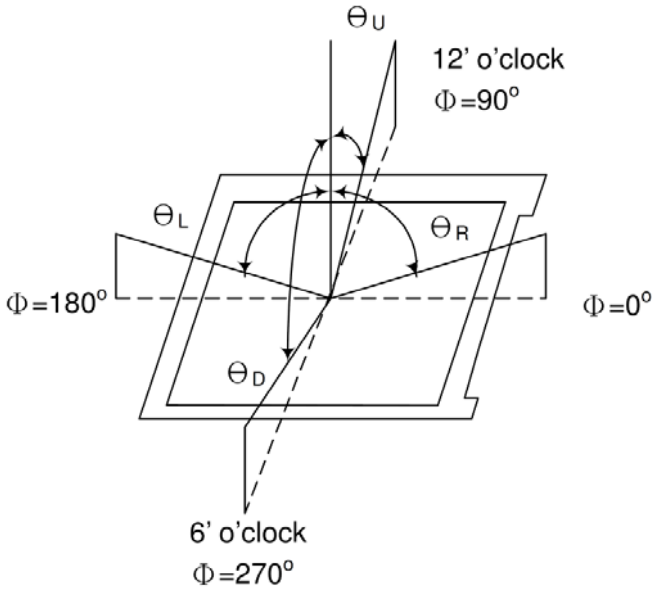
■Ambient temperature：25±2˚C

■15min. warm-up time.

Measuring Equipment

Measuring Equipment is BM-7

Note 1 Definition of viewing angle

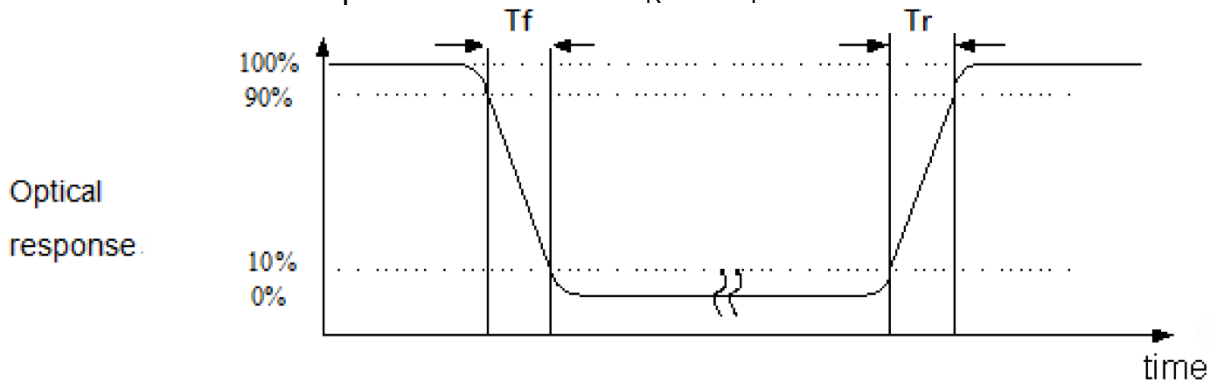


Note 2: Definition of contrast ratio (CR)

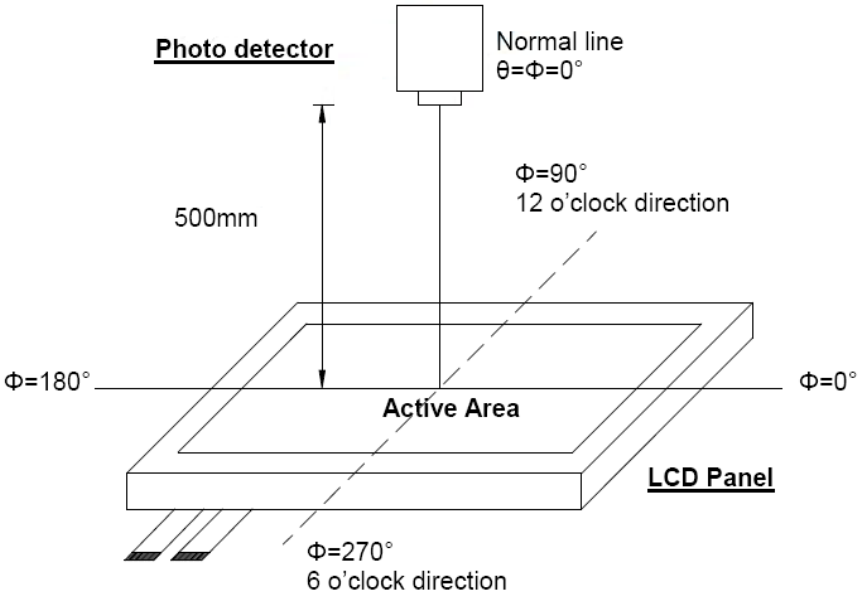
Measured at the center point of panel

$$CR = \frac{Luminance\ with\ all\ pixels\ white}{Luminance\ with\ all\ pixels\ black}$$

Note 3: Definition of response time: Sum of T_R and T_F



Note 4: Definition of optical measurement setup
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° / Height: 500mm.)

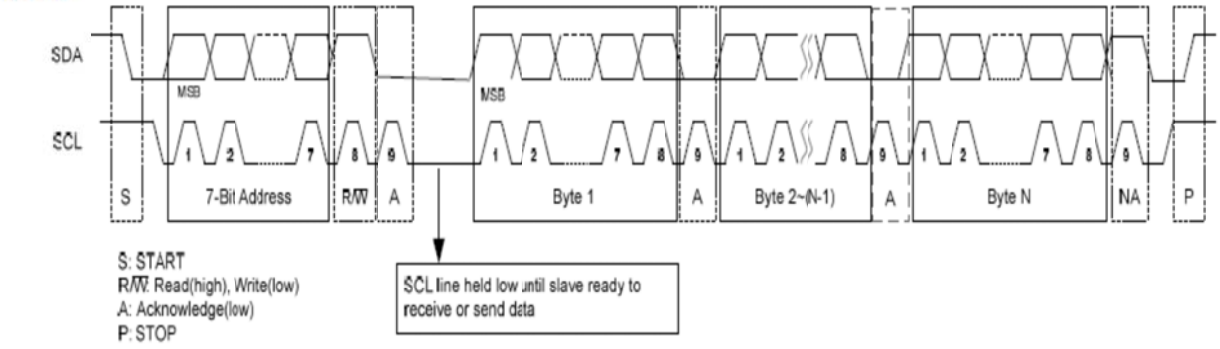


10 Touch Screen Panel Specifications

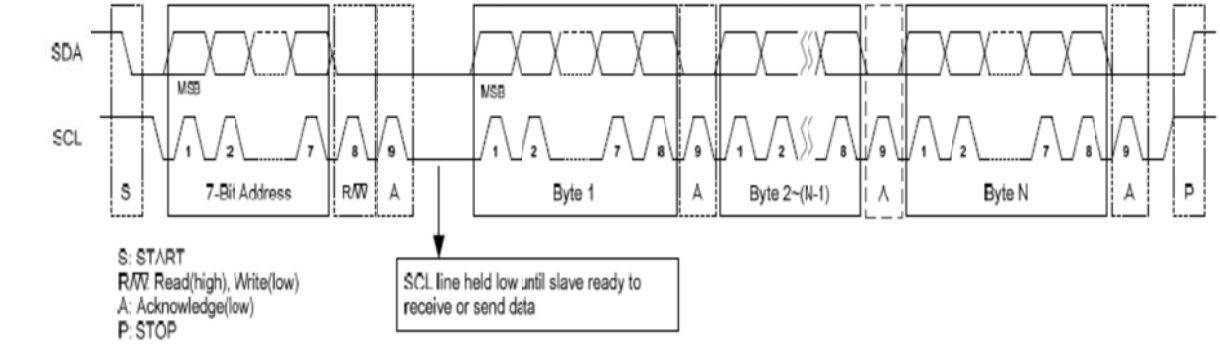
10.1 Information of Capacitive touch panel

I2C Slave Interface

Read



Write



10.2 Default I2C Address

I2C address is default to **0x55** (7-bits address) for Sitronix Touch IC. If the I2C address is conflict with another I2C device's address on same bus, user can change I2C address by TTK PC Utility.

10.3 Register Read

For reading register value from I2C device, host has to tell I2C device the *Start Register Address* before reading corresponding register value.

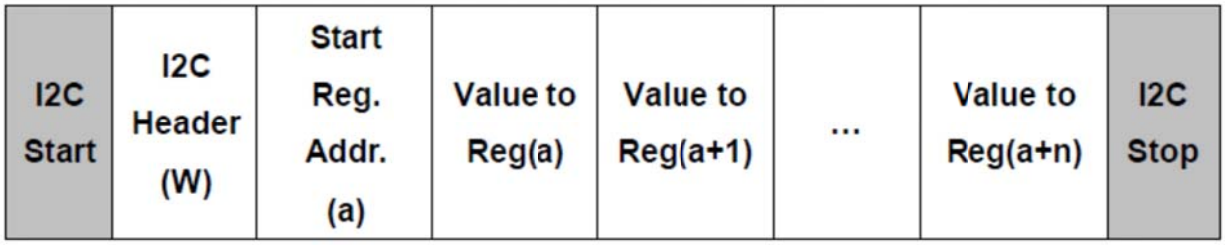
I2C Start	I2C Header (W)	Start Reg. Addr. (a)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I2C Stop

Sitronix Touch IC I2C host interface protocol supports Repeated Register Read. That is, once the Start Register Address has been set by host, consequent I2C Read(R) transactions will directly read register values starting from the Start Register Address without setting address first, as shown in Figure

I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I2C Stop

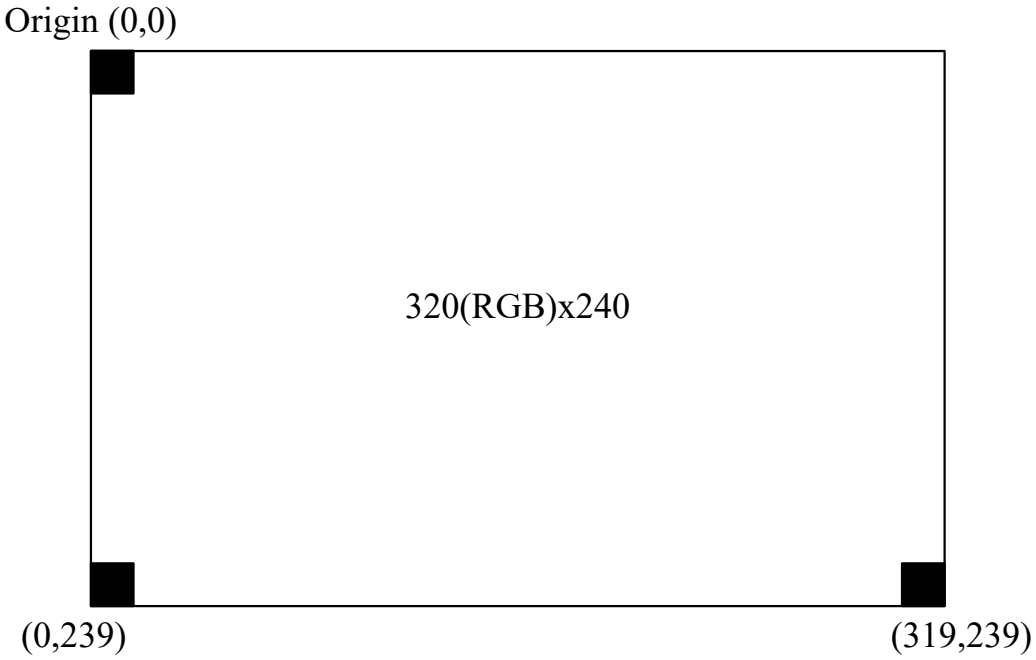
10.4 Register Write

For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure



10.5 TP controller register table

Reg. Addr.	Name	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x10	Advantaged Touch Info.	Reserved	Proximity Flag (RO)	Reserved					
0x11	Keys Reg.	Reserve							
0x12	XY0 Coord. (High byte)	Valid	X0_H				Y0_H		
0x13	X0 Coord. (Low byte)	X0_L							
0x14	Y0 Coord. (Low byte)	Y0_L							
0x15	-	Reserve							
0x16	XY1 Coord. (High byte)	Valid	X1_H				Y1_H		
0x17	X1 Coord. (Low byte)	X1_L							
0x18	Y1 Coord. (Low byte)	Y1_L							
0x19	-	Reserve							
0x1A~0x20	……	……							
0x21	XY4 Coord. (High byte)	Valid	X4_H				Y4_H		
0x22	X4 Coord. (Low byte)	X4_L							
0x23	Y4 Coord. (Low byte)	Y4_L							
0x24	-	Reserve							



10.6 SAMPLE CODES

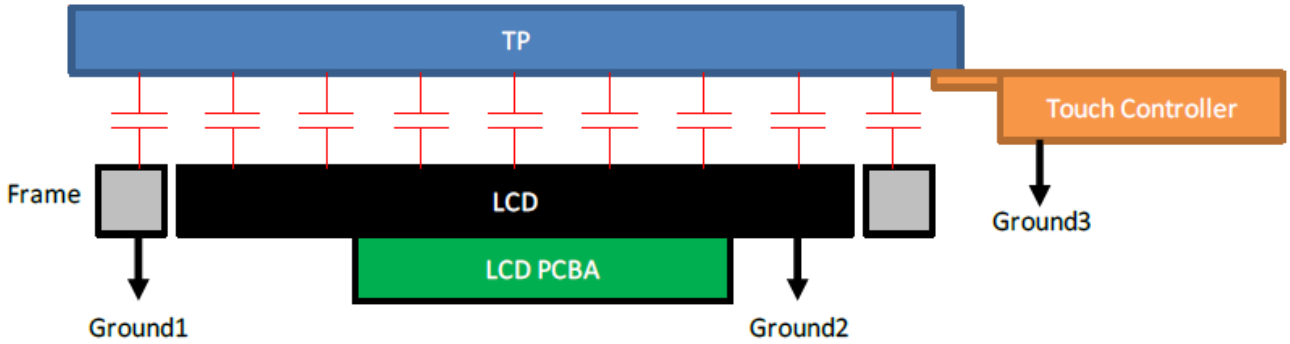
```
typedef struct {
        u8 y_h: 3,
        reserved: 1,
        x_h: 3,
        valid: 1;
        u8 x_l;
        u8 y_l;
        u8 z;
} xyz_data_t;

typedef struct {
        u8 fingers: 4,
        reserved: 4;
        u8 keys;
        xyz_data_t xyz_data[10];
} stx_report_data_t;

// I2C Master sends count bytes data stored in buf to I2C Slave.
// I2C package: | S | I2C Addr | W | Data (buf) | P |
extern int i2c_master_send(const char *buf, int count);

// I2C Master reads count bytes data to buf from I2C Slave.
// I2C package: | S | I2C Addr | R | Data (buf) | Nak | P |
extern int i2c_master_recv(char *buf, int count);
```

10.7. Read XY Coordinates

The function, get_coordinates(), reads XY Coordinate registers from I2C Slave, extracts XY information from data buffer and returns to upper layer. This function shall be called from ISR each time when host receives and INT from device.

```
static int get_coordinates(u8 *count, u32 *x0, u32 *y0, u32 *x1, u32 *y1)
{
	u8 buf[42];
	stx_report_data_t *pdata;
	int ret = 0;
	*count = 0; // Set point detected count to 0.
	if (i2c_master_recv(buf, sizeof(buf))) // Read Coordinates from default Reg. address 0x10.
	goto err;
	pdata = (stx_report_data_t *) buf;
	if (pdata->fingers) {
	if (pdata->xy_data[0].valid) {
	*x0 = pdata->xy_data[0].x_h << 8 | pdata->xy_data[0].x_l;
	*y0 = pdata->xy_data[0].y_h << 8 | pdata->xy_data[0].y_l;
(*count)++;
}
	if (pdata->xy_data[1].valid) {
	*x1 = pdata->xy_data[1].x_h << 8 | pdata->xy_data[1].x_l;
	*y1 = pdata->xy_data[1].y_h << 8 | pdata->xy_data[1].y_l;
(*count)++;
}
}
	err:
	return ret;
}
```

TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.



GND1, GND2 and GND3 should be connected together to have the same ground

11 Reliability Test

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axes Duration : 30 min/each axis	2

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 1 hour storage in normal conditions (15-35°C, 45-65%RH).

Note 3: The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4: All the reliability tests should be done without protective film on the module.

12 USE PRECAUTIONS

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 an optimum work environment.

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

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

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

12.1.8.4. 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

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

12.2.2. 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%

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

12.3 Transportation Precautions

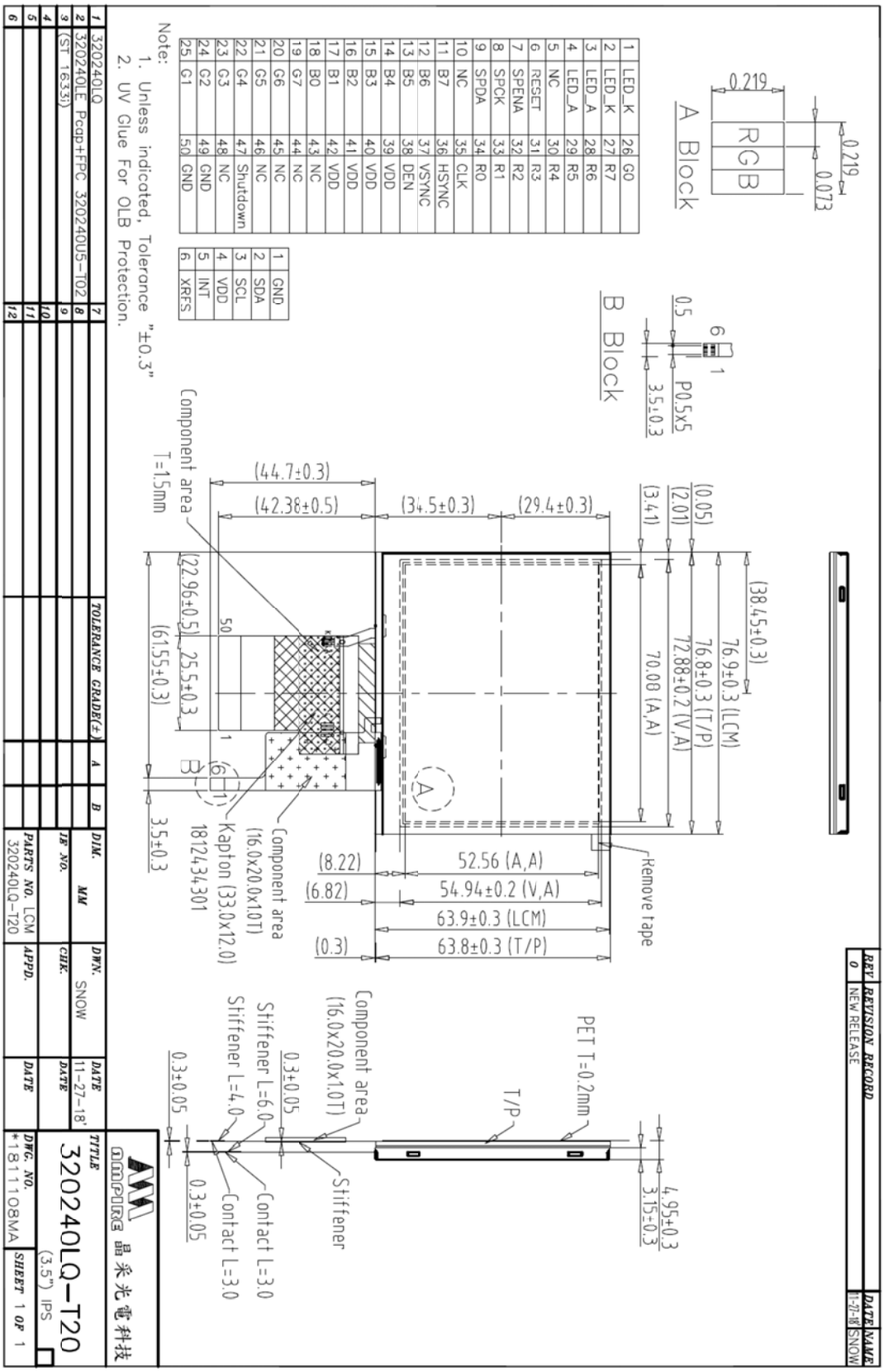
The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

12.4 Other

12.4.1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

12.4.2. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

13 Mechanical Dimensions



1	LED_K	26	G0
2	LED_K	27	R7
3	LED_A	28	R6
4	LED_A	29	R5
5	NC	30	R4
6	RESET	31	R3
7	SPENA	32	R2
8	SPCK	33	R1
9	SPDA	34	R0
10	NC	35	CLK
11	B7	36	HSYNC
12	B6	37	VSYNC
13	B5	38	DEN
14	B4	39	VDD
15	B3	40	VDD
16	B2	41	VDD
17	B1	42	VDD
18	B0	43	NC
19	G7	44	NC
20	G6	45	NC
21	G5	46	NC
22	G4	47	Shutdown
23	G3	48	NC
24	G2	49	GND
25	G1	50	GND

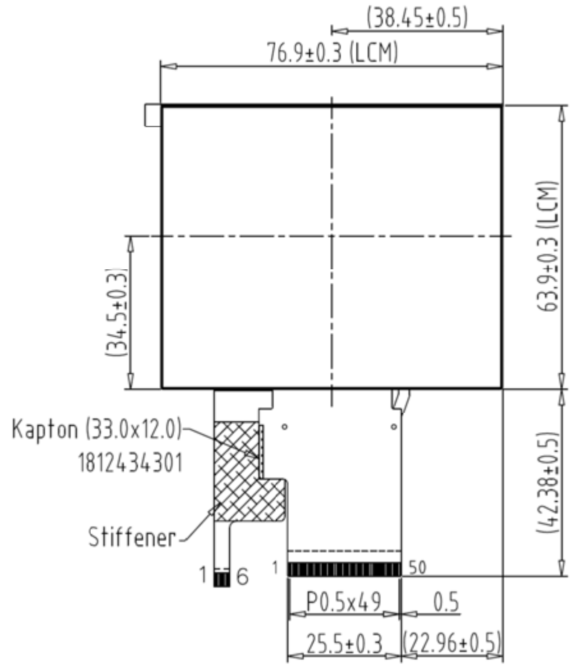
1	GND
2	SDA
3	SCL
4	VDD
5	INT
6	XRFS

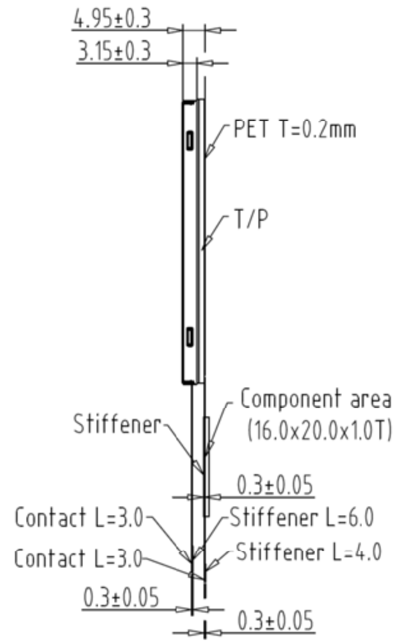
Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.

REV.	REVISION RECORD	DATE	NAME
0	NEW RELEASE	11-27-18	SNOW

1	320240LQ			TOLERANCE GRADE(±)	A	B	DIM.	DWN.	DATE
2	320240LE Pcap+FPC 320240U5-T02						MM	SNOW	11-27-18
3	(ST 1633)						ITE NO.	CHK.	DATE
4									
5							PARTS NO.	APPD.	DATE
6							320240LQ-T20		

TITLE	320240LQ-T20 (3.5") IPS
DWG. NO.	*1811108MA
SHEET	1 OF 1





Back View

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	11-27-18	SNOW

1	LED_K	26	G0
2	LED_K	27	R7
3	LED_A	28	R6
4	LED_A	29	R5
5	NC	30	R4
6	RESET	31	R3
7	SPENA	32	R2
8	SPCK	33	R1
9	SPDA	34	R0
10	NC	35	CLK
11	B7	36	HSYNC
12	B6	37	VSYNC
13	B5	38	DEN
14	B4	39	VDD
15	B3	40	VDD
16	B2	41	VDD
17	B1	42	VDD
18	B0	43	NC
19	G7	44	NC
20	G6	45	NC
21	G5	46	NC
22	G4	47	Shutdown
23	G3	48	NC
24	G2	49	GND
25	G1	50	GND

1	GND
2	SDA
3	SCL
4	VDD
5	INT
6	XRES

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.

1	320240LK-51	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 11-27-18'	TITLE 320240LQ-T20 (3.5") IPS	
2	320240LE Pcap+FPC 320240U5-T02	8									
3	(ST 1633i)	9					IE NO.	CHK.	DATE		
4		10									
5		11					PARTS NO. LCM-1 320240LQ-T20	APPD.	DATE	DWG. NO. *1811109MA	SHEET 1 OF 1
6		12									

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