DATA IMAGE CORPORATION

CTP Module Specification

Preliminary

ITEM NO.: SCF0507827GGU01

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	JACK	JOE	GARY	KEN
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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	9/MAR/12’			Initial preliminary

3. APPLICATION

DVD player, Car TV, UMPC, POS

4. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	5.7 (diagonal)	inch
Display Format	640(H) x (R,G,B) x 480(V)	dot
LCD Active Area	115.2(W) × 86.4(H) mm	mm
Dot Pitch	0.06(W) × 0.18(H) mm	mm
Pixel Configuration	R.G.B. Stripe	
Outline Dimension	142.75(W) x 113.95(H) x 8.6 (D)	mm
Surface treatment	Clear	
Back-light	LED	
Weight	T.B.D(typ)	g
View Angle direction	12 o'clock	

5. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	Vcc	-0.3	5.0	V	
Logic input voltage	VI	-0.3	V_{CC}+0.3	V	
Operating temperature	Top	-10	+60	℃	Ambient temperature
Storage temperature	Tst	-20	+70	℃	Ambient temperature

6. ELECTRICAL CHARACTERISTICS

VSS=0V,DCLK=25MHz,Ta=25℃

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage for LCD	V_{CC}	+3.0	+3.3	+3.6	V	
Power Supply Current for LCD	I_{CC}		111	140	mA	V_{CC} =3.3V
Power Supply voltage for LED	V_{LED}	4.5	5	5.5	V	
Power Supply Current for LED	I_{LED}		333	400	mA	V_{LED} =5.0V
Ripple voltage	V_{RF}	-	-	100	mV_{P-P}	
"H" level logical input voltage	V_{IH}	0.7Vcc	--	Vcc	V	
"L" level logical input voltage	V_{IL}	0	--	0.3Vcc	V	
ADJ frequency		19K	20K	21K	Hz	
ADJ input voltage	VIH	3.0	-	3.3	V	
	VIL	0	-	0.3	V	
LED Dice life time		--	50000	--	Hr	Note 1

Note 1: The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 22℃ and LED dice current=20mA.

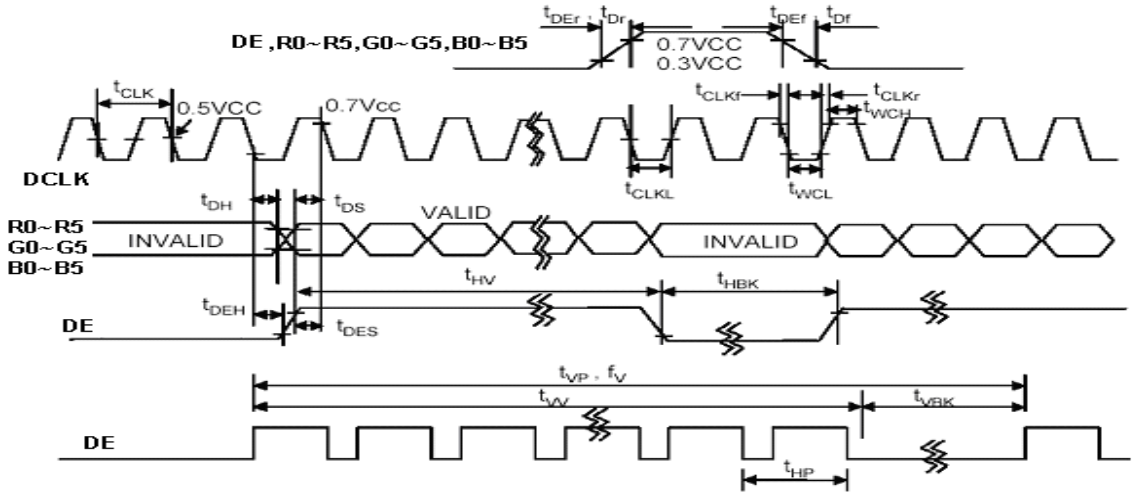
7. INPUT SIGNAL CHARACTERISTICS

7.1 DE mode Input signal characteristics

Signal	Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
DCLK	Period	t_{CLK}	33	40	43	ns	
	Frequency	f_{CLK}	23	25	30	MHz	
	Low Level Width	t_{WCL}	6	-	-	ns	
	High Level Width	t_{WCH}	6	-	-	ns	
	Rise, Fall Time	t_{CLKr}, t_{CLKf}	-	-	3	ns	
	Duty (1)	-	0.45	0.50	0.55	-	
DE (Data Enable)	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	10	-	-	ns	
	Rise, Fall Time	t_{DEr}, t_{DEf}	-	-	16	ns	
	Horizontal Period	t_{HP}	750	800	900	t_{CLK}	
	Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
	Horizontal Blank	t_{HBK}	110	160	260	t_{CLK}	
	Vertical Period	t_{VP}	515	525	560	t_{HP}	
	Vertical Valid	t_{W}	480	480	480	t_{HP}	
	Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
	Vertical Frequency	f_{v}	55	60	65	Hz	
Data R,G,B	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	10	-	-	ns	
	Rise, Fall Time	t_{Dr}, t_{Df}	-	-	3	ns	

Note: (1) tCLKL / tCLK.

7.1.1 DE mode timing waveform



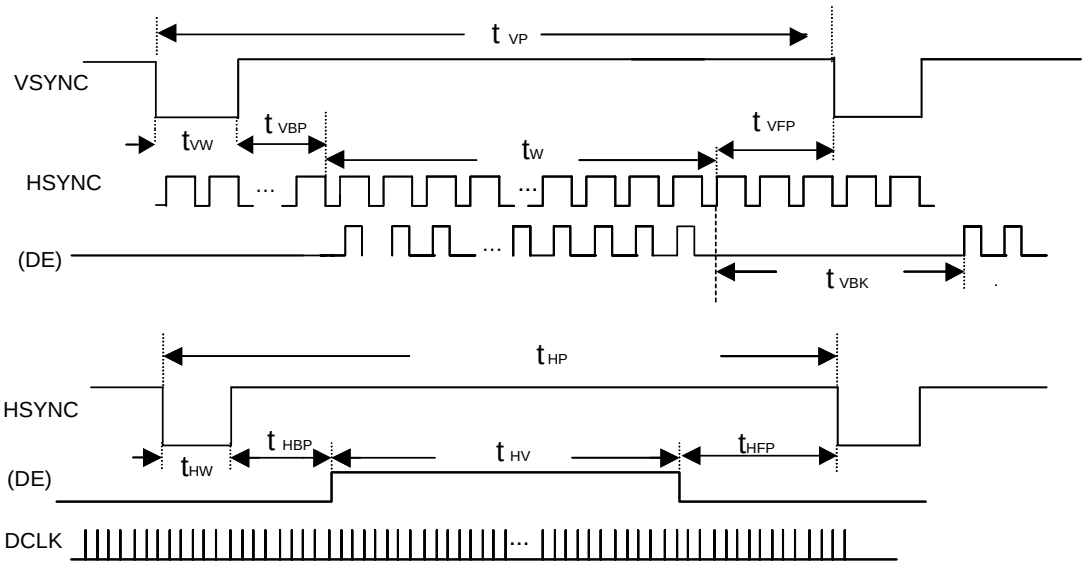
7.2 SYNC mode Input signal characteristics

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Clock Period	t_{CLK}	33	40	43	ns	
Clock Frequency	f_{CLK}	23	25	30	MHz	
Clock Low Level Width	t_{WCL}	6	-	-	ns	
Clock High Level Width	t_{WCH}	6	-	-	ns	
Clock Rise, Fall Time	$t_{CLKr,}t_{CLKf}$	-	-	3	ns	
HSYNC Period	t_{HP}	750	800	900	t_{CLK}	
HSYNC Pulse Width	t_{HW}	5	30	-	t_{CLK}	
HSYNC Front Porch	t_{HFP}	1	16	116	t_{CLK}	
HSYNC Back Porch	t_{HBP}	1	114	139	t_{CLK}	
HSYNC Width + Back Porch	$t_{HW}+t_{HBP}$	144	144	144	t_{CLK}	
Horizontal Blank	t_{HBK}	1	160	260	t_{CLK}	
Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
VSYNC Period	t_{VP}	515	525	560	t_{HP}	
VSYNC Pulse Width	t_{VW}	1	3	5	t_{HP}	
VSYNC Front Porch	t_{VFP}	1	10	45	t_{HP}	
VSYNC Back Porch	t_{VBP}	30	32	34	t_{HP}	
VSYNC Width + Back Porch	$t_{VW}+t_{VBP}$	35	35	35	t_{CLK}	
Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
Vaild data Width	t_{W}	480	480	480	t_{HP}	
Data Setup Time	t_{DS}	5	-	-	ns	
Data Hold Time	t_{DH}	10	-	-	ns	

Note: (1) tHBK = tHFP + tHW + tHBP

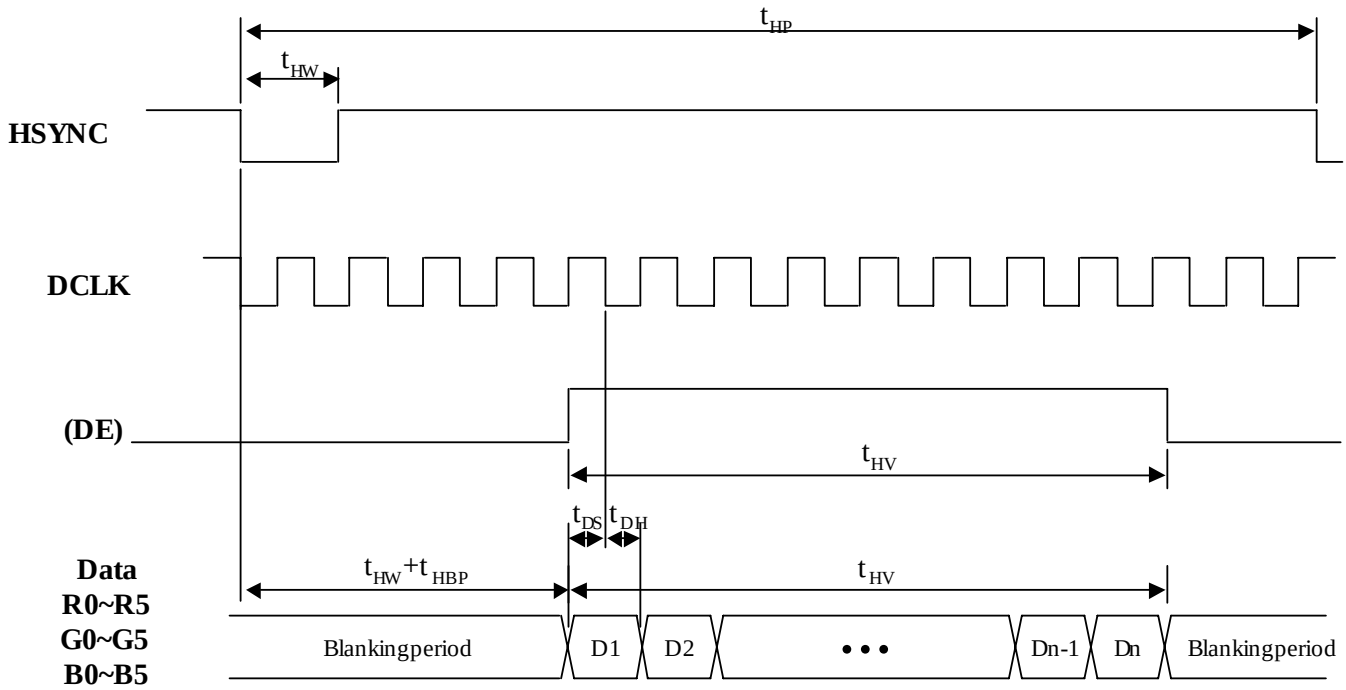
7.2.1 SYNC mode timing waveform

7.2.1.1 Input vertical timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

7.2.1.2 Input horizontal timing



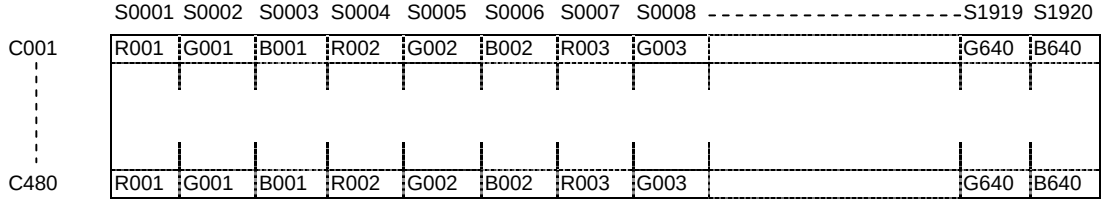
Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

7.3 Color Data Assignment

COLOR	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(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	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	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
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	BLUE(1)	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	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Remarks:(1) Definition of Gray Scale
color(n):n is series of Gray Scale
The more n value is, the bright Gray Scale.
(2)Data:1-High,0-Low

Correspondence between Data and Display Position

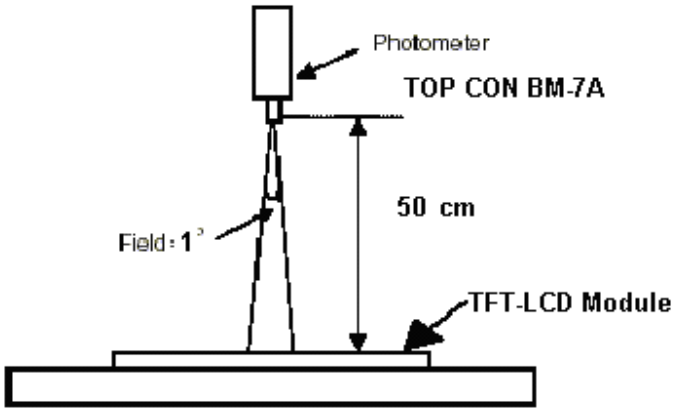


8. OPTICAL CHARACTERISTIC

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR≥10	60	70	--	deg	Note 1,4
		θ_x-		60	70	--		
	Vertical	θ_Y+		50	60	--		
		θ_Y-		30	40	--		
Contrast Ratio		CR	at optimized viewing angle	200	300			Note 1,3
Response time	Rise	Tr	Center θx=θy =0°	-	15		ms	Note 1,6
	Fall	Tf		-	35		ms	
Uniformity		B-uni	θx=θy =0°	70	80	--	%	Note1,5
Brightness		L	θx=θy =0° ADJ=3.3V	---	340	--	cd/m²	Note 1,2
Chromaticity		x_W	Center θx=θy =0°	0.259	0.309	0.359		Note 1,7
		y_W		0.270	0.320	0.370		
		x_R		0.565	0.615	0.665		
		y_R		0.310	0.360	0.410		
		x_G		0.295	0.345	0.395		
		y_G		0.490	0.540	0.590		
		x_B		0.098	0.148	0.198		
		y_B		0.056	0.106	0.156		
Image sticking		tis	2 hours			2	Sec	Note 8

The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C. The measurement method is shown in Note1.

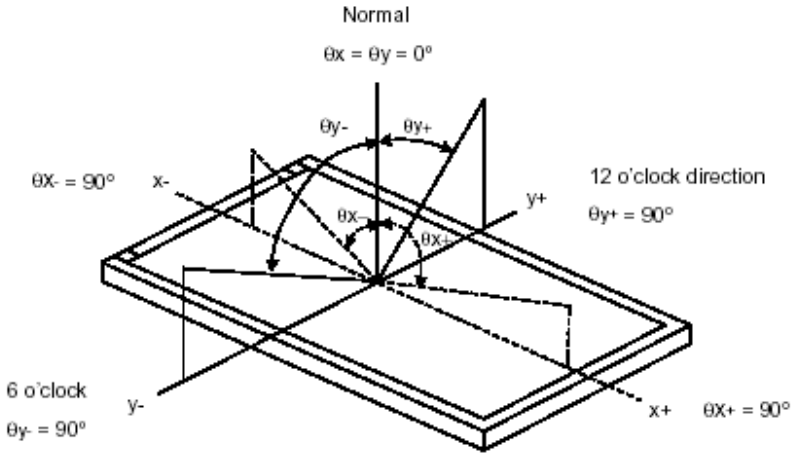
Note1: The method of optical measurement:



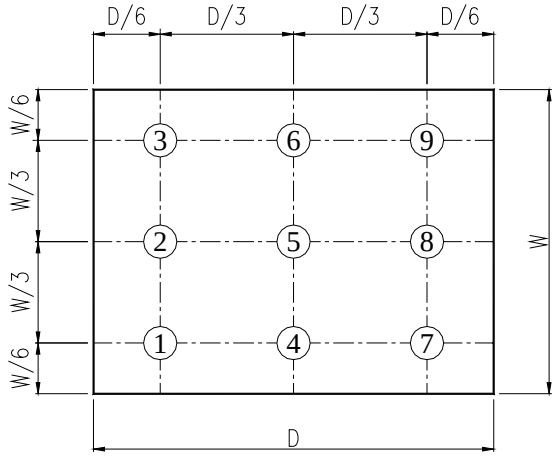
Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°
Note3: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

Note4: Definition of Viewing Angle



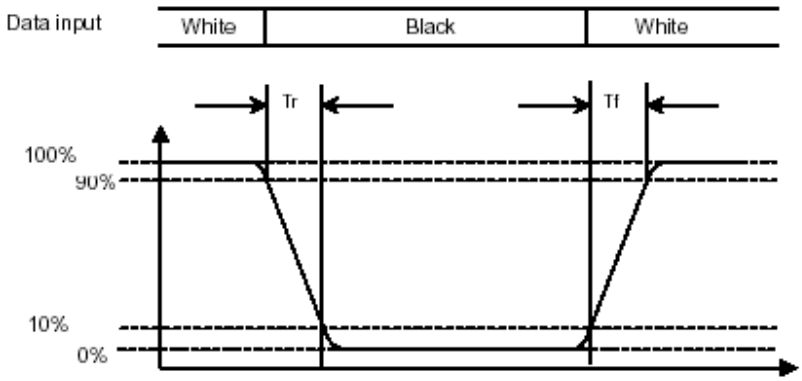
Note 5: Definition of Brightness Uniformity (B-uni):



$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \quad \text{(Note 5).}$$

Note6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure.



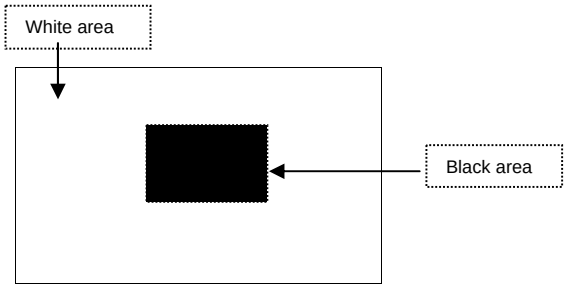
Note 7: Definition of Chromaticity:

The color coordinates (x_W,y_W),(x_R,y_R),(x_G,y_G),and (x_B,y_B) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C

Image sticking pattern



9. PIN CONNECTIONS

Pin NO.	SYMBOL	DESCRIPTION
1	U/D	Up or Down Display Control
2	NC	No Connection
3	HSYNC	Horizontal SYNC.
4	VLED	Power Supply for LED Driver circuit
5	VLED	Power Supply for LED Driver circuit
6	VLED	Power Supply for LED Driver circuit
7	Vcc	Power Supply for LCD
8	VSYNC	Vertical SYNC.
9	DE	Data Enable
10	VSS	Power Ground
11	VSS	Power Ground
12	ADJ	Brightness control for LED B/L
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0
36	VSS	Power Ground
37	VSS	Power Ground
38	DCLK	Clock Signals ; Latch Data at the Falling Edge
39	Vss	Power Ground
40	L/R	Left or Right Display Control

Remarks：
1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
2) ADJ signal is 0~3.3V.Operation frequency is 20KHz
3) VSS PIN must be grounding, can not be floating.

4) U/D and L/R control Function

L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite, Up and Down opposite

5)If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

9.1 Power Signal Sequence

Remarks:

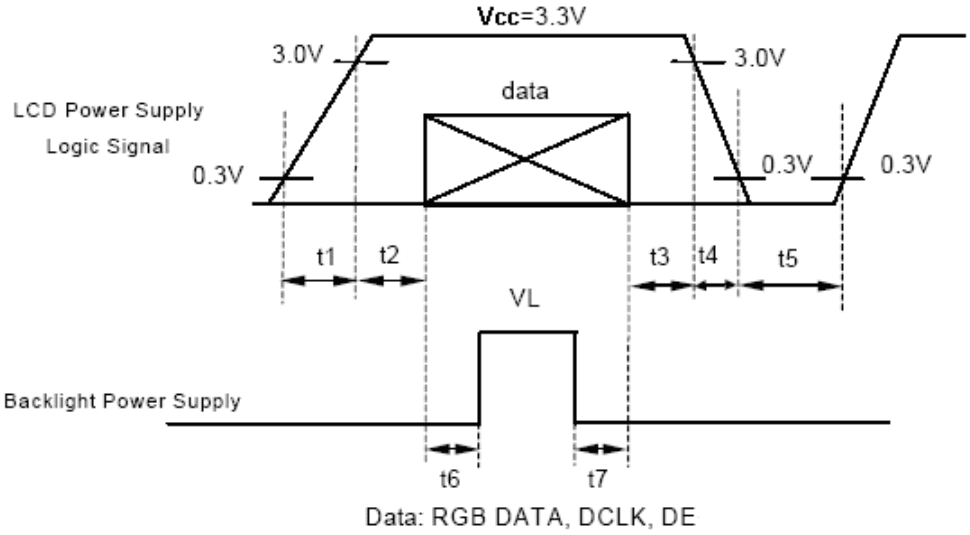
*1) Power Signal sequence:

t1 ≤10ms : 1 sec≤ t5

50ms≤ t2 : 200ms ≤t6

0<t3 ≤50ms: 200ms≤ t7

0<t4 ≤10ms

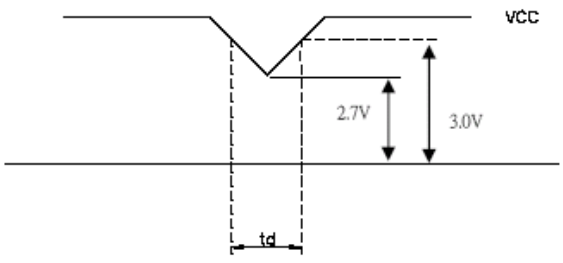


Data: RGB DATA, DCLK, DE

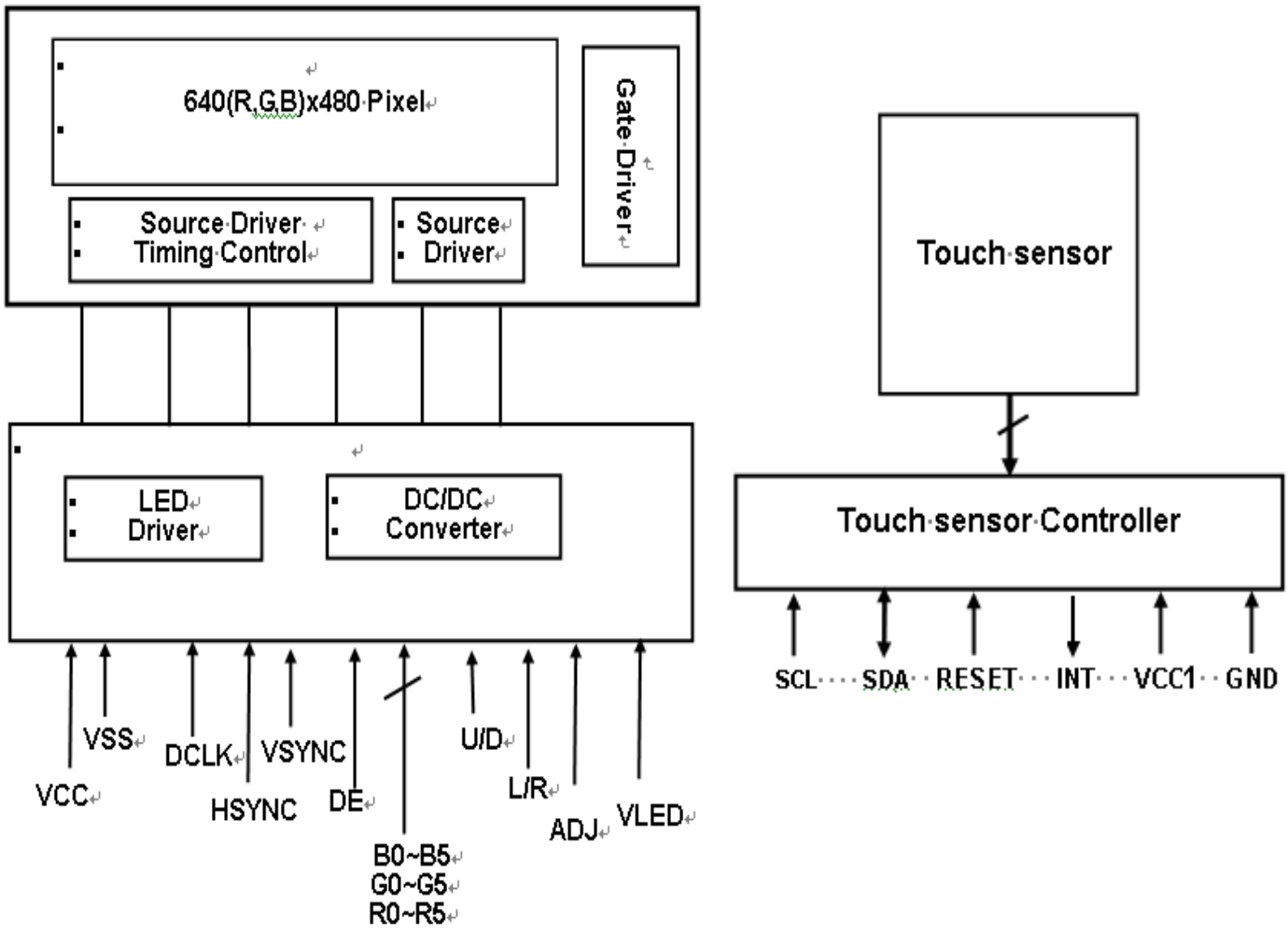
*2) VCC-dip condition:

(1) 2.7 V ≤VCC <3.0V,td ≤ 10 ms

(2) VCC＞3.0V,VCC-dip condition should be the same with VCC-turn-on condition。



10. BLOCK DIAGRAM

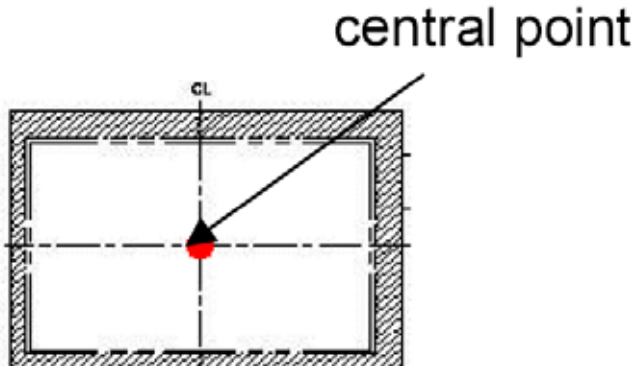


11. CTP General specifications

11.1 CTP main feature

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	5	
Sensor Active Area	118.76(W)(typ.) x89.95(H)(typ.)	mm
Transparency	≧85%	%
Haze	≦2.0%	%
Hardness	7H (typ.) [by JIS K5400]	Pencil hardness
Report rate	Max：122	Points/sec
Response time	15	ms
Point hitting life time	1,000,000 times min.	Note 1

Note 1: Use 8 mm diameter silicon rubber/force 3N to knock on the same point twice per second (no-operating), after test function check pass.



11.2 CTP Absolute Maximum Rating

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC1	Supply voltage	0.3	-	4	V	
VIO	DC input voltage	-0.3	-	VCC1+0.3	V	

11.3 CTP Electrical Characteristic

Symbol	Description	Min	Typ	Max	Unit	Notes
VCC1	Supply voltage	2.6	2.8	3.6	V	
GND	Supply voltage	-	0	-	V	
I	Active mode	-	10		mA	VCC1 = 2.8V
V_{IH}	Input H voltage	2	-	-	V	
V_{IL}	Input L voltage	-	-	0.7	V	
	System clock frequency	-	30	-	MHz	

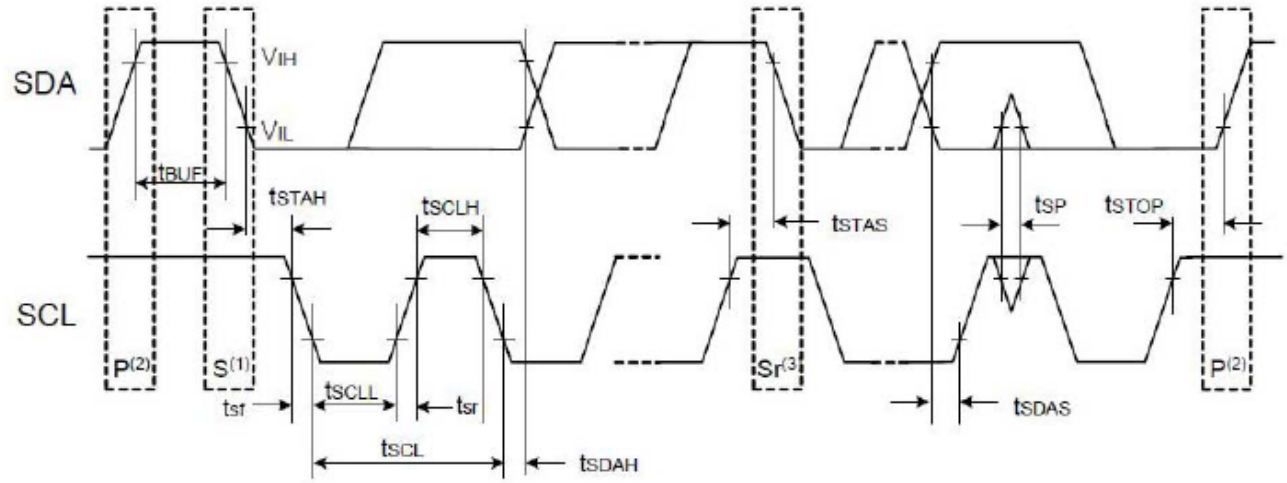
11.4 CTP Pin Connections

No.	Name	I/O	Description
1	NC	-	No connection
2	SCL	I	I^2C Clock
3	SDA	I/O	I^2C Data
4	NC	-	No connection
5	INT	O	Interrupt output
6	GND	P	Ground
7	VCC1	P	Power supply Voltage
8	/RESET	I	Reset active low
9	NC	-	No connection

11.5 CTP Interface and Data Format [Slave address is 0x5D（7 bit addressing）]

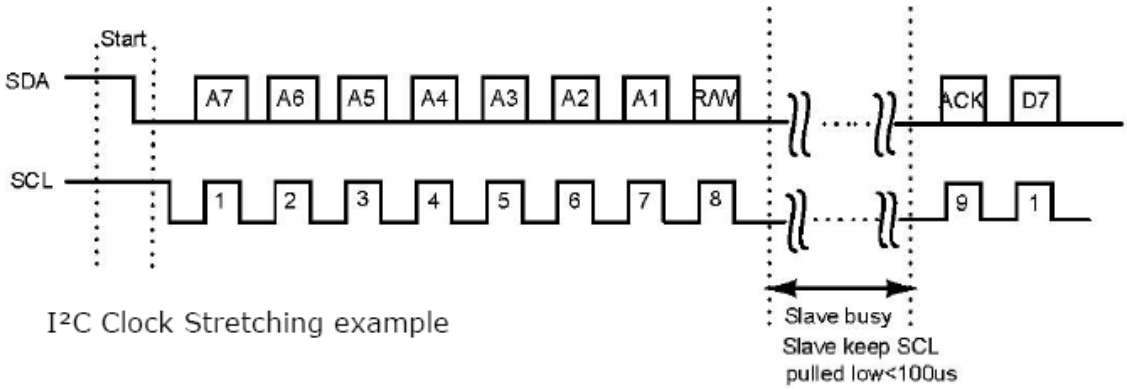
Communication protocol: I^2C

Clock frequency : 100Khz （400Khz Fast mode）



Note：(1) Start Condition;(2)Stop Condition;(3)Retransmit start condition

Symbol	Description	Min	Max	Unit
tSCL	SCL input cycle time	12tcyc+600	-	ns
tSCLH	SCL input H width	3tcyc+300	-	
tSCLL	SCL input L width	5tcyc+500	-	
tSF	SCL, SDA input fall time		300	
tSP	SCL, SDA input spike pulse rejection time		1 tcyc	
tSUF	SDA input bus-free time	5tcyc		
tSTAH	Start condition input hold time	3tcyc		
tSTAS	Retransmit start condition input setup time	3tcyc		
tSTOP	Stop condition input setup time	3tcyc		
tSDAS	Data input setup time	1tcyc+40		
tSDAH	Data Input hold time	10		



I²C Clock Stretching example

The protocol for data exchange has been designed with the following considerations
1 Most of the data traffic is read operation to get the finger or fingers position
2 Read operation do need an initial write operation.
3 Write operations are most of the time power management and interrupt setting instructions
4 Interrupt pulse width setting adjustments need a write operation.

S	START
P	STOP
R	READ
W	WRITE
A	Acknowledge
N	No acknowledge
DATA	8-bit

From slave to Master	From Master to Slave

11.6 Timing Characteristic

I²C slave provides standard I²C communication interface for communication of SCL and SDA with master. In the system, I²C slave is always used in slave mode, all communications are initiated by master, and the communication rate can be up to 400K bps.
I²C slave's address is 0xBA/0xBB. While master is addressing I²C slave, it also sends control bit. Reading and writing control bit is attached behind equipment address, and "0" refers to writing operation, "1" refers to reading operation, so forms a byte with equipment address. i.e. 0xBA—— writing operation to I²C slave; 0xBB—— reading operation to I²C slave.

11.6.1 Data transmission

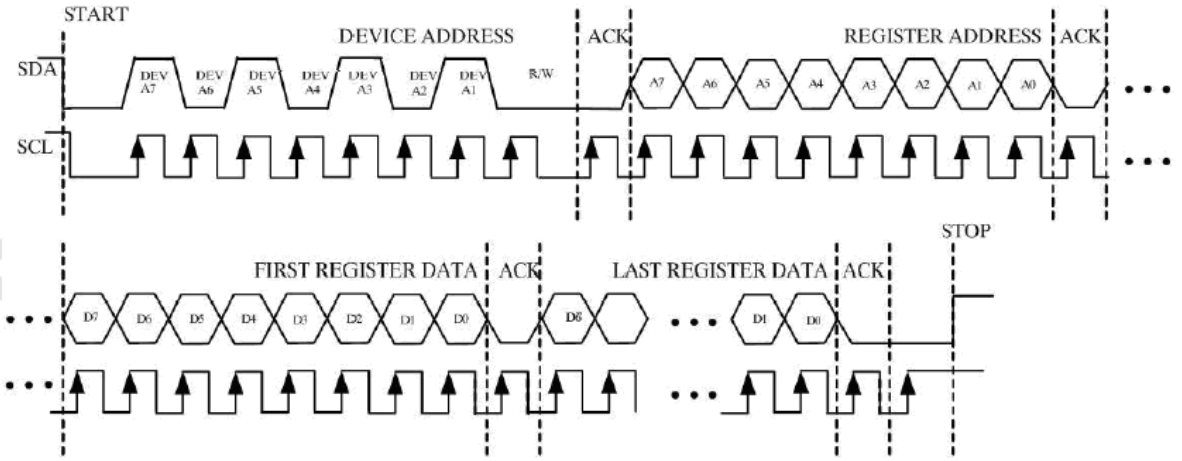
Communication is always initiated by master; a high-to-low transition of SDA with SCL high is a start condition.
All addresses words are serially transmitted to and from on bus in 8-bit words. I²C slave sends a "0" to acknowledge when the address word is 0xBA or 0xBB. This happens during the ninth clock cycle.

The data words are serially transmitted to and from in 9-bit words: 8-bit data +1-bit

ACK or NACK sent by I²C slave. Data changes during SCL high periods.

A low-to-high transition of SDA with SCL high is a stop condition.

11.6.2 Write operations to I²C slave



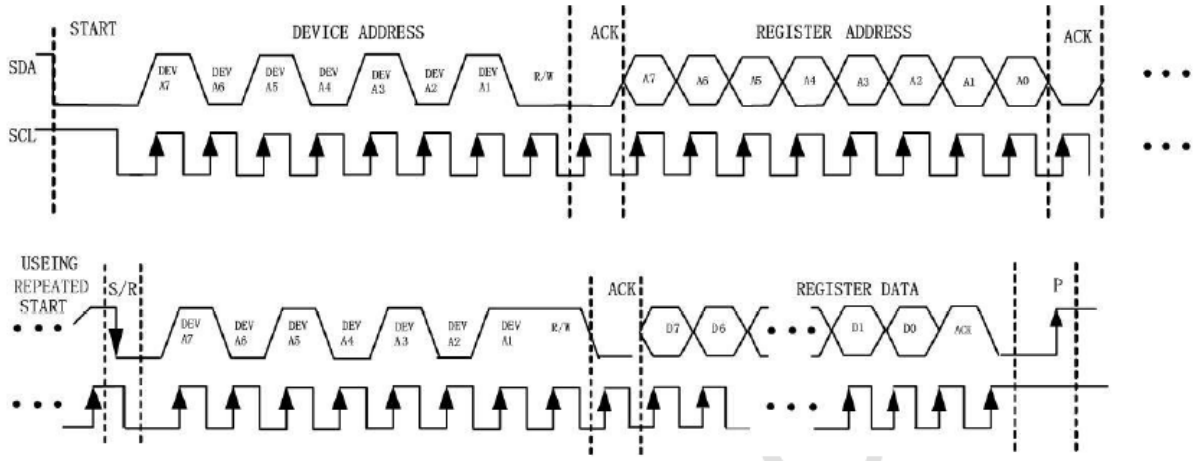
Write operations

Please check above figure, master start the communication first, and then sends address words 0xBA for a write operation.

After receiving ACK from I²C slave, master sends out register address word in16-bit, and then the data word in 8-bit, which is going to be wrote into I²C slave.

I²C slave's address pointer will be automatically added 1 after write operation, so master can sequential write in one operation. When operation finished, master stop the communication.

11.6.3 Read operations to I²C slave



Read operation

Please check above figure, master start the communication first, and then sends address words 0xBA for a write operation.

After receiving ACK from I²C slave, master sends out register address word in 16-bit, to set I²C slave's address pointer. After receiving ACK, master sends out a start signal once again, start the read operation with command: 0xBB, and read data word from I²C slave in 8-bit.

I²C slave also supports sequential read operation, and the default setting is sequential read mode. Master shall send out ACK when receiving successfully in every data word, master sends NACK after getting all the data required, then sends stop signal to finish the communication.

11.7 Register information

11.7.1 Configuration & functional setting register

Addr	R/W	Definition	Description
80	W	Stop	0x00: Normal mode 0x01：LCD OFF 0x02:Firmware update;0x03: Reset 0x04 calibration;
81	W	LED_CONTROL	LED for touch key: support 8 LED。 “0”—LED OFF; “1”—LED ON
82	R	SCREEN_FLAG	Bit7-2：Reserve Bit1-0：TP module identification
83~100		Reserve	
101	R/W	Origin	Origin set
102	R/W	XMaxH	Display resolution set: X direction
103	R/W	XMaxL	
104	R/W	YMaxH	Display resolution set: Y direction
105	R/W	YMaxL	
106	R/W	TouchCountMax	Touch points setting; Max=5
107	R/W	ModuleSwitch	Bit7：Reserve Bit6：X,Y direction setting. 1：X,Y exchange BIT5：SITO module enable, “0” means turn off Bit4：sensor chip ID Bit3：Sensor chip 1 sensing channel sequence; “0”—reverse “1”— positive Bit2：Sensor chip 2 sensing channel sequence; Bit1-0：INT trig method 00b:Rising interruption；01b:Falling 10b: Low when touch;11b: High when touch
108	R/W	ModuleSwitch2	Bit7-5： 00: edge small extend 01: edge strong extend Bit4-3: 0：protocol A; 1:protocol B Bit2-0: GT827 address setting 00: Address=AA&B8;01: Address=AA 10: Address=B8
109	R/W	Reserve	

110	R/W	I2cDelay	Bit7-4: Reserved Bit3-0: standby time after IIC wake up 0000: 50ms; 0001~1010: 20~200ms. 1110：sleep mode disable； 1111: wake up only by INT
111	R/W	SensNum	Sensing channels of TP modules
112	R/W	ShakeCount	Bit7-4: compensation for 4 coroners. “1”—compensation; “0”—no compensation Bit3-0:TouchShakeCount/FingerStaCount
113	R/W	Filter	Filter value setting
114	R/W	LargeTouch	Large touch setting
115	R/W	Reserve	
116	R/W	Reserve	
117	R/W	F1PNUM	Sensitivity setting
118	R/W	F2PNUM	
119	R/W	F3PNUM	
120	R/W	F1SET	
121	R/W	F2SET	
122	R/W	F3SET	
123	R/W	DELAY	
124	R/W	ADCCFG	
125	R/W	RES	
126	R/W	RES	
127	R/W	DriverLine0	Driving channels sequence setting
128	R/W	DriverLine1	
129	R/W	DriverLine2	
130	R/W	DriverLine3	
131	R/W	DriverLine4	
132	R/W	DriverLine5	
133	R/W	DriverLine6	
134	R/W	DriverLine7	
135	R/W	DriverLine8	
136	R/W	DriverLine9	
137	R/W	DriverLine10	

138	R/W	DriverLine11	Driving channels sequence setting
139	R/W	DriverLine12	
140	R/W	DriverLine13	
141	R/W	DriverLine14	
142	R/W	DriverLine15	
143	R/W	DriverLine16	
144	R/W	DriverLine17	
145	R/W	DriverLine18	
146	R/W	DriverLine19	
147	R/W	DriverLine20	
148	R/W	DriverLine21	
149	R/W	DriverLine22	
150	R/W	DriverLine23	
151	R/W	DriverLine24	
152	R/W	DriverLine25	
153	R/W	DriverLine26	
154	R/W	DriverLine27	
155	R/W	DriverLine28	
156	R/W	DriverLine29	
157	R/W	DriverLine30	
158	R/W	DriverLine31	
159	R/W	RES	
160	R/W	RES	
161	R/W	LeaveLevel	Threshold of touch release
162	R/W	TouchLevel	Threshold of touch
163	R/W	KeyTouchLevel	Threshold of touchkey
164	R/W	KEY1	Touch key carried out by sensor: Position of 8 touch keys, 0 means no touch key Touch key carried out by sensor : Bit7-4: Key sensitivity setting Bit3-0: key serial number setting
165	R/W	KEY2	
166	R/W	KEY3	
167	R/W	KEY4	
168	R/W	KEY5	
169	R/W	KEY6	
170	R/W	KEY7	

171	R/W	KEY8	
172	R/W	KEY_TYPE	Touch key carried out by sensor: Bit7-6: Second row keys area 00: Top; 01: Right 10: Bottom; 11: Left Bit5-4: First row keys area 00: Top; 01: Right 10: Bottom; 11: Left Bit3-0: Touch key type 00: No touch key 01: Arranged in series 10: Ground in between 11: Carried by FPC Touch key carried out by FPC: Bit7: LED valid “0”—No LED Bit6: LED control way.“0”—Low enable Bit5-4: LED mode setting 00: Control by IIC command 01: All LEDs on when touch key detected 10: Key LED on when touch key detected 11: Backlight on when there is a touch
173	R/W	KEY_W/K_ADCCFG	Touch key carried out by sensor: First row: Touch key size setting in X direction Touch key carried out by FPC: Touch key sensitivity setting
174	R/W	KEY_H/K_DELAY	Touch key carried out by sensor: First row: Touch key size setting in Y direction Touch key carried out by FPC: Touch key threshold setting
175	R/W	KEY_GAP/K_Driver	Touch key carried out by sensor: First row: Gap between key area and screen setting Touch key carried out by FPC: Driving channel for touch keys
176	R/W	KEY2_BEGIN/ K_RESTRAIN	Touch key carried out by sensor: Second row touch key index. Touch key carried out by FPC: Threshold setting between two touch keys. “0”--strongest
177	R/W	KEY2_W/KEY_LED12	Touch key carried out by sensor: Second row: Touch key size setting in X direction Touch key carried out by FPC: LED index setting for key 1 & 2
178	R/W	KEY2_H/KEY_LED34	Touch key carried out by sensor: Second row: Touch key size setting in Y direction Touch key carried out by FPC: LED index setting for key 3 & 4

179	R/W	KEY2_GAP/KEY_LED56	Touch key carried out by sensor: Second row: Gap between key area and screen setting Touch key carried out by FPC: LED index setting for key 5 & 6
180	R/W	KEY_LED78	Touch key carried out by FPC: LED index setting for key 5 & 6
181	R/W	Reserve	
182	R/W	MASK_LEFT	Coordinate X of dump area on left top corner
183	R/W	MASK_TOP	Coordinate Y of dump area on left top corner
184	R/W	MASK_W	Driving channel quantity on dump area
185	R/W	MASK_H	Sensing channel quantity on dump area
186	R/W	MASK2_LEFT	Coordinate X of dump area on left top corner
187	R/W	MASK2_TOP	Coordinate Y of dump area on left top corner
188	R/W	MASK2_W	Driving channel quantity on dump area
189	R/W	MASK2_H	Sensing channel quantity on dump area
190	R/W	SPACE_TOP	Invalid area on top setting
191	R/W	SPACE_BOTTOM	Invalid area on bottom setting
192	R/W	SPACE_LEFT	Invalid area on left setting
193	R/W	SPACE_RIGHT	Invalid area on right setting
194	R/W	FREQ_INTERVAL	Interval of touch scanning setting

11.7.2 Output register

Addr	R/W	Definition	Description							
0	R	TouchKey	Touch key index							
			K7	K6	K5	K4	K3	K2	K1	K0
1	R	CoorLen0				P4	P3	P2	P1	P0
2	R		Reserve							
3	R	CoorX0h	Touch 1 & touch area							
4	R	CoorX0l								
5	R	CoorY0h								
6	R	CoorY0l								
7	R	CoorW0								
8	R	CoorX1h	Touch 2 & touch area							
9	R	CoorX1l								
10	R	CoorY1h								
11	R	CoorY1l								
12	R	CoorW1								
13	R	CoorX2h	Touch 3 & touch area							
14	R	CoorX2l								
15	R	CoorY2h								
16	R	CoorY2l								
17	R	CoorW2								
18	R	CoorX3h	Touch 4 & touch area							
19	R	CoorX3l								
20	R	CoorY3h								
21	R	CoorY3l								
22	R	CoorW3								
23	R	CoorX4h	Touch 5 & touch area							
24	R	CoorX4l								
25	R	CoorY4h								
26	R	CoorY4l								
27	R	CoorW4								
28~52	R		Reserved							

53	R	CoorCHKSUM	checksum
54~79			Reserved

12. Appearance Specification

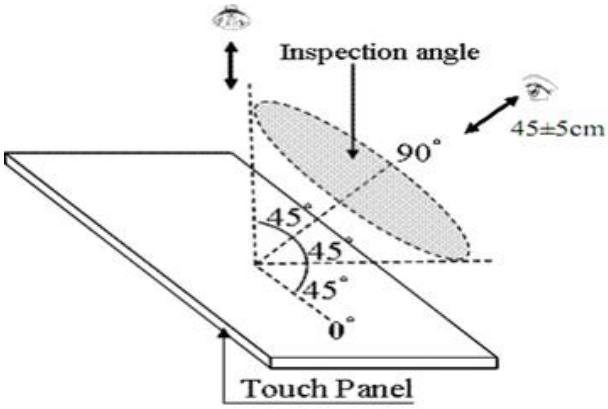
12.1Inspection and Environment conditions

12.1.1 Temperature: 22±2℃
12.1.2 Humidity: 55±5%RH
12.1.3 Light source: Fluorescent Light
12.1.4 Inspection: Viewing distance: 35±5cm
12.1.5 Ambient Illumination:
(1) Cosmetic Inspection: 500 ~ 800 lux
(2) Functional Inspection: 400 ~ 600 lux
12.1.6 Inspection View angle:
(1) Inspection under operating condition : ±5°
(2) Inspection under non-operating condition : ± 45°

12.2 Appearance inspection

Appearance inspection method:

Front visual distance: 30-40CM



12.3 Judgment standard

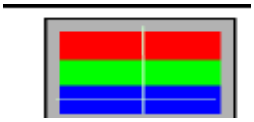
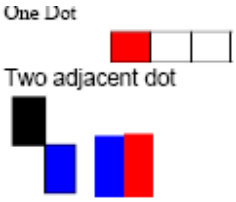
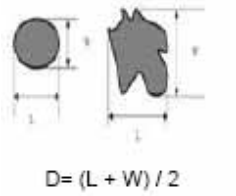
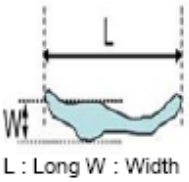
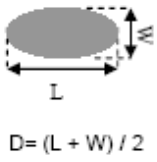
The Judgment of the above test should be made after exposure in room temperature for two hours as follow:

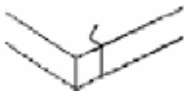
Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defect.

12.4 Cosmetic Specification and Inspection Items

Inspection item	Inspection standard	Description
Display function	No display function	
Contrast	Out of SPEC	

Line defect	No obvious vertical or horizontal line defect (black line or white line)	
Dot defect	Item Acceptable quantity Total quantity Bright dot 2 Dark dot 4 Two adjacent dark dots 2 2	
Dot of foreign material	SPEC Acceptable quantity D>0.8mm 0 0.3mm≦D≦0.8mm 5 D<0.3mm Ignorable	
Line of foreign material	SPEC Acceptable quantity W>0.1mm L>10mm 0 0.05mm≦W≦0.1mm L≦10mm 5 W<0.05mm Ignorable	
Image uniformity	Through ND5%, invisible at R G B ,grey and white	
Size	According to SPEC	
TP scratch	SPEC Acceptable quantity W>0.1mm L>10mm 0 W≦0.1mm L≦10mm 5	
TP dent dot	SPEC Acceptable quantity D>0.5mm 0 0.3≦D≦0.5mm 5	
TP glue overflow	±0.45mm	
Surface damage	X<3mm Y<3mm Z<glass	

Edge damage	X<3mm Y<3mm Z<glass	
TP crack	prohibited	
Bubble in protective film	SPEC Acceptable quantity D>1.0mm N=0 0.5<D<1.0mm N=2 D<0.5 Ignorable	
TP deviation	According to customer drawing spec	
Bubble	D≦0.2mm ignorable 0.2mm＜D≦0.5mm 2 bubbles accepted 0.5mm＜D prohibited	
Printing ink	Light leak is prohibited. Printing serrated： S≦0.1 ignorable S≦0.15 NG Break line on LOGO NG Blur printing, inverse printing, print in wrong position	

12.5 Sampling plan

General problem	Definition		
	primary	AQL0.65%	Completely fail to be used due to defect.
	Secondary	AQL1.5%	Still can be used due to small defect.

13. QUALITY ASSURANCE

13.1 Test Condition

13.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

13.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

13.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

13.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

13.1.5 Test Method

Reliability Test Item & Level		Test Level
No.	Test Item	
1.	Low Temperature Storage Test	T= -20℃,120hrs after 24 hrs at room temperature and test.
2.	High Temperature Storage Test	T= 70℃,120hrs after 24 hrs at room temperature and test.
3.	Low Temperature Operation Test	T= -10℃,120hrs after 24 hrs at room temperature and test.
4.	High Temperature Operation Test	T= 60℃,120hrs after 24 hrs at room temperature and test.
5.	High Temperature and High Humidity Operation Test	T= 40℃, 90%RH,120hrs after 24 hrs at room temperature and test.
6.	Thermal Cycling Test (No operation)	-20 ℃ 30min ~ 70 ℃ 30 min , 100 Cycles after 24 hrs at room temperature and test.
7.	Vibration Test (No operation)	Frequency :10 ~ 55 HZ Amplitude :1.5 mm Sweep time : 11 mins Test Period: 6 Cycles for each direction of X, Y, Z
8.	ESD TEST	Air Discharge : ±15KV Indirect Contact Discharge : ±8KV

13.2 Judgment standard

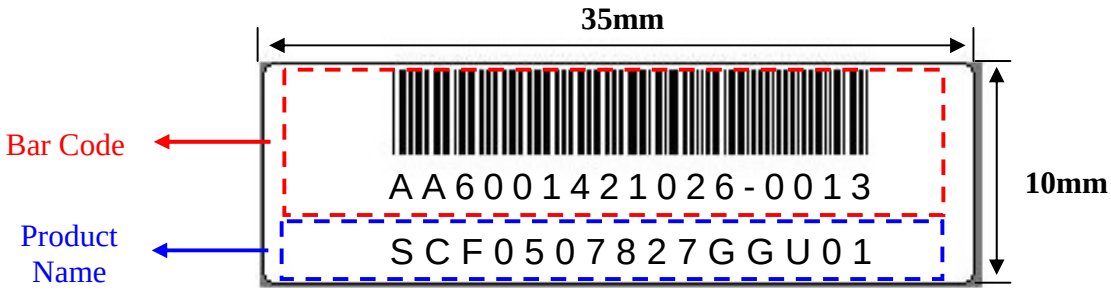
The Judgment of the above test should be made after exposure in room temperature for two hours as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

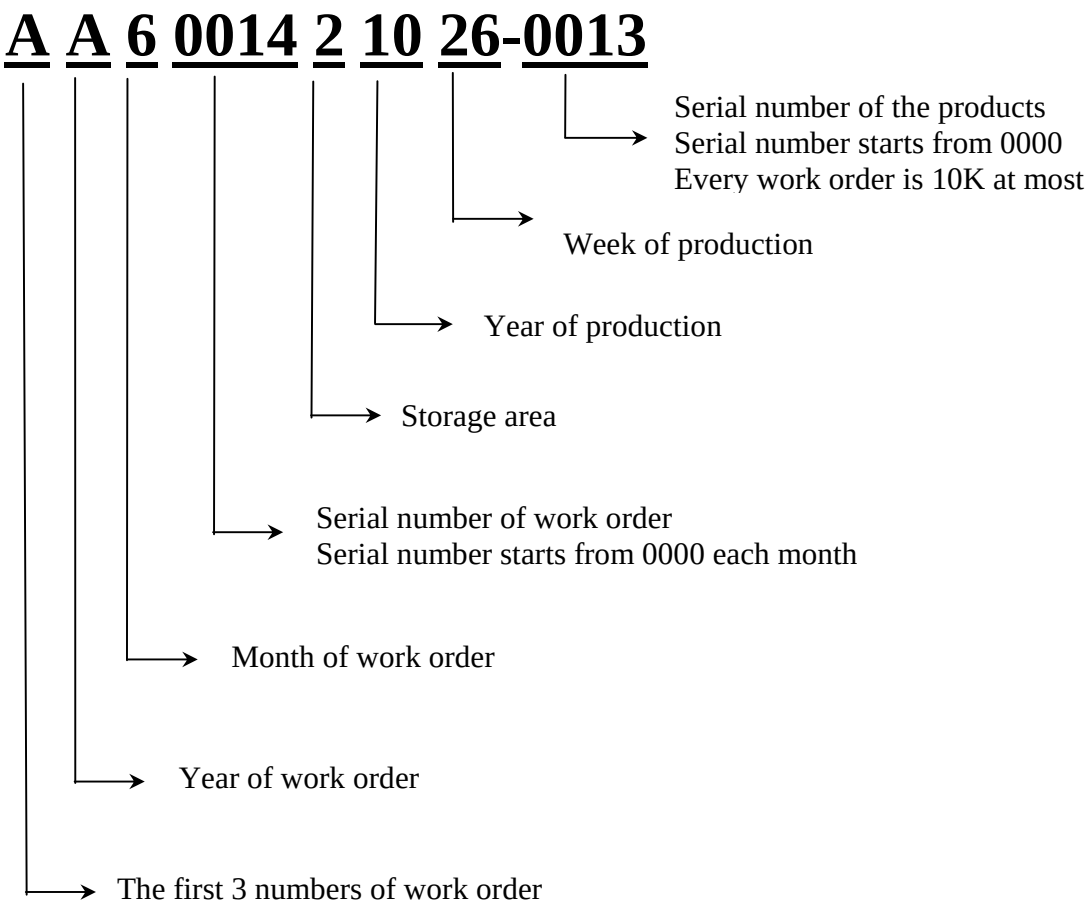
Fail: No display image, obvious non-uniformity, or line defect.

14. LCM PRODUCT LABEL DEFINE

Product Label style:



BarCode Define:



Product Name Define:

SC F 0507 827 G G U 01

Serial Number

Material of Glue

N : None

R : Other

C : OCA

U : UV

Material of Cover Lens

N : None

G : Glass

P : PMMA

C : PC

F : Film

R : Other

Material of Sensor

G : Glass

F : Film

R : Other

IC Number

827 : GT827

Size

0507 : 5.7inch

Module Type

N : None LCM

F : Standard CTP Module

X : Custom CTP Module

Capacitive Touch Panel

15. PRECAUTIONS IN USE LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting . Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2). The modules should be kept in antistatic bags or other containers resistant to static for storage.

(3). Only properly grounded soldering irons should be used.

(4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3 Soldering

(1). Solder only to the I/O terminals.

(2). Use only soldering irons with proper grounding and no leakage.

(3). Soldering temperature : 280°C ± 10°C

(4). Soldering time: 3 to 4 sec.

(5). Use eutectic solder with resin flux fill.

(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4 Operation

(1). The viewing angle can be adjusted by varying the LCD driving voltage V0.

(2). Driving voltage should be kept within specified range; excess voltage shortens display life.

(3). Response time increases with decrease in temperature.

(4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

(5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

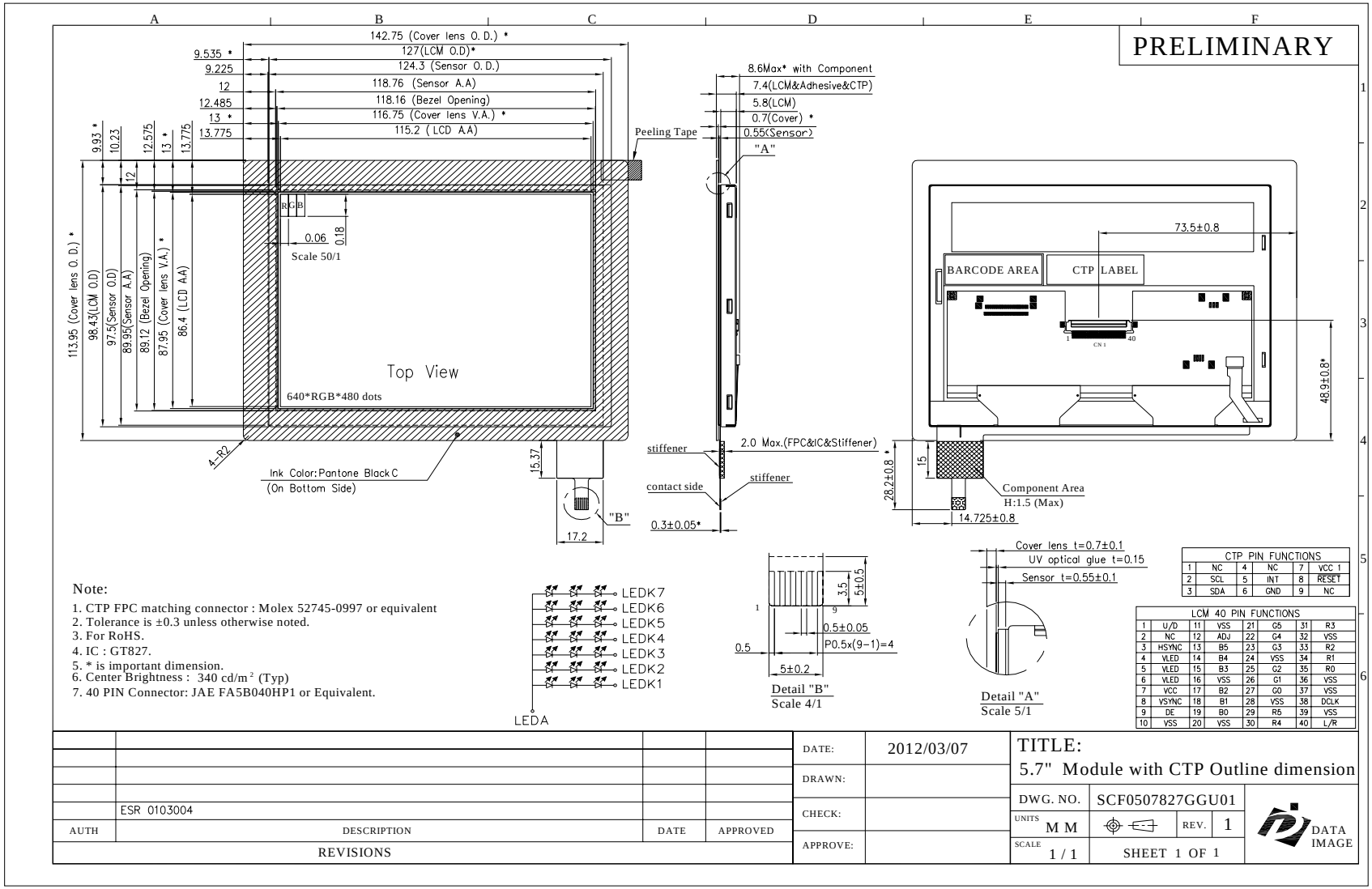
2.5 Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

2.6 Limited Warranty

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

16. OUTLINE DRAWING



17. PACKAGE INFORMATION

TBD