A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

4.3-in COLOR TFT MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M - 4 8 0 2 7 2 H A T M Q W - T A 0 H
APPROVED BY:	
DATE:	

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2012/04/18	-	New Release	Kain
2012/04/24		Modify input power	Kain

1. FEATURES

(1) Construction : a-Si TFT-LCD with driving system, White LED Backlight and Touch Panel.
(2) LCD type : Transmissive , Normally White
(3) Number of the Colors : 16.7M colors (R,G,B 8 bit digital each)
(4) RGB Interface 40 pin.
(5) LCD Power Supply Voltage : 3.3V single power input,
(6) Touch Panel Included

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size (diagonal)	4.3	inch
Resolution	480RGB (W) x 272(H)	dots
Display area	98.7 (W) x57.5 (H)	mm
Pixel pitch	0.198 (W) x 0.198 (H)	mm
Overall dimension	105.5(W)x114.05(H)x6.24 (D)	mm
Color configuration	R.G.B Vertical stripe	
View Direction (Gray Inversion)	6 o'clock	

3. ABSOLUTE MAXIMUM RATINGS

item	Symbol	Values		Unit	Remark
		Min	Max		
Power Supply for logic	VCC	-0.3	5.0	V	GND=0
Operation Temperature (Ambient)	T_{OP}	-20	70	℃	
Storage Temperature (Ambient)	T_{ST}	-30	80	℃	Note 1
LED Forward current	I_f		20	mA	OneLED/Note2
LED Power Dissipation	P_d		64	mW	One LED

*TFT LCD Ratings

Note 1: Hsync, Vsync, DEN, DCLK, R0~R7, G0~G7, B0~B7

Note 2: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

4. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	Θ=Φ=0°	-	40		ms	(3)
Contrast ratio		CR			250	-	-	(1)
Viewing Angle	Vertical	Θ	CR≧10		90.	-	Deg.	(4)
	Horizontal	Φ			130	-		
Luminance		L	Θ=Φ=0°	--	400	--	cd/m^2	(2)
Color chromaticity	White	Wx			0.301			(2)(3)
		Wy			0.339			

NOTE :

Measure Condition:IL= 20.0mA

Measure Item Definition as follow：

(1)Definition of Contrast Ratio：(Measured by BM-7 (TOPCON) [dark room])

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

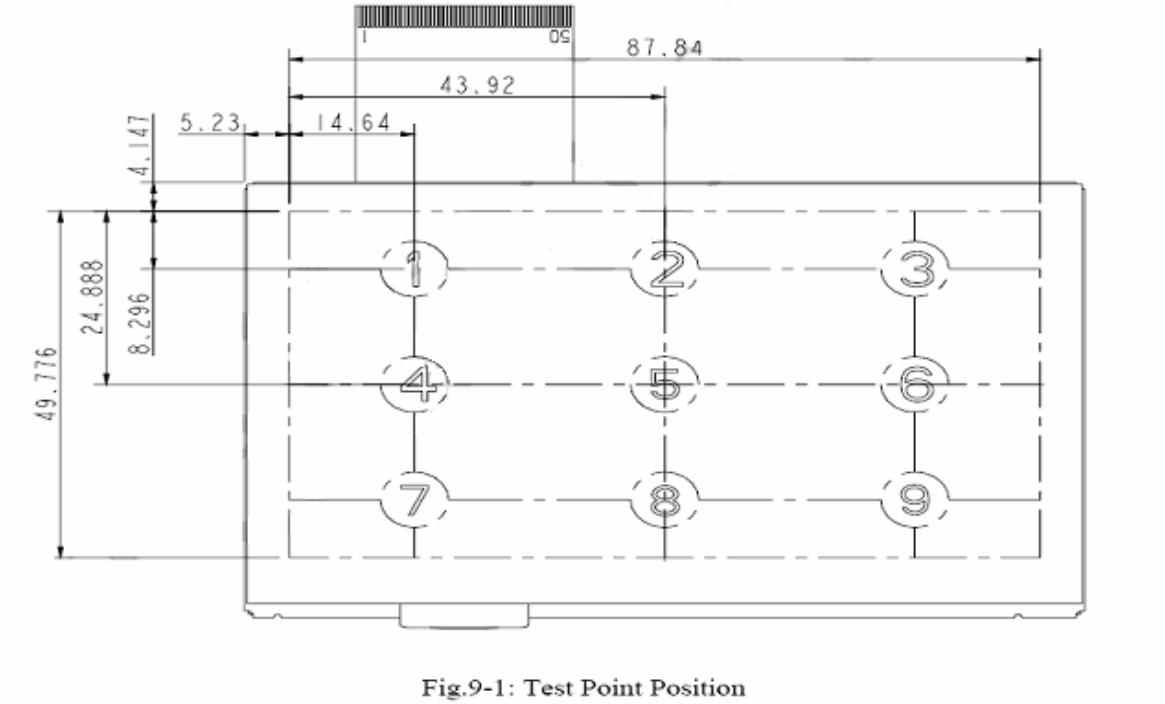


Fig.9-1: Test Point Position

(2) Definition of Center Luminance &Luminance Uniformity：(Measured by BM-7 (TOPCON) [dark room])

Center Luminance：Measure luminance on Point No5 as figure 9-1.

Luminance Uniformity：Measure maximum luminance(L(MAX))and minimum luminance (L(MIN))on the **9** points as figure 9-1.

L = [L(MIN)/L(MAX)]×100%△

(3) Response Time (White - Black)

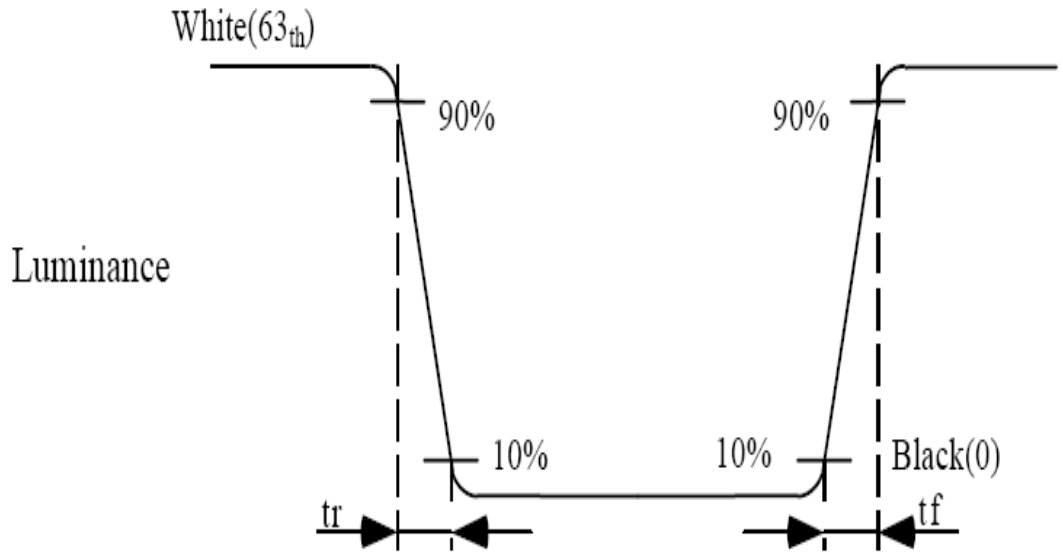
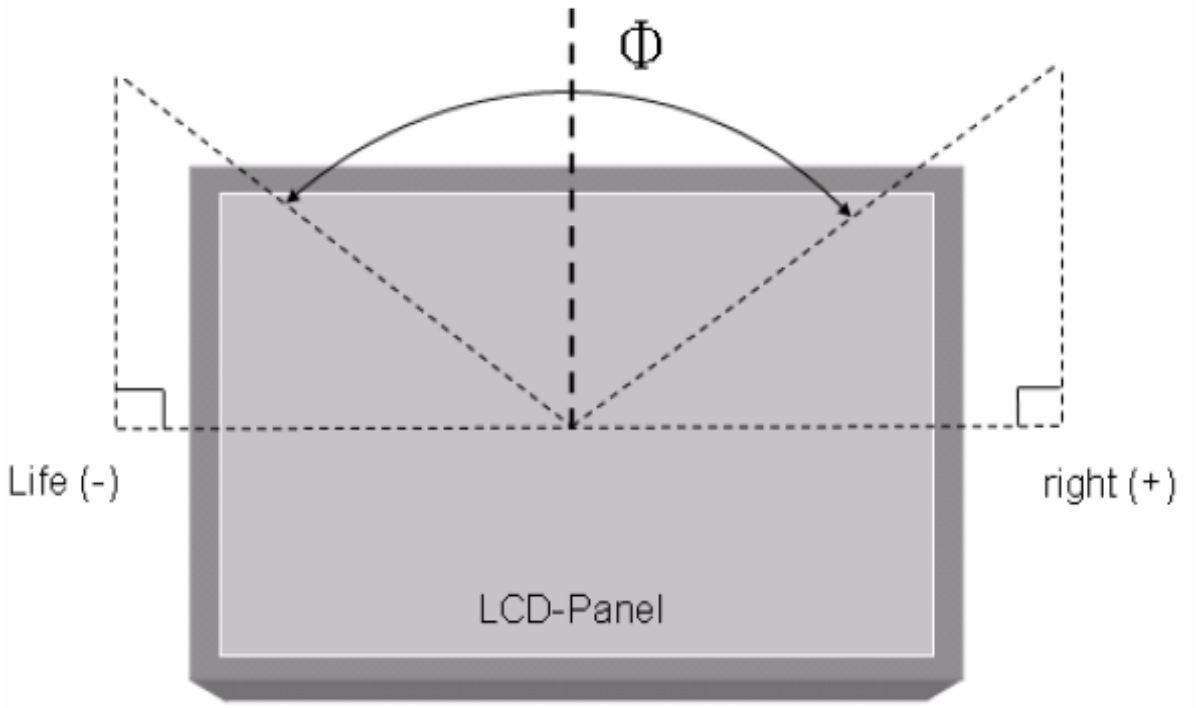
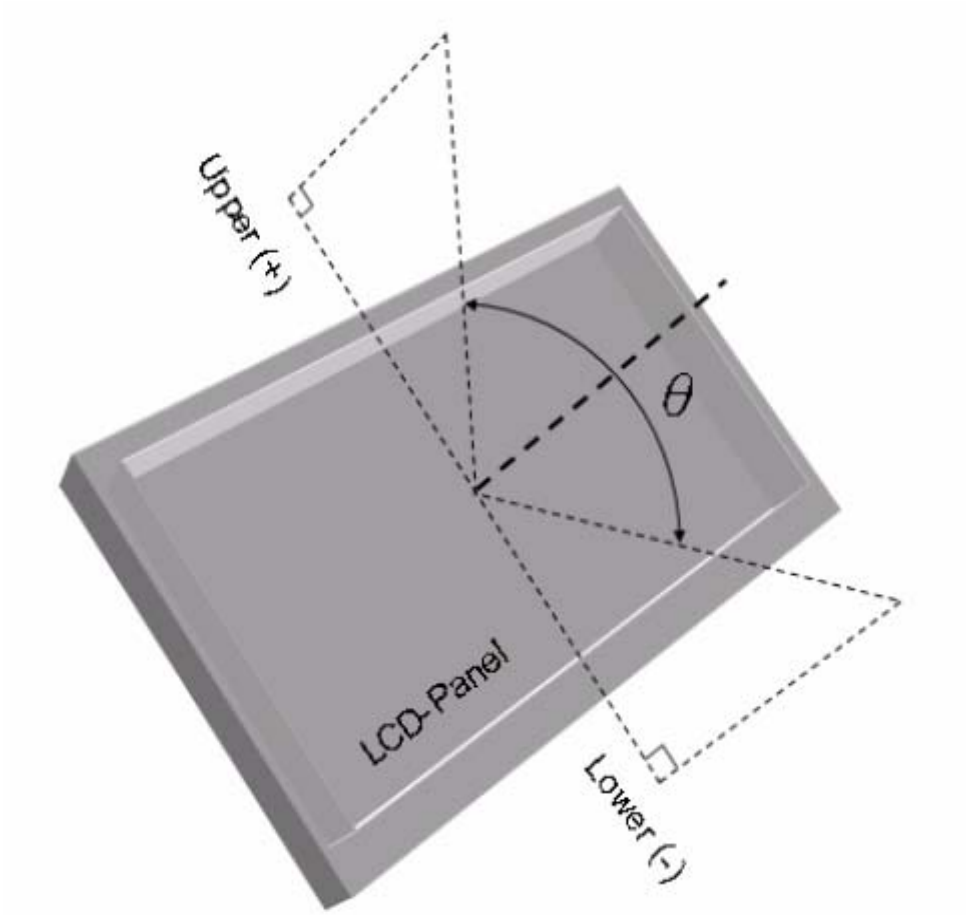


Fig.9-2: Definition of Response Time (White - Black)

(4)Definition of Viewing Angle.() ：(by EZ-CONTRAST (ELDIM) in the dark room.)





5. ELECTRICAL CHARACTERISTICS

LCD driving

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage		VDD	3.0	3.3	3.6	V	
Input voltage for logic	H Level	V_{IH}	0.8 VDD	--	VDD	V	(1)
	L Level	V_{IL}	0	--	0.2 VDD	V	
Power Supply current		IDD	--	45	--	mA	(2)

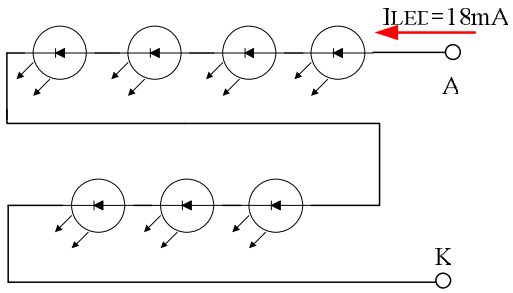
Note 1: Hsync, Vsync, DEN, DCLK, R0~R5, G0~G5, B0~B5

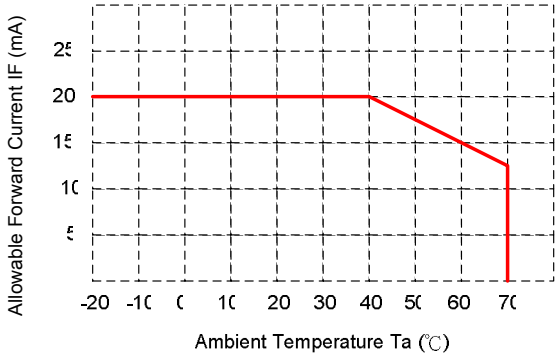
Note 2: fV =60Hz , Ta=25℃ , Display pattern : All Black

LED back light specification

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Forward voltage	V_f	I_f =18mA		23.1	25.2	V
Forward current	I_f	7-chip serial	-	18	20	mA
Uniformity (with L/G)	-	I_f=18mA	75%*1	-	-	
Life Time (LED Dice)	-	T_a=25°C, I_F=20mA	17.7K			Hrs
Luminous color	White					
Chip connection	7 chip serial connection					

■ The constant current source is needed for white LED back-light driving. When LCM is operated over 60 deg.C ambient temperature, the I_{LED} of the LED back-light should be adjusted to 15mA max

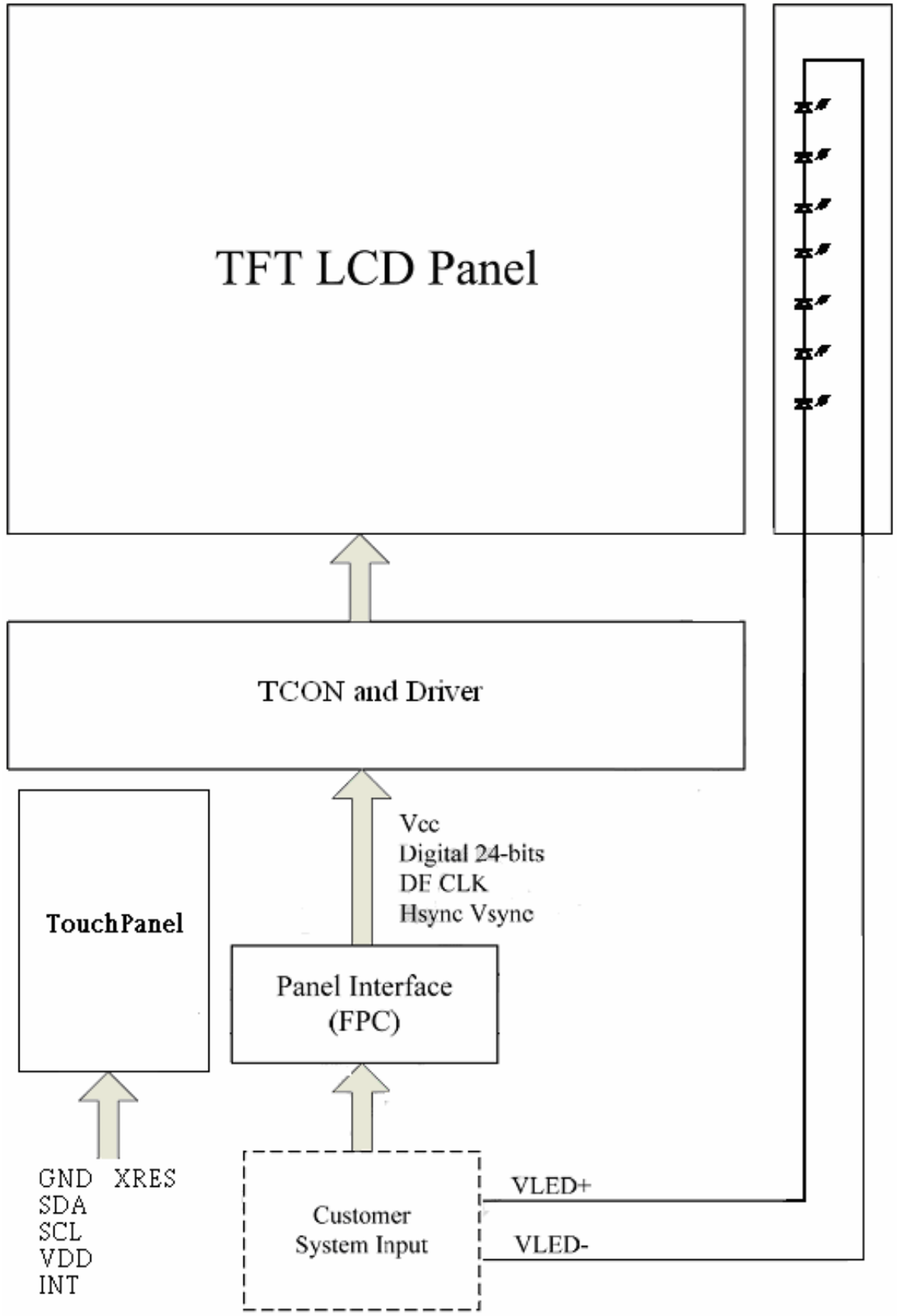




Pin definition of Backlight

Pin no	Symbol	Function
1	LED_K	LED Cathode
2	NC	Keep NC
3	NC	Keep NC
4	LED_A	LED Anode

6. BLOCK DIAGRAM



7. TFT LCD Panel FPC Descriptions

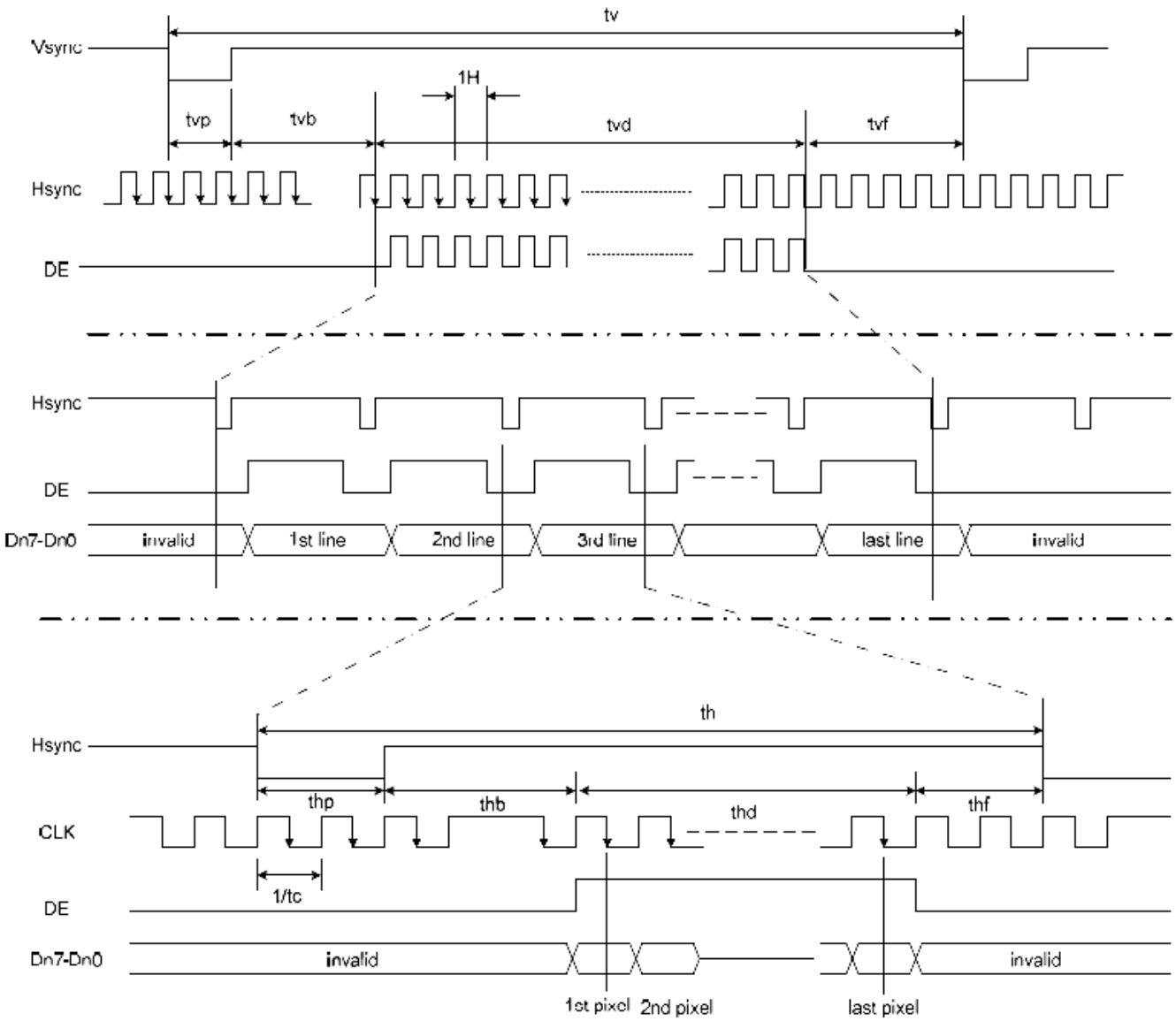
Pin no	Symbol	Function
1	GND	Ground
2	GND	Ground
3	VCC	Power Supply(3.3V)
4	VCC	Power Supply(3.3V)
5	R0	Red Data Bit 0
6	R1	Red Data Bit 1
7	R2	Red Data Bit 2
8	R3	Red Data Bit 3
9	R4	Red Data Bit 4
10	R5	Red Data Bit 5
11	R6	Red Data Bit 6
12	R7	Red Data Bit 7
13	G0	Green Data Bit 0
14	G1	Green Data Bit 1
15	G2	Green Data Bit 2
16	G3	Green Data Bit 3
17	G4	Green Data Bit 4
18	G5	Green Data Bit 5
19	G6	Green Data Bit 6
20	G7	Green Data Bit 7
21	B0	Blue Data Bit 0
22	B1	Blue Data Bit 1
23	B2	Blue Data Bit 2
24	B3	Blue Data Bit 3
25	B4	Blue Data Bit 4
26	B5	Blue Data Bit 5
27	B6	Blue Data Bit 6
28	B7	Blue Data Bit 7
29	GND	Ground
30	DCLK	Dot Data Clock
31	DISP	Display ONOFF
32	Hsync	Horizotal Sync Input
33	Vsync	Vertical Sync Input
34	NC	Not Connection
35	NC	Not Connection
36	NC	Not Connection
37	NC	Not Connection
38	Test1	Not Connection
39	Test2	Not Connection
40	Test3	Not Connection

Capacitive Touch Panel FPC Descriptions

No.	Symbol	I/O	Description	Remark
1.	GND	-	Ground.(0V)	
2.	SDA	I/O	I2C Interface.	
3.	SCL	I		
4.	VDD	-	Power Supply for TP controller.(3.3V)	
5.	INT	O	IRQ Terminal.	
6.	XRES	I	Terminal of Reset TP controller.	

8. INPUT SIGNAL

8.1 Parallel RGB input timing Chart



8.2 Timing Specification

Parallel RGB input timing requirement

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	$1/t_C$*1		9	15	MHz
Hsync cycle	$1/f_H$		17.14	-	KHz
Vsync cycle	$1/f_v$		59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th*2	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp	2	41	41	CLK
Horizontal back porch	thb	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285-	286	511	H
Vertical display period	tvd	272	272	272	H
Vertical front porch	tvf	1	2	227	H
Vertical pulse width	tvp	1	10	11	H
Vertical back porch	tvb	1	2	11	H

Note:

(1) Unit: CLK=1/ fCLK , H=th,

(2)It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode.

8.3 Timing Chart 2

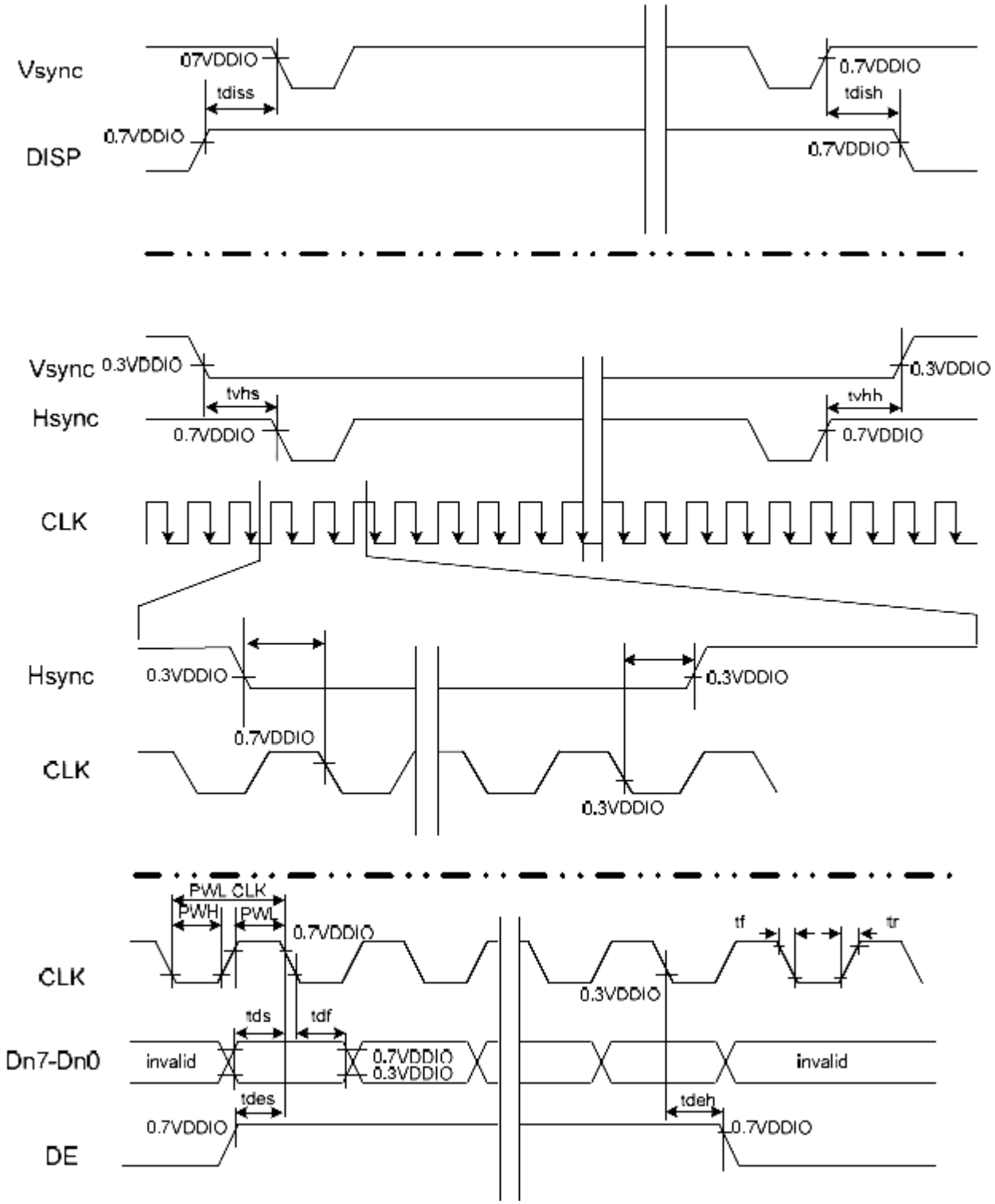
Input setup timing requirement

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-		ns
Clock period	PW_{CLK}*1	66.7	-	-	ns
Clock pulse high period	PWH*1	26.7	-	-	ns
Clock pulse low period	PWL*1	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-		ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
DE setup time	t_{des}	10	-	-	ns
DE hold time	t_{deh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note

1. For parallel interface, maximum clock frequency is 15MHz.
2. tr, tf is defined 10% to 90% of signal amplitude.

8.4 Input setup timing Chart

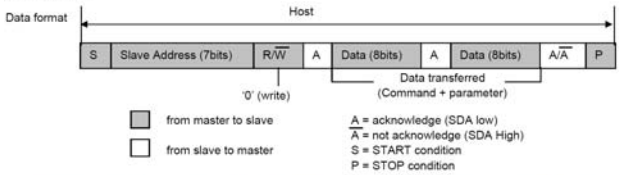


8.5 AC Timing characteristic of the capacitive touch panel

IIC Interface (T/P Controller) Slave Address=0x5C.

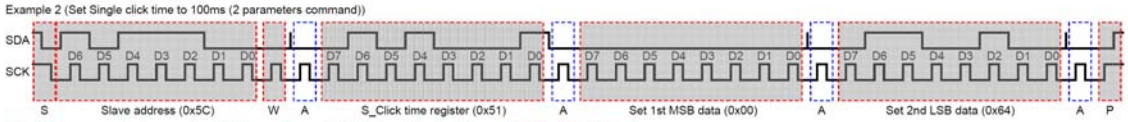
Standard IIC Timing

Write Operating



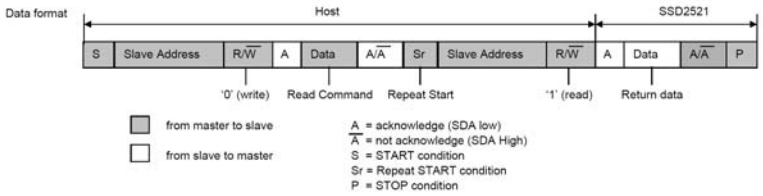
Example 1 (Set Drive Line Number to 18 lines (1 parameter command))

Example 2 (Set Single click time to 100ms (2 parameters command))

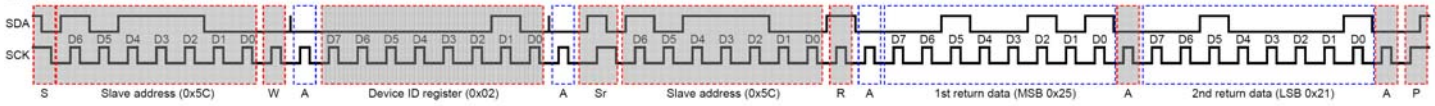


Note: All the command and parameter data byte must be sent within 1 transaction (i.e. between START and STOP signal)

Read Operation

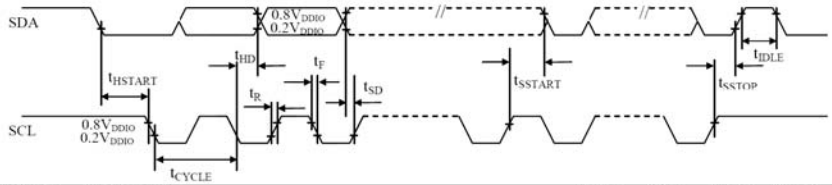


Example (Read ID from SSD2521)



Note: A Repeat-START condition must be use between the address setup and data read transaction.
All the data must be read within one transaction ot the address counter will return to 0 after the SSD2521 received a STOP signal (i.e. the return data will always start from 1st data bye when host issued READ request).

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	-	us
t_{HSTART}	Start condition Hold Time	0.6	-	-	us
t_{HD}	Data Hold Time (for "SDA_{OUT}" pin)	0	-	-	ns
	Data Hold Time (for "SDA_{IN}" pin)	300	-	-	ns
t_{SD}	Data Setup Time	100	-	-	ns
t_{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t_{SSTOP}	Stop condition Setup Time	0.6	-	-	us
t_R	Rise Time for data and clock pin	-	-	300	ns
t_F	Fall Time for data and clock pin	-	-	300	ns
t_{IDLE}	Idle Time before a new transmission can start	1.3	-	-	us



Symbol	Parameter	Min	Typ	Max	Unit
t_{PR}	Power rise time	-	-	30	us
t_{PD}	Power delay time	-	-	30	us
t_{STABLE}	Chip stable time	-	-	10	us
t_{RES}	Reset pulse	4	-	-	us
t_{READY}	Chip need time after hardware reset	-	-	1	us

9. TP controller command table

Reg#	Function	R/W/C	No. of Byte	Parameter	Default
R00h	No Operation	C	0	N/A	N/A
R01h	Software Reset	C	0	N/A	N/A
R02h	Device ID	R	2	nibble based representation of "2521"	0x2521
R06h	Number of Driving Electrodes	W	1	[7:4]: Reserved [3:0]: Select between 6 to 21 electrodes according to mapping in specification.	0x0F
R07h	Number of Sensing Electrodes	W	1	[7:3]: Reserved [2:0]: Select between 6 to 12 electrodes according to mapping in specification.	0x06
R08h	Select Drive Pin and Slew Rate for Drive Line 00	W	1	[7:5] Slew rate [4:0] Drive pin select	0x00
R09h	Select Drive Pin and Slew Rate for Drive Line 01	W	1	[7:5] Slew rate [4:0] Drive pin select	0x01
RAh	Select Drive Pin and Slew Rate for Drive Line 02	W	1	[7:5] Slew rate [4:0] Drive pin select	0x02
RBh	Select Drive Pin and Slew Rate for Drive Line 03	W	1	[7:5] Slew rate [4:0] Drive pin select	0x03
RCh	Select Drive Pin and Slew Rate for Drive Line 04	W	1	[7:5] Slew rate [4:0] Drive pin select	0x04
RDh	Select Drive Pin and Slew Rate for Drive Line 05	W	1	[7:5] Slew rate [4:0] Drive pin select	0x05
REh	Select Drive Pin and Slew Rate for Drive Line 06	W	1	[7:5] Slew rate [4:0] Drive pin select	0x06
RFh	Select Drive Pin and Slew Rate for Drive Line 07	W	1	[7:5] Slew rate [4:0] Drive pin select	0x07
R10h	Select Drive Pin and Slew Rate for Drive Line 08	W	1	[7:5] Slew rate [4:0] Drive pin select	0x08
R11h	Select Drive Pin and Slew Rate for Drive Line 09	W	1	[7:5] Slew rate [4:0] Drive pin select	0x09
R12h	Select Drive Pin and Slew Rate for Drive Line 10	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0A
R13h	Select Drive Pin and Slew Rate for Drive Line 11	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0B
R14h	Select Drive Pin and Slew Rate for Drive Line 12	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0C
R15h	Select Drive Pin and Slew Rate for Drive Line 13	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0D
R16h	Select Drive Pin and Slew Rate for Drive Line 14	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0E
R17h	Select Drive Pin and Slew Rate for Drive Line 15	W	1	[7:5] Slew rate [4:0] Drive pin select	0x0F
R18h	Select Drive Pin and Slew Rate for Drive Line 16	W	1	[7:5] Slew rate [4:0] Drive pin select	0x10
R19h	Select Drive Pin and Slew Rate for Drive Line 17	W	1	[7:5] Slew rate [4:0] Drive pin select	0x11
R1Ah	Select Drive Pin and Slew Rate for Drive Line 18	W	1	[7:5] Slew rate [4:0] Drive pin select	0x12

R1Bh	Select Drive Pin and Slew Rate for Drive Line 19	W	1	[7:5] Slew rate [4:0] Drive pin select	0x13
R1Ch	Select Drive Pin and Slew Rate for Drive Line 20	W	1	[7:5] Slew rate [4:0] Drive pin select	0x14
R23h	System Enable (wake-up)	C	1	Dummy Byte. For example, 0x00 can be sent.	N/A
R24h	System Disable (go to sleep)	C	1	Dummy Byte. For example, 0x00 can be sent.	N/A
R25h	Write Operation Mode	W	1	[7:4]: reserved [3:0]: 0000 = Idle mode 0001 = Idle mode 0010 = Fast Scan, 200Hz 0011 = Fast Scan, 166Hz 0100 = Fast Scan, 142Hz 0101 = Fast Scan, 125Hz 0110 = Fast Scan, 100Hz 0111 = Normal Scan, 83.3Hz 1000 = Normal Scan, 71.4Hz 1001 = Normal Scan, 62.5Hz 1010 = Normal Scan, 55.5Hz 1011 = Normal Scan, 50.0Hz 1100 = Slow Scan, 45.5Hz 1101 = Slow Scan, 37.0Hz 1110 = Slow Scan, 30.3Hz 1111 = Slow Scan, 25.0Hz	0x00
R26h	Read Operation Mode	R	1	Ditto	0x00
R27h	Set Power Down Time	W	1	[7:3]: reserved [2:0]: 000 = 200ms (5Hz) 001 = 140ms (7Hz) 010 = 100ms (10Hz) 011 = 70ms (14Hz) 100 = 50ms (20Hz) 101 = 35ms (28Hz) 110 = 25ms (40Hz) 111 = 17.7ms (56Hz)	0x04
R28h	Set No. of Frames escape without finger touch before entering Power Save Mode.	W	1	[7:4]: reserved [3:0]: 0000 = 20 frames 0001 = 40 frames 0010 = 60 frames 0011 = 80 frames 0100 = 100 frames 0101 = 120 frames 0110 = 140 frames 0111 = 160 frames 1000 = 180 frames 1011 = 200 frames 1011 = 220 frames 1011 = 240 frames 1100 = 260 frames 1101 = 280 frames 1110 = 300 frames 1111 = 320 frames	0x08
R29h	Number of idle cycles insert between driving two rows.	W	1	[7:4]: reserved [2:0] =: No. of idle cycles – 2 Range: 2 – 9 cycles	0x07

R2Ah	Number of Sub Frames per frame scan.	W	1	[7:2]: reserved [1:0]: No. of sub frames – 1 Range: 1 – 4 sub frames	0x03
R33h	Min Finger Area (in unit of crossover points)	W	1	[7:0]: set minimum area for valid finger detection	0x02
R34h	Min Finger Level (in unit of delta difference)	W	1	[7:0] set minimum level for valid finger detection	0x05
R35h	Min Finger Weight (in unit of delta difference)	W	2	[7:0]: set minimum weight for valid finger detection	0x00 0x0A
R36h	Max Finger Area (in unit of crossover points)	W	1	[7:0]: set maximum area for valid finger detection	0x1E
R37h	Control depth of image segmentation	W	1	[7:2]: reserved [1:0]: 0 = 68% of max value 1 = 63% of max value 2 = 56% of max value 3 = 49% of max value	0x00
R38h	Select Delta Data Range	W	1	[7:2]: reserved [1:0]: 00 = delta_data[7:0] 01 = delta_data[8:1] 10 = delta_data[9:2] 11 = delta_data[10:3]	0x00
R39h	Select CG calculation method	W	1	[7:1]: reserved [0]: 0 = Weighted Avg. 1 = Curve Fitting	0x00
R3Ah	Enable filtering in init calibration sequence	W	1	[7:1]: reserved [0]: 0 = disable filter 1 = enable filter	0x00
R3Bh	Invert polarity of delta	W	1	[7:1]: reserved [0]: 0 = invert 1 = non-invert	0x00
R51h	Single Click Timing (in 1ms unit)	W	2	[15:11]: Reserved [10:0]: define single click timing	0x00 0x00
R52h	Double Click Timing (in 1ms unit)	W	2	[15:11]: Reserved [10:0]: define double click timing	0x00 0x00
R53h	CG Tolerance (in 1/32 electrode span)	W	1	[7]: Reserved [6:0]: define CG tolerance	0x00
R54h	X Tracking tolerance (in 1/32 electrode span)	W	1	[7:0]: X coordinate tracking tolerance	0x00
R55h	Y Tracking tolerance (in 1/32 electrode span)	W	1	[7:0] Y coordinate tracking tolerance	0x00
R56h	Enable Adaptive Moving Average filter to smooth fingers' output coordinates.	W	1	[7:1]: reserved [0]: 0 = disable filter 1 = enable filter	0x00
R57h	Select the scaling factor for finger speed (in 1/32 electrode span)	W	1	[7:1]: reserved [0]: 0 = speed / 4 1 = speed / 8	0x00
R58h	Select the scaling factor for finger press weight (in unit of a delta difference)	W	1	[7:2]: reserved [1:0]: 00 = weight/1 01 = weight/2 10 = weight/4 11 = weight/8	0x00

R66h	Scaling factor for X coordinate. Floating point format is ##.######.	W	1	[7:0]: X scaling factor. 2-bit integer part and 6-bit fractional part.	0x40
R67h	Scaling factor for Y coordinate. Floating point format is ##.######.	W	1	[7:0]: Y scaling factor. 2-bit integer part and 6-bit fractional part.	0x40
R68h	Offset of X coordinate. (in unit of pixel. That is, after X scaling)	W	1	[7:6]: reserved [5:0]: X offset	0x00
R69h	Offset of Y coordinate. (in unit of pixel. That is, after Y scaling)	W	1	[7:6]: reserved [5:0]: Y offset	0x00
R79h	Event Status	R	1	[7]: Reserved [6]: Large Object detected [5]: FIFO overflow [4]: FIFO not empty [3]: Finger 3 detected [2]: Finger 2 detected [1]: Finger 1 detected [0]: Finger 0 detected	N/A
R7Ah	Event Mask	W	2	[15]: Unknown event mask [14:8]: Reserved [7]: FM Event mask [6]: FL Event mask [5]: FE Event mask [4]: DFDC Event mask [3]: DFSC Event mask [2]: SFDC Event mask [1]: SFSC Event mask [0]: Reserved	0x00 0x00
R7Bh	IRQ Mask	W	1	[7]: Reserved [6]: Large Object status mask [5]: FIFO overflow status mask [4]: FIFO not empty status mask [3]: Finger03 status mask [2]: Finger02 status mask [1]: Finger01 status mask [0]: Finger00 status mask	0x00
R7Ch	Finger01 (X,Y) coordinates, speed index and press weight index.	R	4	[31:24]: x-coordinate[7:0] [23:16]: y-coordinate[7:0] [15:12]: x-coordinate [11:8] [11:08]: y-coordinate [11:8] [07:04]: press weight index[3:0] [03:00]: speed index [3:0]	0xFF 0xFF 0xFF 0x00
R7Dh	Finger02 (X,Y) coordinates, speed index and press weight index.	R	4	Ditto	Ditto
R7Eh	Finger03 (X,Y) coordinates, speed index and press weight index.	R	4	Ditto	Ditto
R7Fh	Finger04 (X,Y) coordinates, speed index and press weight index.	R	4	Ditto	Ditto

R80h	Event Stack	R	4	[31:28]: Finger flag [3:0] [27:24]: Event number [3:0] [23:16]: x-coordinate[7:0] [15:08]: y-coordinate[7:0] [07:04]: x-coordinate [11:8] [03:00]: y-coordinate [11:8]	0x00 0xFF 0xFF 0xFF
R81h	Event Stack Clear	C	0	Clear the Event Stack when not overflow	N/A
RA2h	Reset Init Reference Procedure	W	1	Dummy Byte	N/A
RC1h	Charge Pump 2nd Booster Control	W	1	[7:6]: Reserved [5:4]: 2nd Booster Control 00: x6 01: Reserved 10: x5 11: x4 [3:0]: Reserved	0x32
RD5h	Select Driving voltage level	W	1	[7:4]: reserved [3:0]: 0 = 8.0V, 1 = 8.5V 2 = 9.0V, 3 = 9.5V 4 = 10.0V, 5 = 10.5V 6 = 11.0V, 7 = 11.5V 8 = 12.0V, 9 = 12.5V 10 = 13.0V, 11 = 13.5V 12 = 14.0V, 13 = 14.5V 14 = 15.0V, 15 = 15.5V	0x00

*Check the datasheet of SSD2531 for further detail.

10. Touch Panel Initial code

```
void TP_ini(void)
{

//IO_I2C_WR(device_Addr, Command, parameter);
//IO_I2C_WR_2Byte(device_Addr, Command, parameterH, parameterL);

IO_I2C_WR(0x5C,0x23,0x00);
Delay(10);
IO_I2C_WR(0x5C,0x2B,0x03);
IO_I2C_WR(0x5C,0xD4,0x00);
IO_I2C_WR(0x5C,0x06,0x0D);
IO_I2C_WR(0x5C,0x07,0x05);
IO_I2C_WR(0x5C,0x08,0x00);
IO_I2C_WR(0x5C,0x09,0x01);
IO_I2C_WR(0x5C,0x0A,0x02);
IO_I2C_WR(0x5C,0x0B,0x03);
IO_I2C_WR(0x5C,0x0C,0x04);
IO_I2C_WR(0x5C,0x0D,0x05);
IO_I2C_WR(0x5C,0x0E,0x06);
IO_I2C_WR(0x5C,0x0F,0x07);
IO_I2C_WR(0x5C,0x10,0x08);
IO_I2C_WR(0x5C,0x11,0x09);
IO_I2C_WR(0x5C,0x12,0x0A);
IO_I2C_WR(0x5C,0x13,0x0B);
IO_I2C_WR(0x5C,0x14,0x0C);
IO_I2C_WR(0x5C,0x15,0x0D);
IO_I2C_WR(0x5C,0x16,0x0E);
IO_I2C_WR(0x5C,0x17,0x0F);
IO_I2C_WR(0x5C,0x18,0x10);
IO_I2C_WR(0x5C,0x19,0x11);
IO_I2C_WR(0x5C,0x1A,0x12);
IO_I2C_WR(0x5C,0x1B,0x13);
IO_I2C_WR(0x5C,0x1C,0x14);
IO_I2C_WR(0x5C,0x2A,0x03);
IO_I2C_WR(0x5C,0x8D,0x01);
Delay(100);
IO_I2C_WR(0x5C,0x8D,0x00);
IO_I2C_WR(0x5C,0x25,0x0C);
Delay(100);
IO_I2C_WR(0x5C,0xC1,0x02);
IO_I2C_WR(0x5C,0xD5,0x0C);
Delay(300);
IO_I2C_WR(0x5C,0x38,0x00);
IO_I2C_WR(0x5C,0x33,0x01);
IO_I2C_WR(0x5C,0x34,0x3A);
IO_I2C_WR_2Byte(0x5C,0x35,0x00,0x40);
IO_I2C_WR(0x5C,0x36,0x1E);
IO_I2C_WR(0x5C,0x37,0x03);
```

```
IO_I2C_WR(0x5C,0x39,0x01);
IO_I2C_WR(0x5C,0x56,0x01);
IO_I2C_WR_2Byte(0x5C,0x51,0x00,0xFF);
IO_I2C_WR_2Byte(0x5C,0x52,0x00,0xFF);
IO_I2C_WR(0x5C,0x53,0x20);
IO_I2C_WR(0x5C,0x54,0x40);
IO_I2C_WR(0x5C,0x55,0x40);
IO_I2C_WR(0x5C,0xD9,0x01);
IO_I2C_WR(0x5C,0xD8,0x03);
IO_I2C_WR(0x5C,0xD7,0x04);
IO_I2C_WR(0x5C,0x2C,0x02);
IO_I2C_WR(0x5C,0x3D,0x01);
IO_I2C_WR(0x5C,0xD6,0x01);
IO_I2C_WR(0x5C,0xA2,0x00);
IO_I2C_WR(0x5C,0x2C,0x02);
IO_I2C_WR(0x5C,0x66,0x35);
IO_I2C_WR(0x5C,0x67,0x36);
}
```

11. Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

12. QUALITY AND RELIABILITY

12.1Test Conditions

Tests should be conducted under the following conditions :
Ambient temperature : 25 ± 5°C
Humidity : 60 ± 25% RH.

12.2 Sampling Plan

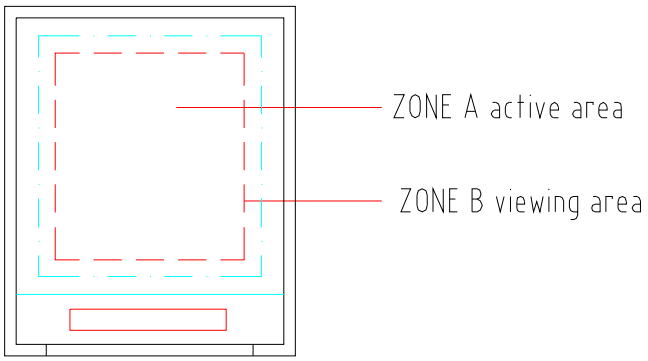
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

12.3 Acceptable Quality Level

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

12.4Appearance

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



13. Incoming Inspection Standard

131-1Scope

Specifications contain

13-1.1 Display Quality Evaluation

13-1.2 Mechanics Specification

13-2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II.

13-2.1 Lot size: Quantity per shipment as one lot (different model as different lot).

13-2.2 Sampling type: Normal inspection, single sampling.

13-2.3 Sampling level: Level II.

13-2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

13-3. Panel Inspection Condition

13-3.1 Environment:

Room Temperature: 25±5°C.

Humidity: 65±5% RH.

Illumination: 300 ~ 700 Lux.

13-3.2 Inspection Distance:

35-40 cm

13-3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

13-3.4 Inspection time：

Perceptibility Test Time: 20 seconds max.

13-4. Display Quality

13-4.1 Function Related:

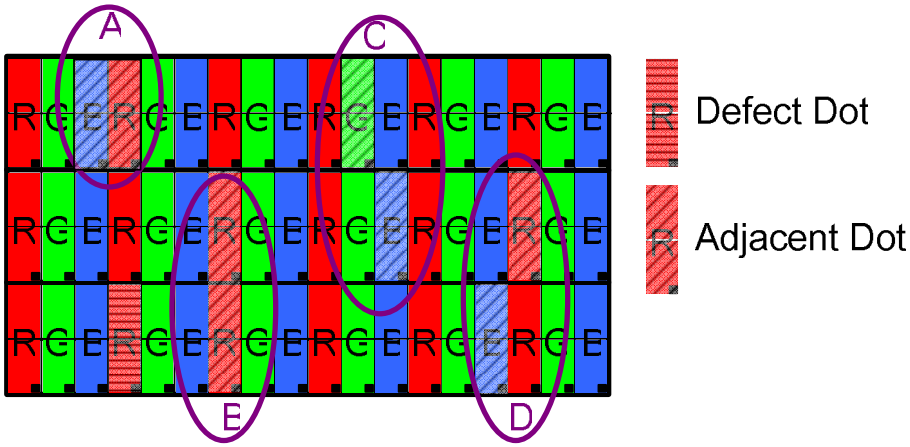
The function defects of line defect, abnormal display, and no display are considered Major defects

13-4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	N≤ 1
Dark Dots	0	N≤ 3
Total Bright and Dark Dots	0	N≤ 3

[Note 1]

Judge defect dot and adjacent dot as following.

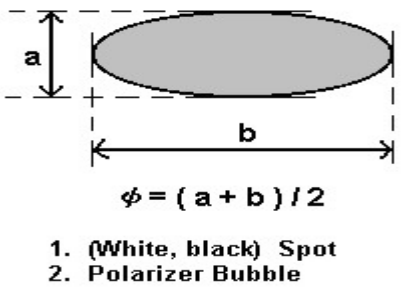


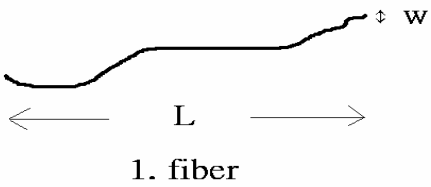
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)
(2) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
(3) Allow above (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.
(4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
(5) There should be no distinct non-uniformity visible through 6% ND Filter within 2 sec inspection times.

11-4. Visual Inspection specifications

Defect Type	Specification	Count(N)
Dot Shape (Particle、Scratch and Bubbles in display area)	D≤ 0.15mm	Ignored
	0.15mm＜D≤ 0.3mm	N≤ 3
	D＞0.3mm	N=0
Line Shape (Particles、Scratch、Lint and Bubbles in display area)	W≤ 0.05mm	Ignored
	0.05mm<W≤ 0.1mm L≤ 3mm	N≤ 3
	W＞0.1mm， L＞3mm	N=0

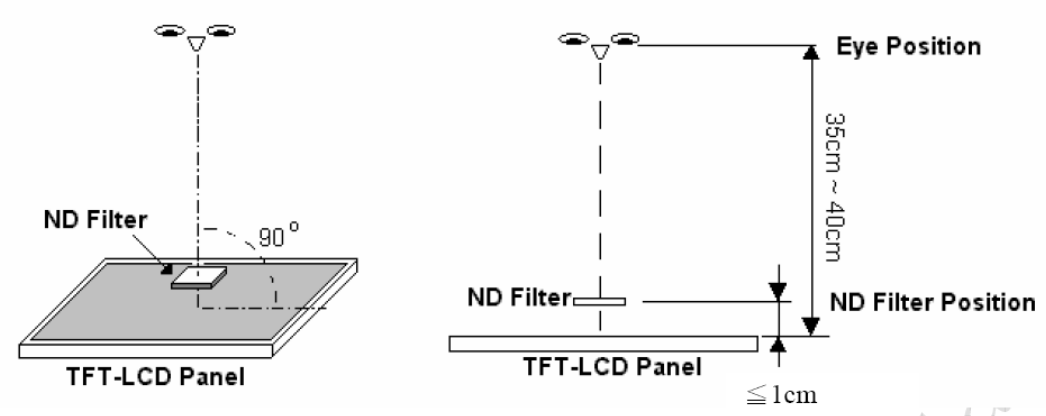
[Note2] W : Width[mm], L : Length[mm], N : Number, φ: Average Diameter





1. fiber

[Note3] Bright dot is defined through 6% transmission ND Filter as following.



Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.
(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

14. Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/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).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

15. USE PRECAUTIONS

15.1 Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzene and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

15.2 Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

15.3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

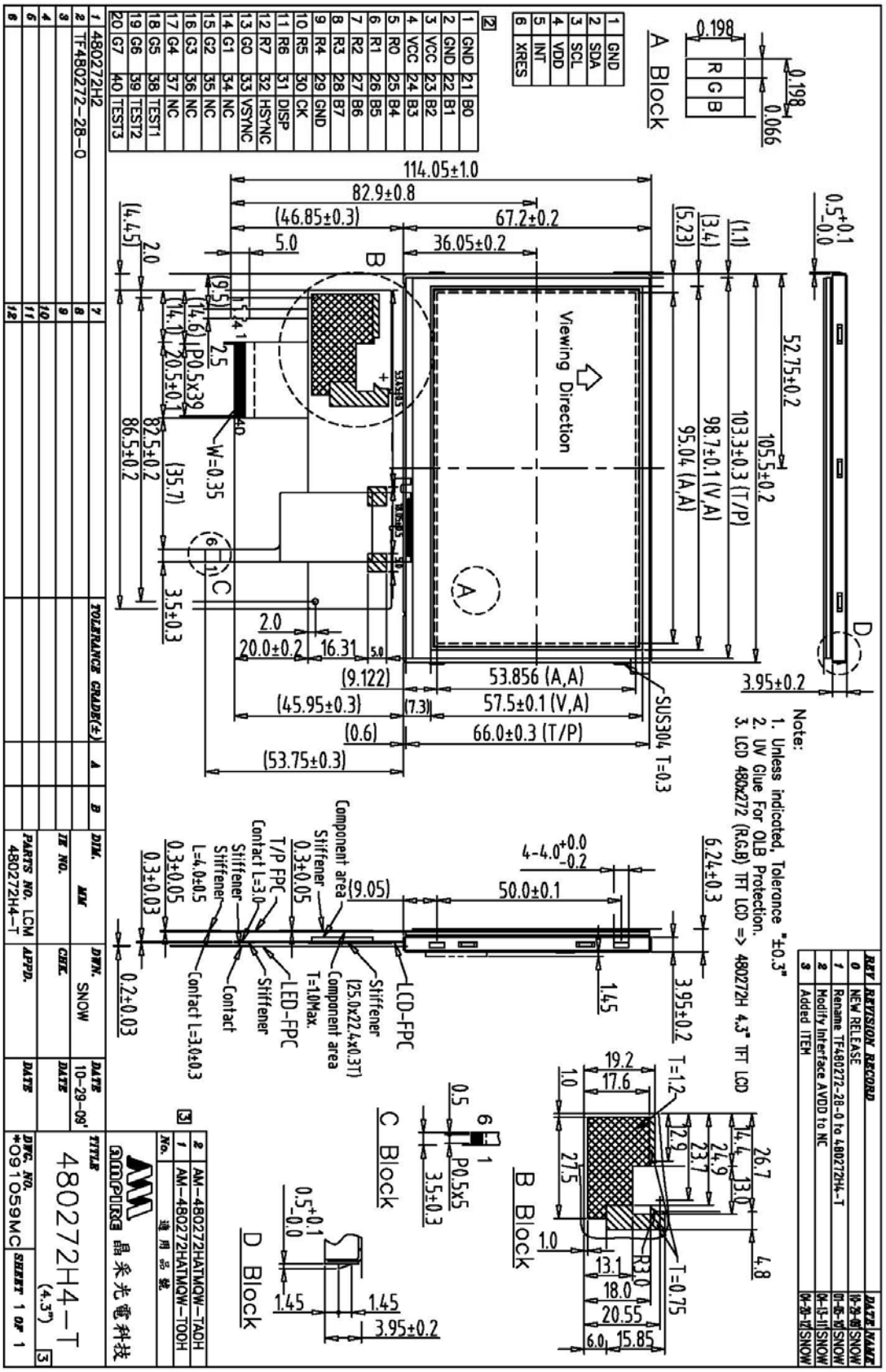
15.4 Operating precautions

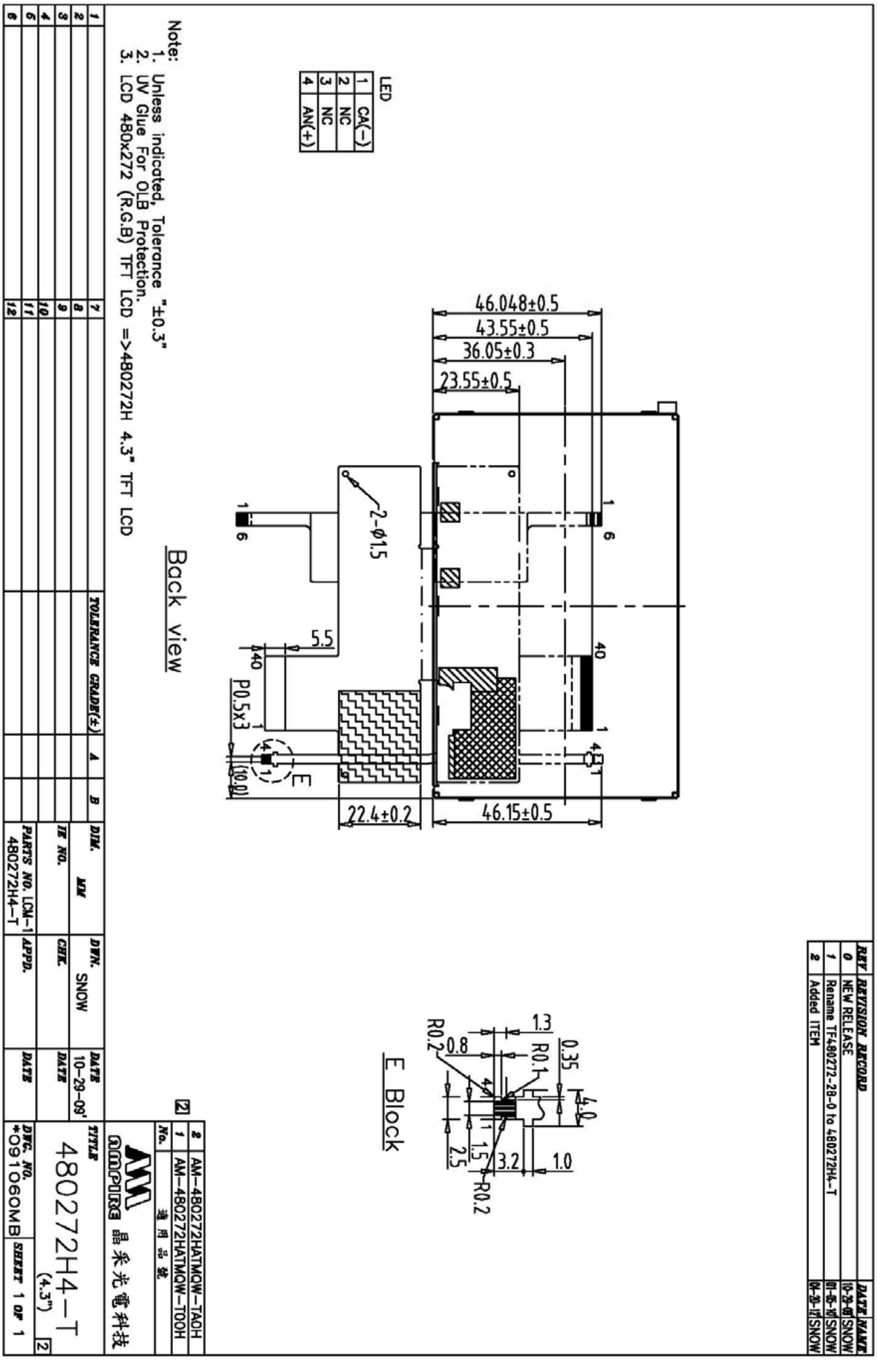
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

15.5 Other

1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

16 OUTLINE DIMENSION




Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 480x272 (R.G.B) TFT LCD =>480272H 4.3" TFT LCD
LED
1 CA(–)
2 NC
3 NC
4 AN(+)
Back view
46.048±0.5
43.55±0.5
36.05±0.3
23.55±0.5
2-ϕ1.5
5.5
40
P0.5x3
(10.0)
E
22.4±0.2
46.15±0.5
E Block
1.3
0.35
R0.1
R0.2
0.8
4.0
1.0
3.2
1.5
2.5
R0.2
REV REVISION RECORD DATE NAME
0 NEW RELEASE 10-29-09 SNOW
1 Rename TF480272-28-0 to 480272H4-T 01-05-10 SNOW
2 Added ITEM 04-20-12 SNOW
No. 適用品號
1 AM-480272HATMQW-TOOH
2 AM-480272HATMQW-TAOH
ampire 晶采光電科技
TOLERANCE GRADE(±) A B
DIM. MM
DWN. SNOW
DATE 10-29-09'
IE NO.
CHK.
PARTS NO. LCM-1 480272H4-T
APPD.
TITLE 480272H4-T (4.3")
DWG. NO. *091060MB
SHEET 1 OF 1