HY-LINE®
COMPUTER COMPONENTS

QVGA-TFT-PCAP-Modul Datenblatt

Modell SCF0507827GGU02

Kurzdaten

Hersteller	Data Image
Diagonale	5,7“ / 14,5 cm
Format	normal
Auflösung	320 x 240
Backlight	LED / 415 cd/m²
Interface	RGB
Touchscreen	ja
Temperatur	-10… +60°C (Betrieb)

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DATA IMAGE

Confidential Document

DATA IMAGE CORPORATION

CTP Module Specification

Preliminary

ITEM NO.: SCF0507827GGU02

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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	10/MAR/12'			Initial preliminary
2	15/JUL/12'	11.3 11.5	14 15	1.Modify VIH 2.Modify CTP Interface and Data Format

3. APPLICATION

DVD player, Car TV, UMPC, POS

4. GENERAL SPECIFICATIONS

Parameter Specificati	ons	Unit
Screen Size	5.7 (diagonal)	inch
Display Format	320(H) x (R,G,B) x 240(V)	dot
LCD Active Area	115.2(W) × 86.4(H) mm	mm
Dot Pitch	0.12W) × 0.36(H) mm	mm
Pixel Configuration	R.G.B. Stripe	
Outline Dimension	142.75(W) x 113.95(H) x 10.9 (D)	mm
Surface treatment	Clear	
Back-light	LED	
Display mode	Normally white	
Weight T.	B.D(typ)	g
View Angle direction	6 o'clock	

5. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol M	IN.	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 -1	0	+60	℃	Ambient temperature
Storage temperature	Tst	-20	+70	℃	Ambient temperature

6. ELECTRICAL CHARACTERISTICS

GND=0V,CLK1=7.21MHz,Ta=25℃

Parameter	Symbol	MIN. Ty	p.	MAX.	Unit	Remark
Power Supply voltage for LCD	V_{CC} +3.0		+3.3	+3.6	V	
Power Supply Current for LCD	I_{CC}		62	80	mA	V_{CC} =3.3V
Power Supply voltage for LED	VLED 4.5		5	5.5	V	
Power Supply Current for LED	ILED		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	19	K	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

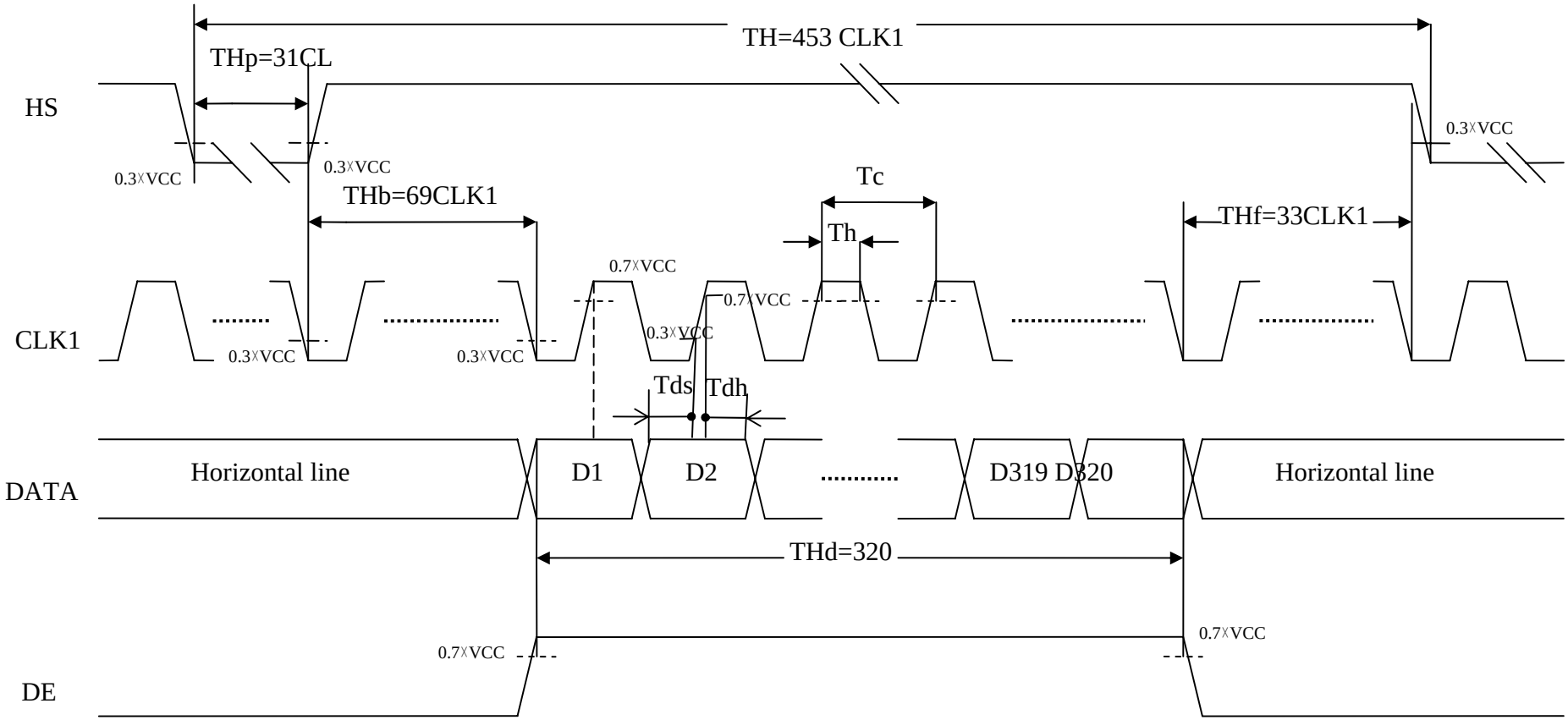
Note 1: The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 22℃ and LED dice current=20mA.

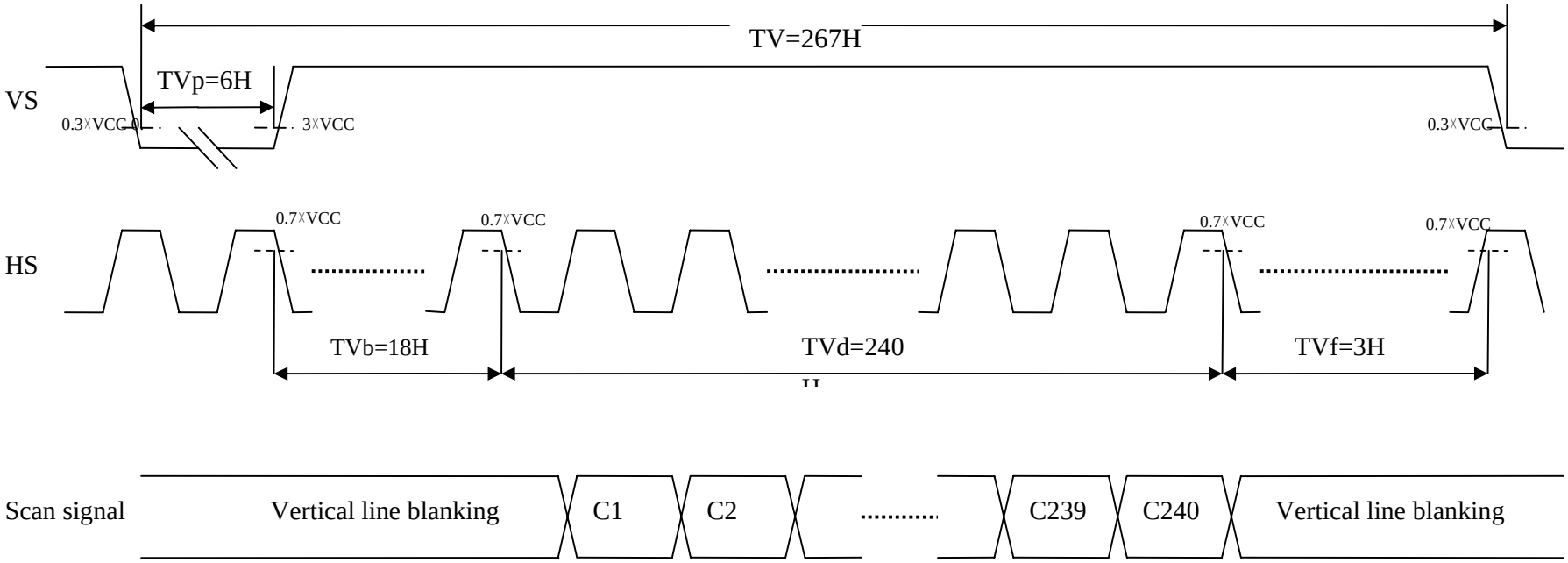
7. INPUT SIGNAL CHARACTERISTICS

7.1 Input Signal Timing Specifications

Parameter Sym		bol	MIN.	TYP.	MAX.	Unit	Remarks
CLK	Frequency 1/	Tc		7.21		MHz	
	Duty ratio	Th/Tc	40	50	60 %		
DATA	Setup time	Tds	12		ns		
	Hold time	Tdh	12		ns		
Horizontal synchronizing	Period TH		--	453	-- C	lock	
	Pulse width	THp	--	31	--	Clock	
	Horizontal period	THd	--	320	--	Clock	
	Back porch	THb	--	69	--	Clock	
	Front porch	THf	--	33	--	Clock	
Vertical synchronizing	Period TV		--	267	-- Li	ne	
	Pulse width	TVp	--	6	--	Line	
	Vertical period	TVd	--	240	--	Line	
	Back porch	TVb	--	18	--	Line	
	Front porch	TVf	--	3	--	Line	

Note:
- ✧ In case of using the slow frequency, the deterioration of display flicker etc may occur.
- ✧ The timing characteristics are basically fixed as above.



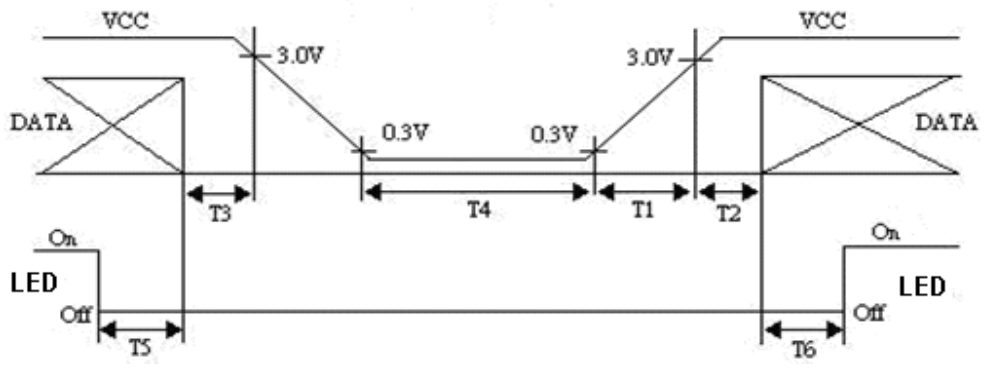


7.2 SYNC mode timing (DE connect to GND)

Parameter Sym		bol	MIN.	TYP.	MAX.	Unit	Remarks
CLK	Frequency 1/	Tc		6.41		MHz	
	Duty ratio	Th/Tc	40	50	60 %		
DATA	Setup time	Tds	12		ns		
	Hold time	Tdh	12		ns		
Horizontal synchronizing	Period TH		--	408	-- C	lock	
	Pulse width	THp	--	30	--	Clock	
	Horizontal period	THd	--	320	--	Clock	
	Back porch	THb	--	38	--	Clock	
	Front porch	THf	--	20	--	Clock	
Vertical synchronizing	Period TV		--	262	-- Li	ne	
	Pulse width	TVp	--	4	--	Line	
	Vertical period	TVd	--	240	--	Line	
	Back porch	TVb	--	15	--	Line	
	Front porch	TVf	--	3	--	Line	

Note:
- ✧ In case of using the slow frequency, the deterioration of display flicker etc may occur.
- ✧ The timing characteristics are basically fixed as above.

7.3 Power Off/On Sequence Timing

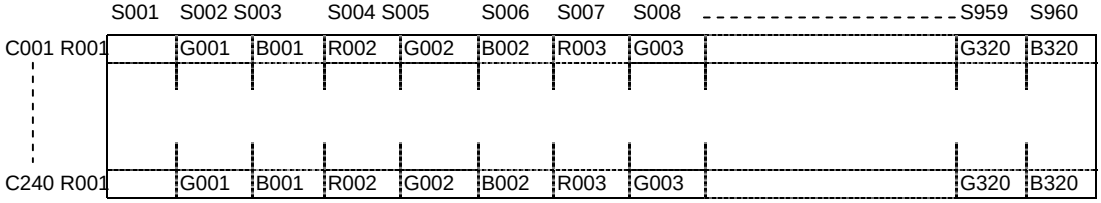


Timing Specifications:
0<T1≤15mS
T2>0.5S
0<T3≤0.1S
T4>1S
T5>0.1S
T6>0.1S

7.4 Color Data Input Assignment

Color		Data Signal																	
		Red G						reen						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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
Gray Scale of Red	Red(0) / Dark	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(61)	1	1	1	1	0	1	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
Gray Scale of Green	Green(0)/ Dark	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(61)	0	0	0	0	0	0	1	1	1	1	0	1	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	1	1	1	1	1	1	0	0	0	0	0	0	0
Gray Scale of Blue	Blue(0)/ Dark	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 (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	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	1	1	1	1	1	1	0	0	0	0	0	0	0

Correspondence between Data and Display Position

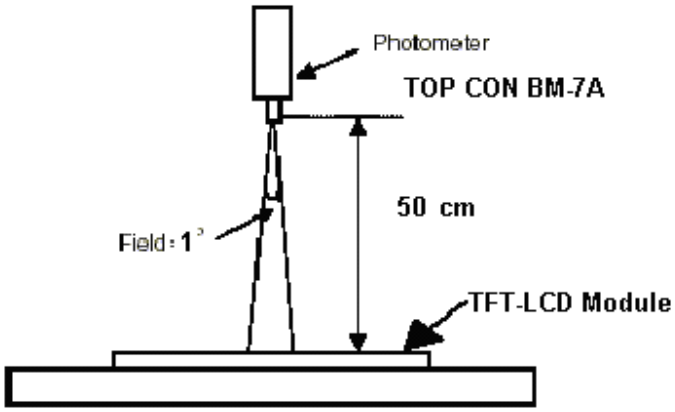


8. OPTICAL CHARACTERISTIC

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR≥5	60	70	--	deg	Note 1,4
		θ_x-		60	70	--		
	Vertical	θ_Y+		40	50	--		
		θ_Y-		60	70	--		
Contrast Ratio		CR	at optimized viewing angle	300	350			Note 1,3
Response time	Rise Tr		Center θx=θy =0°	-	15	30	ms	Note 1,6
	Fall	Tf		-	35	50	ms	
Uniformity		B-uni	θx=θy =0°	70	80	--	%	Note1,5
Brightness L			θx=θy =0° ADJ=3.3V	370	415	--	cd/m²	Note 1,2
Chromaticity		x_W 0	Center θx=θy =0°	.262	0.312	0.362		Note 1,7
		y_W 0		.270	0.320	0.370		
		x_R 0		.568	0.618	0.668		
		y_R 0		.319	0.369	0.419		
		x_G 0		.301	0.351	0.401		
		y_G 0		.521	0.571	0.621		
		x_B 0		.094	0.144	0.194		
		y_B		0.031	0.081	0.131		
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.

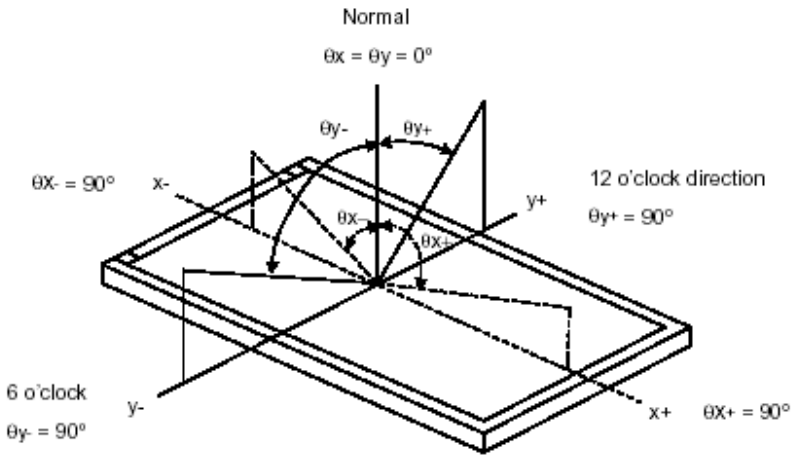
Note1: The method of optical measurement:



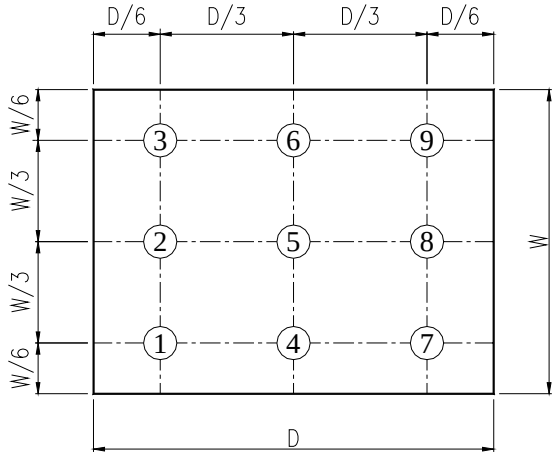
Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°
Note3: Definition of Contrast Ratio (CR):

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

Note4: Definition of Viewing Angle



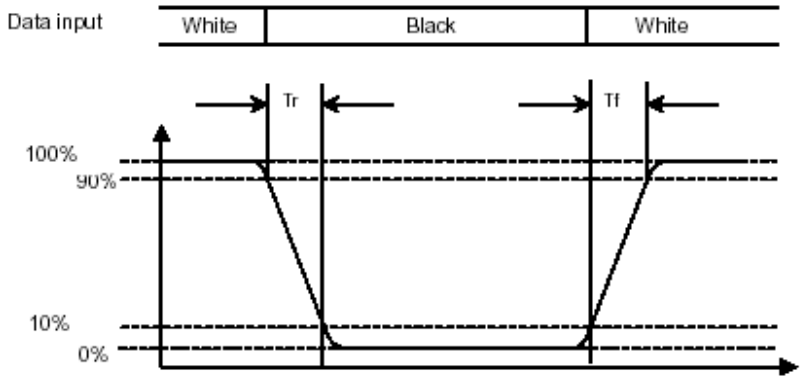
Note 5: Definition of Brightness Uniformity (B-uni):



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

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.



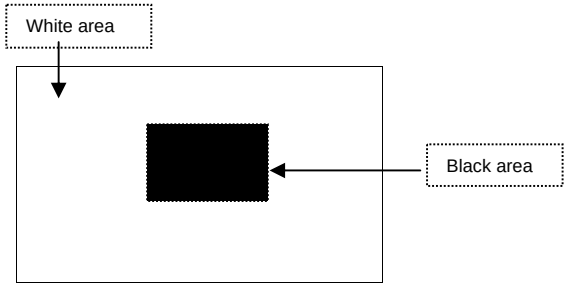
Note 7: Definition of Chromaticity:

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

9.1 CN1 Pins Connections

Pin No	Symbol	Function	Remark
1	GND	Ground for logic circuit	
2	CLK1	Data sampling clock	
3	HS (HSYNC)	Horizontal synchronous signal	
4	VS (VSYNC)	Vertical synchronous signal	
5	GND	Ground	
6	R0 R	ed pixel data(LSB)	
7	R1 R	ed pixel data	
8	R2 R	ed pixel data	
9	R3 R	ed pixel data	
10	R4 R	ed pixel data	
11	R5 R	ed pixel data(MSB)	
12	GND	Ground	
13	G0	Green pixel data(LSB)	
14	G1	Green pixel data	
15	G2	Green pixel data	
16	G3	Green pixel data	
17	G4	Green pixel data	
18	G5	Green pixel data(MSB)	
19	GND	Ground	
20	B0 Blue	pixel data(LSB)	
21	B1 Blue	pixel data	
22	B2 Blue	pixel data	
23	B3 Blue	pixel data	
24	B4 Blue	pixel data	
25	B5 Blue	pixel data(MSB)	
26	GND	Ground for logic circuit	
27	DE	Data Enable (connected to GND, if sync mode)	
28	VCC	Power Supply : +3.3V	
29	VCC	Power Supply : +3.3V	
30	R/L	Horizontal display mode select signal Left / Right Scan control input	*2
31	U/D	Vertical display mode select signal Up / Down Scan control input	*2
32	NC N	o Connection	
33	GND	Ground	

*1 The horizontal display start timing is settled in accordance with a rising timing of DE signal.
In case DE is fixed "Low", the horizontal start timing is determined as described in 9.2.
Don't keep DE "High" during operation.

*2 U/D and L/R control Function

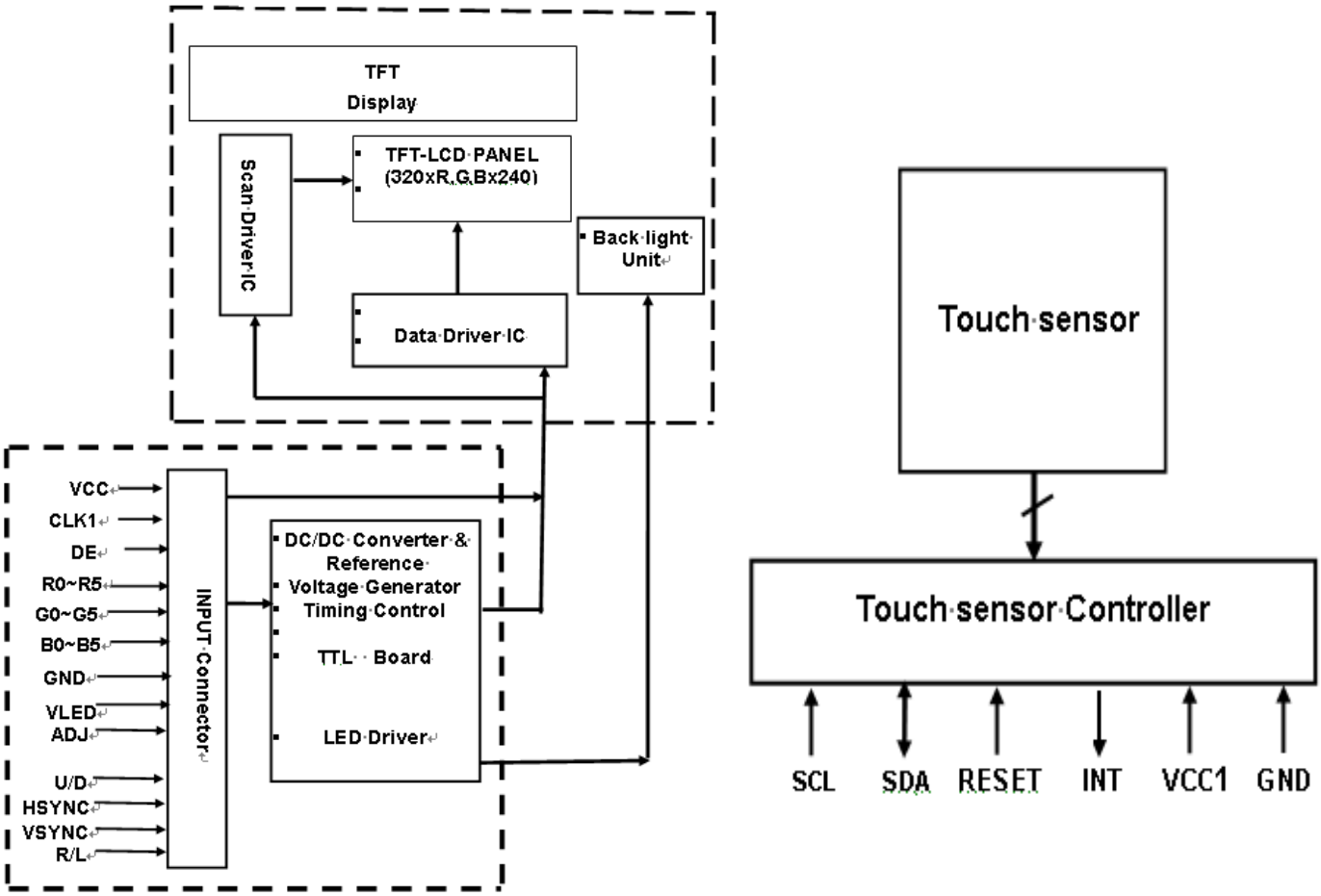
L/R	U/D	Function
0	1	Normally display
1	1	Left and Right opposite
0	0	Up and Down opposite
1	0	Left and Right opposite, Up and Down opposite

9.2. CN2 Pins Connections

Pin No.	Symbol	Function	Remark
1	VLED	Power supply for LED driver circuit	
2 GND		Ground	
3	ADJ	Brightness control for LED B/L	

*ADJ is brightness control pin. The larger of the pulse duty is, higher of the brightness.

10. BLOCK DIAGRAM

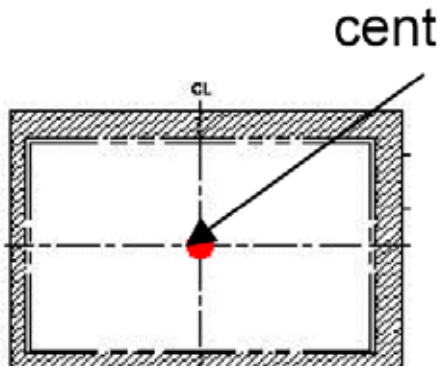


11. CTP General specifications

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.) x 89.95(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 Ty	p.	Max	Unit	Not es
VCC1	Supply voltage	0.3	-	4	V	
VIO D	C input voltage	-0.3	-	VCC1+0.3	V	

11.3 CTP Electrical Characteristic

Symbol	Description	Min Ty	p Max		Unit	Notes
VCC1 Sup	ply voltage	2.6	2.8	3.6	V	
GND	Supply voltage	-	0	-	V	
I	Active mode	-	10		mA	VCC1 = 2.8V
VIH	Input H voltage	1.6	-	-	V	
VIL	Input L voltage	-	-	0.7	V	
	System clock frequency	-	30	-	MHz	

11.4 CTP Pin Connections

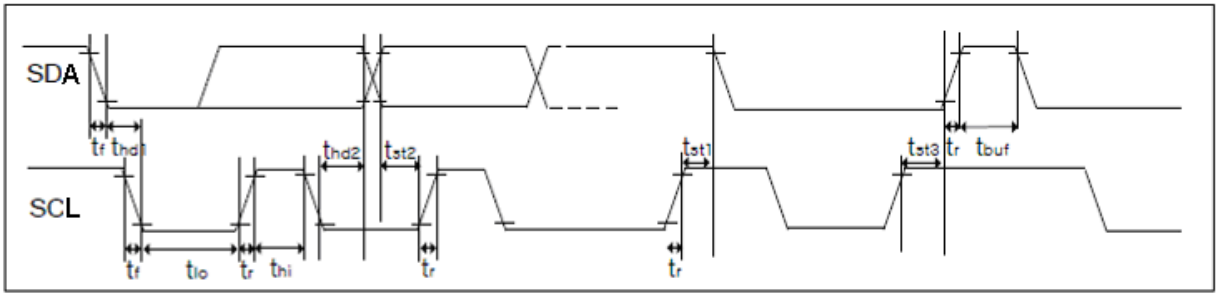
No.	Name	I/O	Description
1	NC	-	No connection
2	SCL	I	I²C Clock
3	SDA	I/O	I²C Data
4	NC	-	No connection
5	INT	O	Interrupt output
6	GND	P	Ground
7	VCC1	P	Power supply Voltage
8	/RESET	I	Reset active low
9	NC	-	No connection

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

Communication protocol: I²C

Clock frequency : 100Khz （400Khz Fast mode）

Below is timing of I2C hardware circuit:



Parameter	Symbol	Min	Max	Unit
SCL frequency	f_{sck}	- 60	0	KHZ
SCL low period	t_{lo}	0.8 -		us
SCL high period	t_{hi}	0.5 -		us
SCL setup time for START condition	t_{st1}	0.4 -		us
SCL setup time for STOP condition	t_{st3}	0.4 -		us
SCL hold time for START condition	t_{st1}	0.4 -		us
SDA setup time	t_{st2}	0.5 -		us
SDA hold time	t_{st2}	0.2 -		us

11.6 Timing Characteristic

The address of GT827's slave device is 0xBA/0xBB. When master CPU addressing GT827, it will send read and write control bits simultaneously where are appended to slave device ("0"- write; "1"- read) for composing a byte with device address. i.e.: 0xBA – conduct write operation to GT827; 0xBB – conduct read operation to GT827.

11.6.1 Postfix Communication:

Only after receiving postfix signal (under the condition of no external signal), can GT827 update coordinate in buffer in real time. After completing communication, I2C needs to send extra postfix signal. But if a series of communication appear, the postfix signal should be sent after the last one finished (except the coordinate reading process, the postfix signal could be sent after finishing reading a frame, so as to prevent output buffer to be changed by GT827 during the read process of master device). Below is the communication format of postfix: Use write process to search register addressing (0x8000), and send stop signal.

11.6.2 Data Transmission:

The communication usually is launched by master CPU. When SCL keeps "1" SDA manages the change from "1" to "0". Then the address information or data stream begins to transmit after start signal.
Any slave device connected with I2C circuit needs to check 8 bits address information after circuit launches start signal and respond correctly. After receiving the matching address information, GT827 will update SDA as an output and set the value as "0" for answering signal in the ninth clock cycle. The GT827 will lay idle if matching address information is unavailable (neither 0XBA nor 0XBB).
The SDA port sends the data with 9 bits serial data according to nine clock cycles. The 8 valid data + 1 receiver send ACK (acknowledgement signal) or NACK (negative acknowledgement signal). It is valid when SCL is "1" during the data transmission.
The main CPU sends stop signal after transmission where SDA manages the change from "0" to "1" when SCL stays "1".

11.6.3 Write operations to I²C slave

Write operations

Above is the flow chart of master CPU conducting write process for GT827. Master CPU launches a start signal and sends address, write and read information ("0" means write process -- 0XBA).

After receiving response，master CPU sends 16 bits address of register and writes 8 bits into register

The address pointer of GT827's register will automatically increase 1 in write process. So it can continuously write continuation register address at a time. If write process is done, master CPU sends stop signal.

11.6.4 Read operations to I²C slave

Read operation

Above is the flow chart of master CPU conducting read process for GT827. Master CPU launches a start signal and sends address, write and read information ("0" means read process -- 0XAA).

Once receives acknowledgement signal, master CPU sends 16 bits register address information and sets the read-demanding register address. Then master CPU resends a start signal for read process (0XAB). It begins to read data until receiving acknowledge.

Likewise, GT827 can conduct continuation read process. Master CPU will correspondingly send an acknowledgement signal to indicate successful byte reception. And CPU will send "NACK" once receiving the last byte to stop transmission.

11.7 Register information

Addr	R/W	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0XF40	R	Touch Flags	Buffer Status		L_touch	P4	P3	P2	P1	P0
0XF41	R	Touch key	Reserved				Key4	Key3	Key2	Key1
0XF42	R	Point0	Point0 X H							
0XF43	R		Point0 X L							
0XF44	R		Point0 Y H							
0XF45	R		Point0 Y L							
0XF46	R	Point1	Point0 Size							
0XF47	R		Point1 X H							
0XF48	R		Point1 X L							
0XF49	R		Point1 Y H							
0XF4A	R		Point1 Y L							
0XF4B	R		Point1 Size							
0XF4C	R	Point2	Point2 X H							
0XF4D	R		Point2 X L							
0XF4E	R		Point2 Y H							
0XF4F	R		Point2 Y L							
0XF50	R		Point2 Size							
0XF51	R	Point3	Point3 X H							
0XF52	R		Point3 X L							
0XF53	R		Point3 Y H							
0XF54	R		Point3 Y L							
0XF55	R		Point3 Size							
0XF56	R	Point4	Point4 X H							
0XF57	R		Point4 X L							
0XF58	R		Point4 Y H							
0XF59	R		Point4 Y L							
0XF5A	R		Point4 Size							
0XF5B	R	Coor checksum	Coordinate checksum							
0XF5C~ 0XF7C	-	NC	Reserved							
0xF7D	R	PID	Product ID(hex)							
0xF7E	R	VID_H	Product version High byte(hex)							

0xF7F	R	VID_L	Product version low byte(hex)
0xF80	R/W	DriverCH0	Screen 1 drives corresponding IC drive line
0xF81	R/W	DriverCH1	Screen 2 drives corresponding IC drive line
0xF82	R/W	DriverCH2	Screen 3 drives corresponding IC drive line
0xF83	R/W	DriverCH3	Screen 4 drives corresponding IC drive line
0xF84	R/W	DriverCH4	Screen 5 drives corresponding IC drive line
0xF85	R/W	DriverCH5	Screen 6 drives corresponding IC drive line
0xF86	R/W	DriverCH6	Screen 7 drives corresponding IC drive line
0xF87	R/W	DriverCH7	Screen 8 drives corresponding IC drive line
0xF88	R/W	DriverCH8	Screen 9 drives corresponding IC drive line
0xF89	R/W	DriverCH9	Screen 10 drives corresponding IC drive line
0xF8A	R/W	DriverCH10	Screen 11 drives corresponding IC drive line
0xF8B	R/W	DriverCH11	Screen 12 drives corresponding IC drive line
0xF8C	R/W	DriverCH12	Screen 13 drives corresponding IC drive line
0xF8D	R/W	DriverCH13	Screen 14 drives corresponding IC drive line
0xF8E	R/W	DriverCH14	Screen 15 drives corresponding IC drive line
0xF8F	R/W	DriverCH15	Screen 16 drives corresponding IC drive line
0xF90	R/W	DriverCH16	Screen 17 drives corresponding IC drive line
0xF91	R/W	DriverCH17	Screen 18 drives corresponding IC drive line
0xF92	R/W	DriverCH18	Screen 19 drives corresponding IC drive line
0xF93	R/W	DriverCH19	Screen 20 drives corresponding IC drive line
0xF94	R/W	DriverCH20	Screen 21 drives corresponding IC drive line
0xF95	R/W	DriverCH21	Screen 22 drives corresponding IC drive line
0xF96	R/W	DriverCH22	Screen 23 drives corresponding IC drive line
0xF97	R/W	DriverCH23	Screen 24 drives corresponding IC drive line
0xF98	R/W	DriverCH24	Screen 25 drives corresponding IC drive line
0xF99	R/W	DriverCH25	Screen 26 drives corresponding IC drive line
0xF9A	R/W	DriverCH26	Screen 27 drives corresponding IC drive line
0xF9B	R/W	DriverCH27	Screen 28 drives corresponding IC drive line
0xF9C	R/W	DriverCH28	Screen 29 drives corresponding IC drive line
0xF9D	R/W	NC Re	served
0xF9E	R/W	SensorCH0	Screen 1 induction wire corresponds to IC drive line
0xF9F	R/W	SensorCH1	Screen 2 induction wire corresponds to IC drive line
0xFA0	R/W	SensorCH2	Screen 3 induction wire corresponds to IC drive line
0xFA1	R/W	SensorCH3	Screen 4 induction wire corresponds to IC drive line
0xFA2	R/W	SensorCH4	Screen 5 induction wire corresponds to IC drive line
0xFA3	R/W	SensorCH5	Screen 6 induction wire corresponds to IC drive line
0xFA4	R/W	SensorCH6	Screen 7 induction wire corresponds to IC drive line
0xFA5	R/W	SensorCH7	Screen 8 induction wire corresponds to IC drive line
0xFA6	R/W	SensorCH8	Screen 9 induction wire corresponds to IC drive line
0xFA7	R/W	SensorCH9	Screen 10 induction wire corresponds to IC drive line
0xFA8	R/W	SensorCH10	Screen 11 induction wire corresponds to IC drive line
0xFA9	R/W	SensorCH11	Screen 12 induction wire corresponds to IC drive line
0xFAA	R/W	SensorCH12	Screen 13 induction wire corresponds to IC drive line
0xFAB	R/W	SensorCH13	Screen 14 induction wire corresponds to IC drive line
0XFAC	R/W	SensorCH13	Screen 15 induction wire corresponds to IC drive line
0XFAD	R/W	SensorCH14	Screen 16 induction wire corresponds to IC drive line
0XFAE~ 0XFB1	-	NC	Reserved
0xFB2	R/W	ADCCFG	chip scanning control parameter
0xFB3	R/W	SCAN	chip scanning control parameter
0xFB4	R/W	F1SET	drive pulse 1 frequency
0xFB5	R/W	F2SET	drive pulse 2 frequency

0xFB6	R/W	F3SET	drive pulse 3 frequency							
0xFB7	R/W	F1PNUM	1 drive pulse							
0xFB8	R/W	F2PNUM	2 drive pulse							
0xFB9	R/W	F3PNUM 3	drive puilse							
0xFBA	R/W	F1DELAY dr	ive pulse 1 phase delay							
0xFBB	R/W	F2DELAY	drive pulse 2 phase delay							
0xFBC	R/W	F3DELAY	drive pulse 3 phase delay							
0xFBD	R/W	DC-DC	high pressure setting							
0xFBE	R/W	Sc_Touch	TP key threshold							
0xFBF	R/W	Sc_Leave	TP key up threshold							
0xFC0	R/W	Md_switch	Reserved	DD2: difference And half	Reserved	Shape_EN defamation denoise	INT pulse mode	SITO denoise switch	Reserved	Reserved
0xFC1	R/W	LPower_C Reserved	time to low power consumption without pressing: 0-63s valid, unit: S							
0xFC2	R/W	Refresh	0-100 valid; 0: period 10ms, 100: period 20ms							
0xFC3	R/W	Touch_N	Reserved	Reserved	Output touch point, 1-5 valid					
0xFC4	R/W	Output_Th	output limit: output until coordinate transformation value is higher than this, 0-254 configurable (unit:4 coordinate),255 means first pressing coordinate and keying up							
0xFC5	R/W	X_Ou_Max_H	X direction output maximum coordinate, the higher byte placed first							
0xFC6	R/W	X_Ou_Max_L								
0xFC7	R/W	Y_Ou_Max_H	Y direction output maximum coordinate, the higher byte placed first							
0xFC8	R/W	Y_Ou_Max_L								
0xFC9	R/W	X_Co_Sm	X direction slide control parameter, 0-255 configurable, 0 means closure							
0xFCA	R/W	Y_Co_Sm	Y direction slide control parameter, 0-255 configurable, 0 means closure							
0xFCB	R/W	X_Sp_Lim	X direction maximum speed limit of slide0-255 configurable, 0 means closure(unit:16 coordinate)							
0xFCC	R/W	Y_Sp_Lim	Y direction maximum speed limit of slide: 0-255 configurable, 0 means closure(unit:16 coordinate)							
0xFCD	R/W	Noise_R s	ampling drop-driven	while noise elimination: 0-15 valid						
0xFCE	R/W	NC Re	served							
0xFCF	R/W	Filter	Reserved	coordinate window filtering value (in base 4)						
0xFD0	R/W	Large_Tc	representative touch points for large area: 0-255 valid							
0xFD1	R/W	Shake_Cu	Touch Shake Count	Finger Number Shake Count						
0xFD2	R/W	Pos_Ref_T	benchmark update configuration in normal condition, 0-255 valid, 0 means close benchmark update							
0xFD3	R/W	NC	benchmark update configuration in sudden change condition,0-255 valid, 0 means close benchmark update							
0xFD4	R/W	NC	Reserved							
0xFD5	R/W	NC								
0xFD6	R/W	Edge_exp Reserved	0: weak tensile 1: strong							
0xFD7	R/W	Tc_K_F Key	_com	Key_con	Reserved	valid interval in regional keys (unilateral): 0-15 valid				
0xFD8	R/W	Key 1	Key 1 position: 0-255 valid, 0 means unavailable							
0xFD9	R/W	Key 2	Key 2 position: 0-255 valid, 0 means unavailable							
0xFDA	R/W	Key 3	Key 3 position: 0-255 valid, 0 means unavailable							
0xFDB	R/W	Key 4	Key 4 position: 0-255 valid, 0 means unavailable							
0xFDC	R/W	K_Touch key	threshold							
0xFDD	R/W	K_Leave key	up threshold							
0xFDE	R/W	K_SEC_max	upper limit of sub-maximum difference in independent key judgment							
0xFEF	R/W	K_DIS_min	lower limit of difference between maximum and sub-maximum in independent key judgment							
0xFE0	R/W	X_border_Lim_ Near	discarded coordinate numbers on X proximal border							

0xFE1	R/W	X_border_Lim_ Far	discarded coordinate numbers on X far end			
0xFE2	R/W	Y_border_Lim_ Near	discarded coordinate numbers on Y proximal border			
0xFE3	R/W	Y_border_Lim_ Far	discarded coordinate numbers on Y far end			
0xFE4	R/W	KEY_ADCCFG	FPC ADCCFG parameter (applicable to drive key common port)			
0xFE5	R/W	KEY_F1SET	FPC drive frequency setting (applicable to drive key common port)			
0xFE6	R/W	KEY_F1NUM	FPC drive pulse number setting (applicable to drive key common port)			
0xFE7	R/W	Key_Shake_Cu	touch key Shake counter (0-255)			
0xFE8	R/W	Key2_Touch	touch Level of FPC touch key2			
0xFE9	R/W	Key3_Touch	touch Level of FPC touch key3			
0xFEA	R/W	Key4_Touch	touch Level of FPC touch key4			
0xFEB~ 0xFEE	-	NC	Reserved			
0xFEF	R/W	Con_Frs	mark for configuration update, write 1 when master completing configuration information			
0xFF0	R/W	Cfg_Chk_H	configuration information checksum, the higher byte placed first			
0xFF1	R/W	Cfg_Chk_L				
0xFF2	R/W	System_Sta	Power_sta		Reserved	
0xFF3	R/W	LED_Con L	ED_EN	LED_CM	LED_SW	time of light-on after key up (unit: S)
0xFF4	R/W	Command Re	served			
0xFF5	R/W	Module_Type Re	served		module supplier' ID: 0-2 valid	

12. Appearance Specification

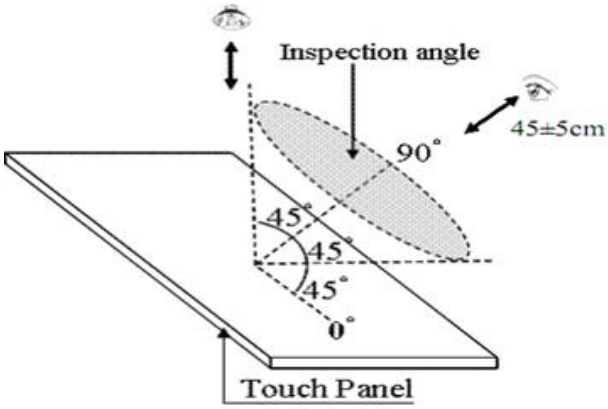
12.1Inspection and Environment conditions

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

Appea rance inspection method:

Fro nt visual distance: 30-40CM



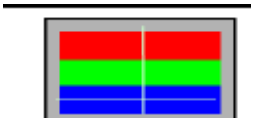
12.3 Judgment standard

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	One Dot Two adjacent dot
Dot of foreign material	SPEC Ac ceptable quantity D>0.8mm 0 0.3mm≦D≦ 0.8mm 5 D<0.3mm Ignorable	D= (L + W) / 2
Line of foreign material	SPEC Ac ceptable quantity W>0.1mm L>10mm 0 0.05mm≦W≦ 0.1mm L≦10mm 5 W<0.05mm Ignorable	L : Long W : Width
Image uniformity	Through ND5%, invisible at R G B ,grey and white	
Size Ac	cording to SPEC	
TP scratch	SPEC A cceptable quantity W>0.1mm L>10 mm 0 W≦0.1mm L 10mm 5	
TP dent dot	SPEC Ac ceptable quantity D>0.5mm 0 0.3≦D≦ 0.5mm 5	D= (L + W) / 2
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 Ignora ble	
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≦ .1 ignorable S≦ .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 ℃ 30 min ~ 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

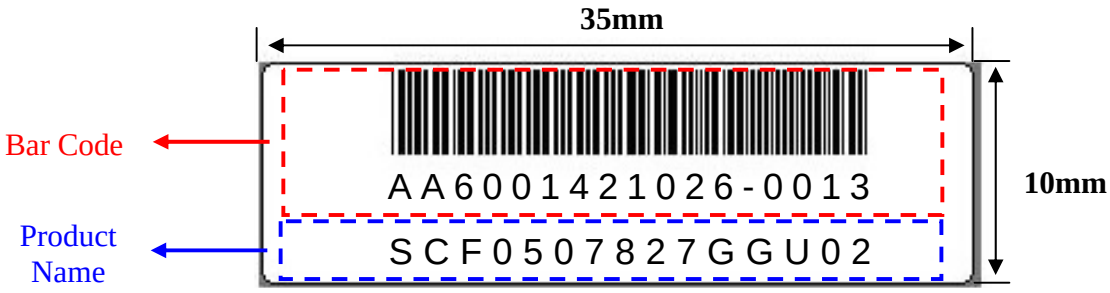
The Judgment of the above test should be made after exposure in room temperature for two hours as follow:

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

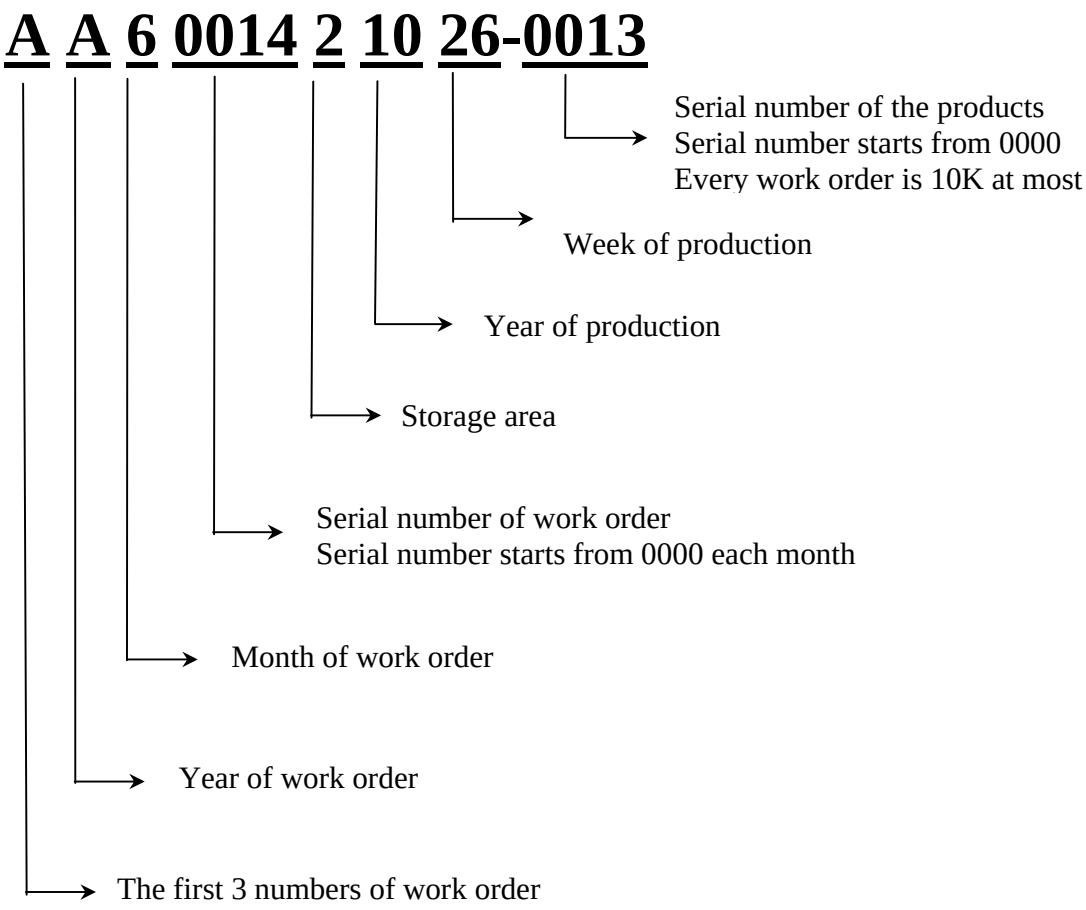
Fail: No display image, obvious non-uniformity, or line defect.

14. LCM PRODUCT LABEL DEFINE

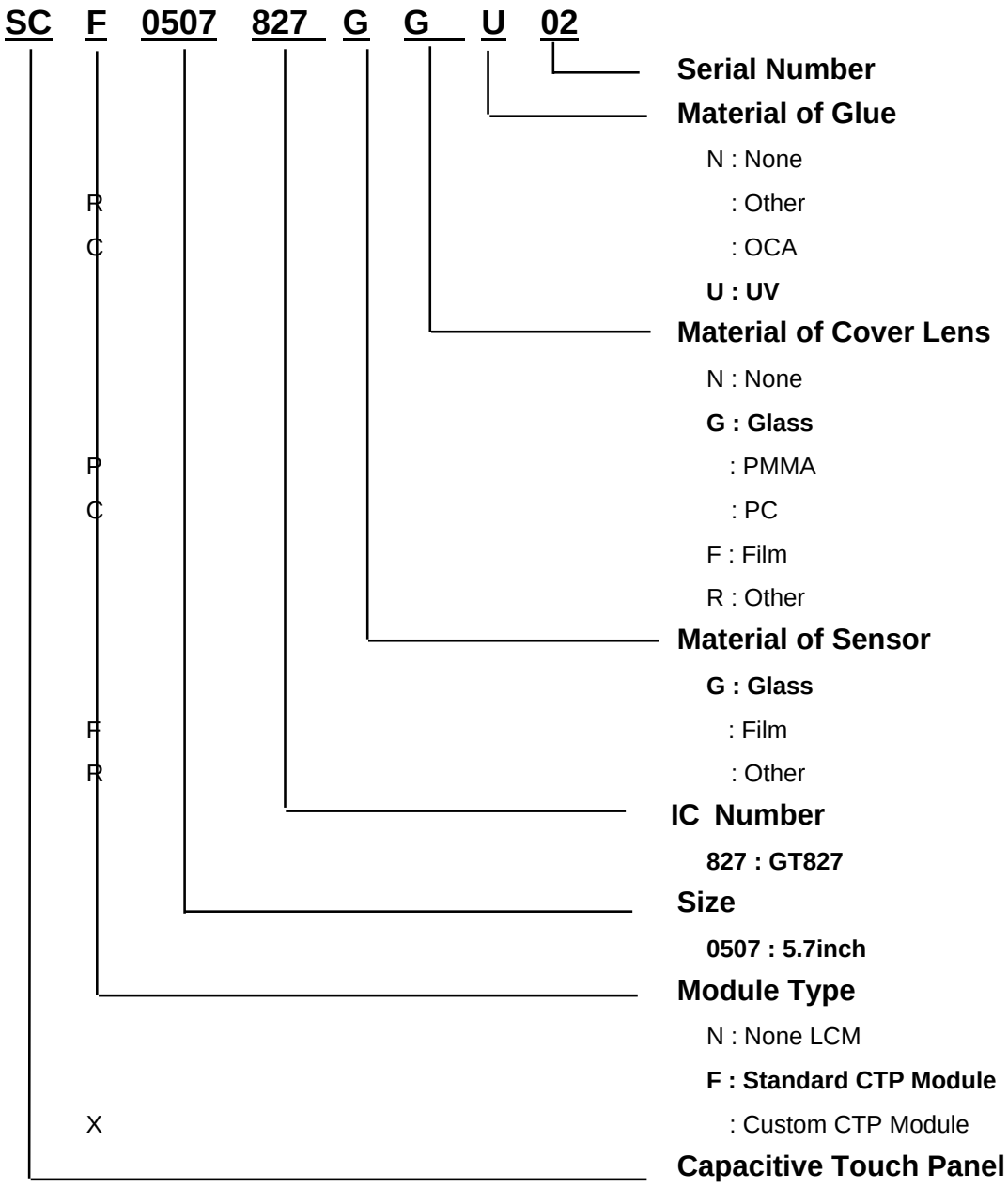
Product Label style:



BarCode Define:



Product Name Define:



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 Mec hanical 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".

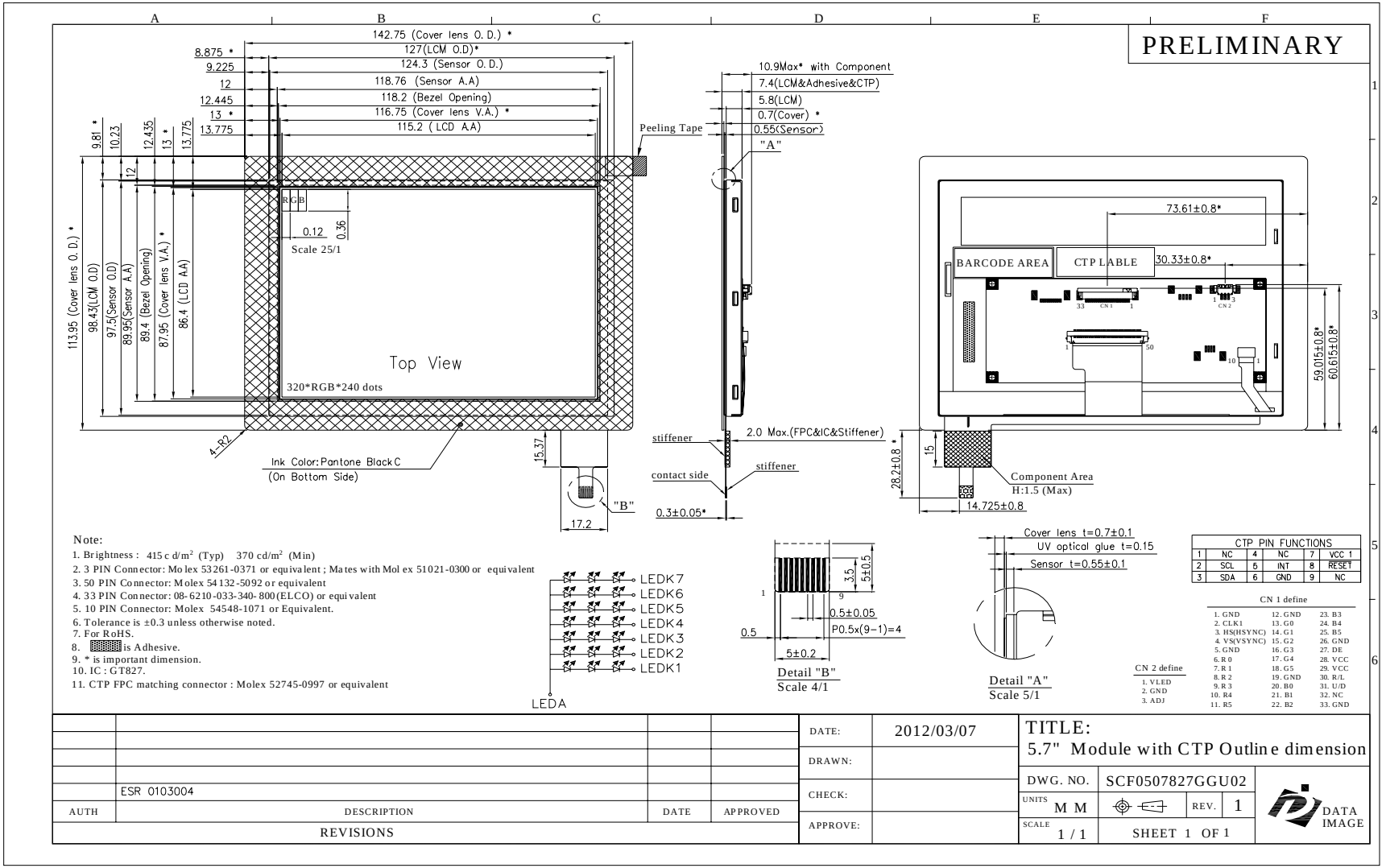
2.5 Storage

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