HY-LINE®
COMPUTER COMPONENTS

WVGA-TFT-PCAP-Modul Datenblatt

Modell SCF0700M48GGU17

Kurzdaten

Hersteller	Data Image
Diagonale	7,0“ / 17,8 cm
Format	wide
Auflösung	800 x 480
Backlight	LED / 270 cd/m²
Interface	RGB
Touchscreen	ja
Temperatur	-20… +70°C (Betrieb)

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DATA IMAGE

Confidential Document

DATA IMAGE CORPORATION

TFT Module Specification

Preliminary

ITEM NO.: SCF0700M48GGU17

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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	26/MAY/12’			Initial preliminary

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3. GENERAL SPECIFICATIONS

Composition: 7inch WVGA resolution display with a projected Capacitive Touch Panel (CTP).
Interface：Parallel RGB Interface for display and I^2C for the CTP

Parameter	Specifications	Unit
Screen Size	7 (diagonal)	inch
Display Format	800(H) x (R,G,B) x 480(V)	dot
Outline Dimension	180(W) x 120(H) x 12.05 Max (D)	mm
LCD Active Area	152.4(W) × 91.44(H)	mm
Sensor Active Area	154.6 (W) x 92.4 (H)	mm
Pixel Configuration	Stripe	
Dot Pitch	0.0635(W) × 0.1905(H)	mm
Surface treatment	Clear	
Back-light	LED	
Display mode	Normally white	
Weight	T.B.D	g
View Angle direction	6 o'clock	

4. LCD ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage		Vcc, VDD	-0.3	6	V	Ta=25°C
Logic input voltage		VI	-0.3	V_{CC}+0.3	V	
Operating temperature		Top	-20	+70	°C	Module surface*
Storage temperature		Tst	-30	+80	°C	-
Humidity	Operation	20%~90% relative humidity				Ta<=38°C
	Non Operation	5%~90% relative humidity				Ta<=38°C

5. LCD ELECTRICAL CHARACTERISTICS

fH=30KHz, fv=60Hz, fCLK=33.26,MHz,Ta=25°C

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}		150	200	mA	V_{CC} =3.3V
Power Supply voltage for LED	V_{DD}	3.0	3.3	5.5	V	
Power Supply Current for LED	I_{DD}	--	650	850	mA	V_{DD} =3.3V
			400	550	mA	V_{DD} =5.0V
"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			20000		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 18℃~28℃ and LED dice current=20mA

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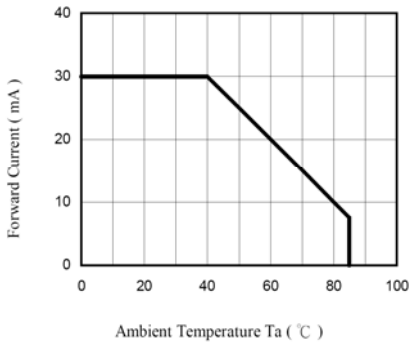
Note2: The LED Dice's Ambient Temp. vs. Allowable Forward Current Curve.



6. LCD INPUT SIGNAL CHARACTERISTICS

6.1 Input signal characteristics

6.1.1 AC Electrical Characteristics

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Data setup time	T_{dsu}	6	-	-	ns
Data hold time	T_{dhd}	6	-	-	ns
DE setup time	T_{esu}	6	-	-	ns

6.1.2 Resolution：

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
DCLK frequency	F_{CPH}	-	33.26	-	MHz
DCLK period	T_{CPH}	-	30.06	-	ns
DCLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}
DE pulse width	T_{DH}	-	800	-	T_{CPH}
DE frame blanking	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$
DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$

6.2 Timing Controller Timing Chart

6.2.1 Clock and Data input waveforms

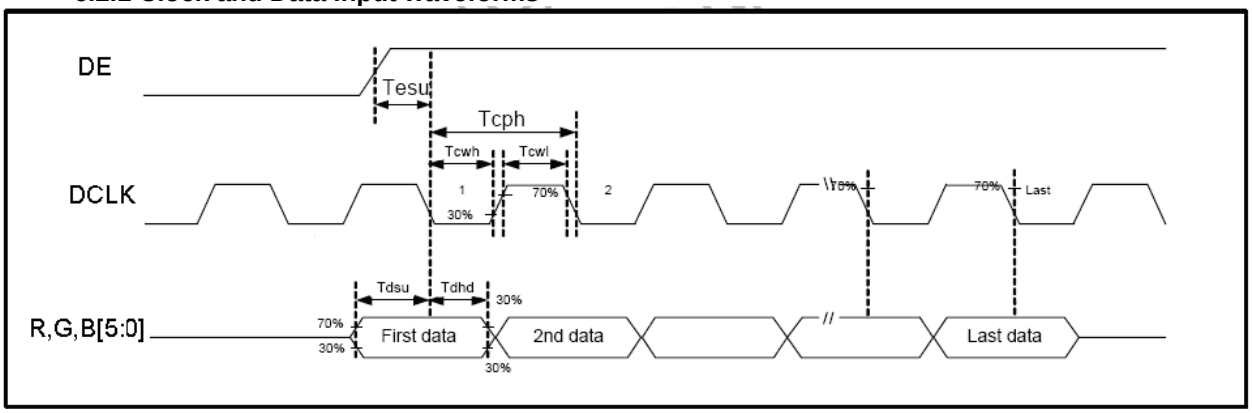


Figure 1 Clock and Data input waveforms.

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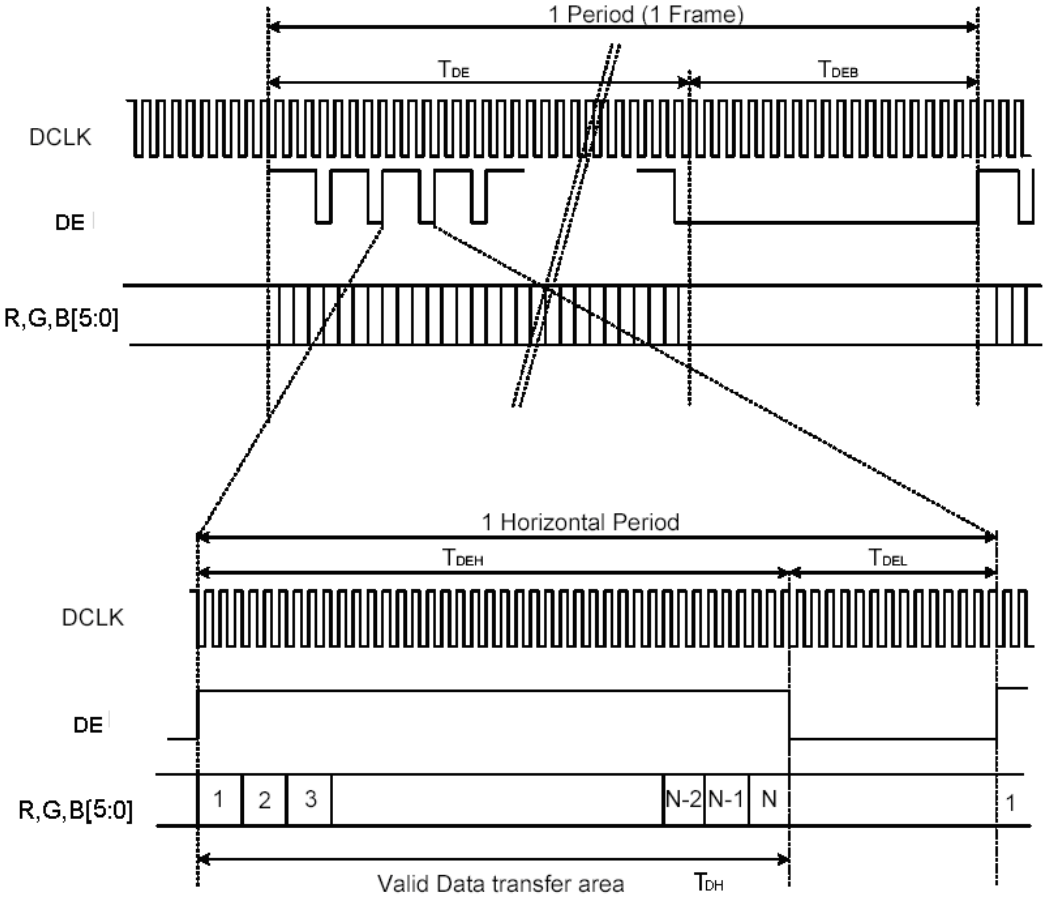

N=800

Figure 2 DE Mode Data Format

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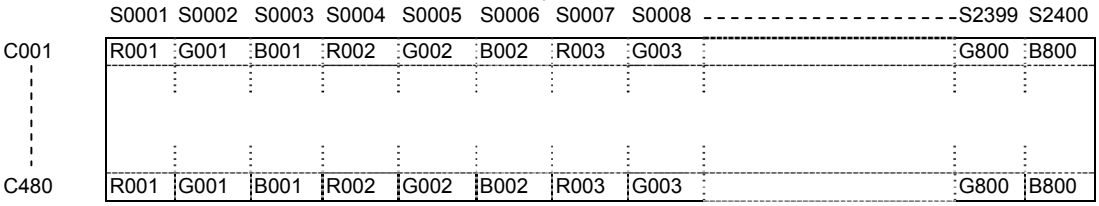
6.3 Color Data Input Assignment

Color		Data Signal																	
		Red						Green						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	0	1	1	1	1	1	1	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	0	0	0	0	0	0	0	1	1	1	1	1	1

Correspondence between Data and Display Position



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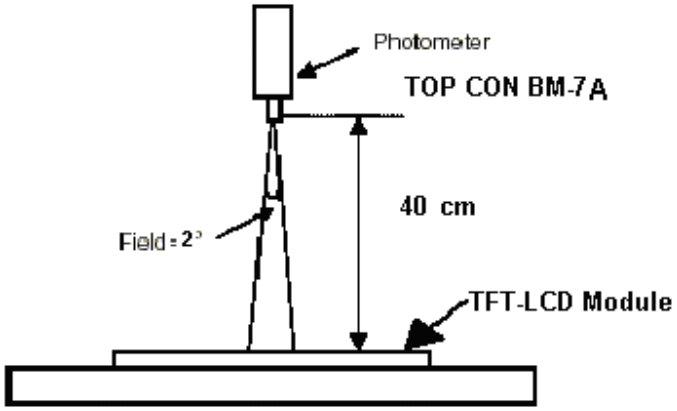
7. OPTICAL CHARACTERISTIC

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR≥10	65	70	--	deg	Note 1,4
		θ_x-		65	70	--		
	Vertical	θ_Y+		55	60	--		
		θ_Y-		55	60	--		
Contrast Ratio		CR	at optimized viewing angle	--	TBD	--		Note 1,3
Response time	Rise	Tr	Center θx=θy =0°	-	5	10	ms	Note 1,6
	Fall	Tf		-	11	16	ms	
Uniformity		B-uni	θx=θy =0°	70	80	--	%	Note1,5
Brightness		L	θx=θy =0°	240	270	--	cd/㎡	Note 1,2
Chromaticity		x_W	Center θx=θy =0°	0.26	0.31	0.36		Note 1,7
		y_W		0.28	0.33	0.38		
		x_R		0.52	0.57	0.62		
		y_R		0.31	0.36	0.41		
		x_G		0.30	0.35	0.40		
		y_G		0.53	0.58	0.63		
		x_B		0.10	0.15	0.20		
		y_B		0.09	0.14	0.19		
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 and LED Backlight Current IL=180mA. The measurement method is shown in Note1.

Note1: The method of optical measurement:



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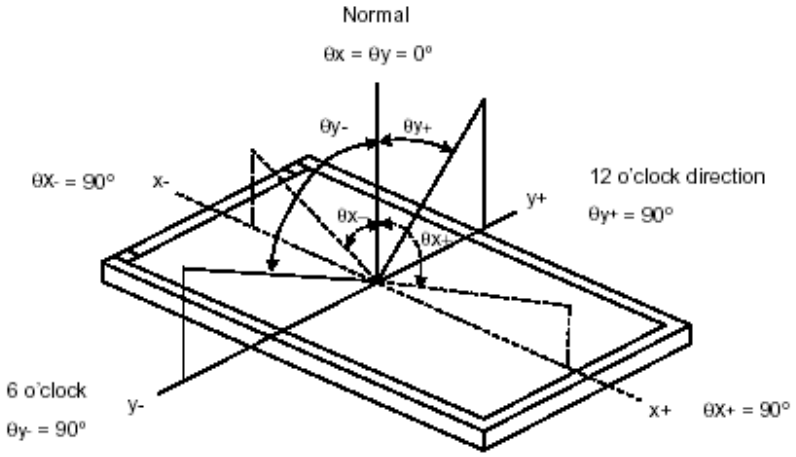
Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°

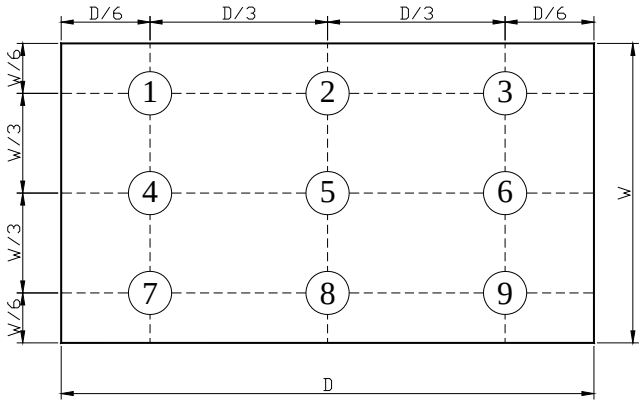
Note3: Definition of Contrast Ratio (CR):

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

Note4: Definition of Viewing Angle



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



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

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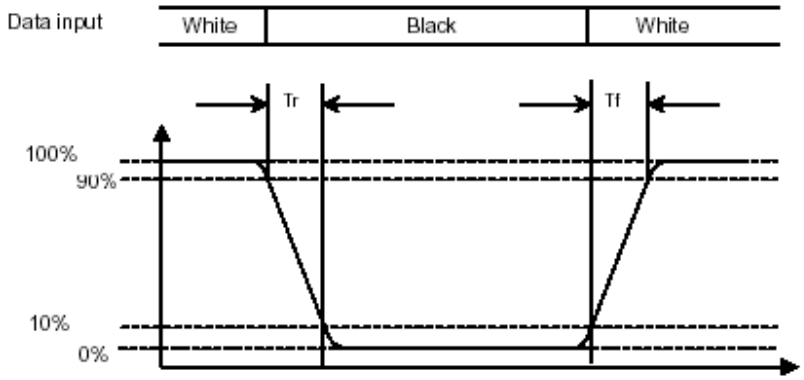
Note6: Definition of Response Time:

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.



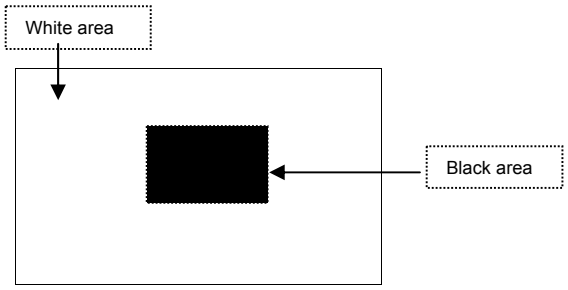
Note 7: Definition of Chromaticity:

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



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8. LCD PIN CONNECTIONS

Pin NO.	SYMBOL	DESCRIPTION
1	Vss	Power Ground
2	Vss	Power Ground
3	ADJ	Brightness control for LED B/L
4	VDD	Power Supply for LED Driver
5	VDD	Power Supply for LED Driver
6	VDD	Power Supply for LED Driver
7	Vcc	Power Supply for Digital Circuit
8	Vcc	Power Supply for Digital Circuit
9	DE	Data Enable
10	Vss	Power Ground
11	Vss	Power Ground
12	Vss	Power Ground
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	Vss	Power Ground

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.

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Remarks:

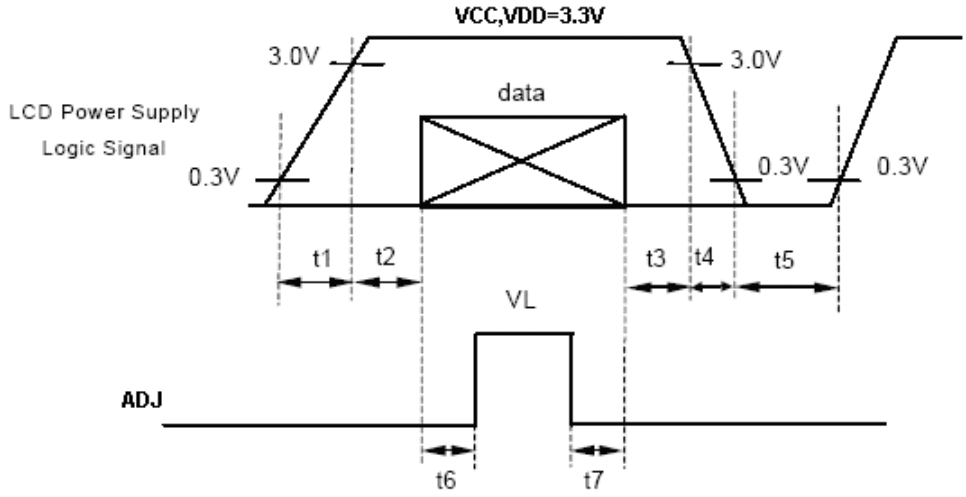
Power Signal sequence:

t1 ≤10ms ; 1 sec≤ t5

50ms≤ t2 ; 200ms ≤t6

0<t3 ≤50ms ; 200ms≤ t7

0<t4 ≤10ms

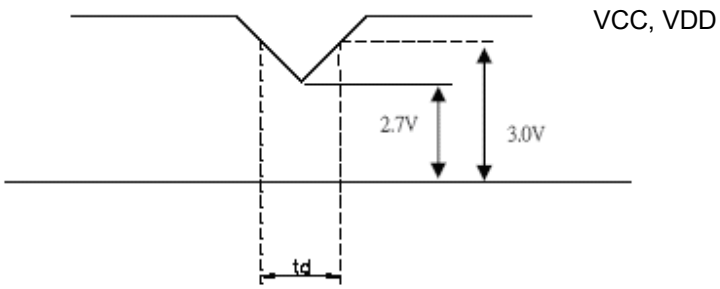


Data: RGB DATA, DCLK, DE

VCC,VDD -dip condition:

(1) 2.7V ≤VCC,VDD≤3.0V: td ≤10 ms

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



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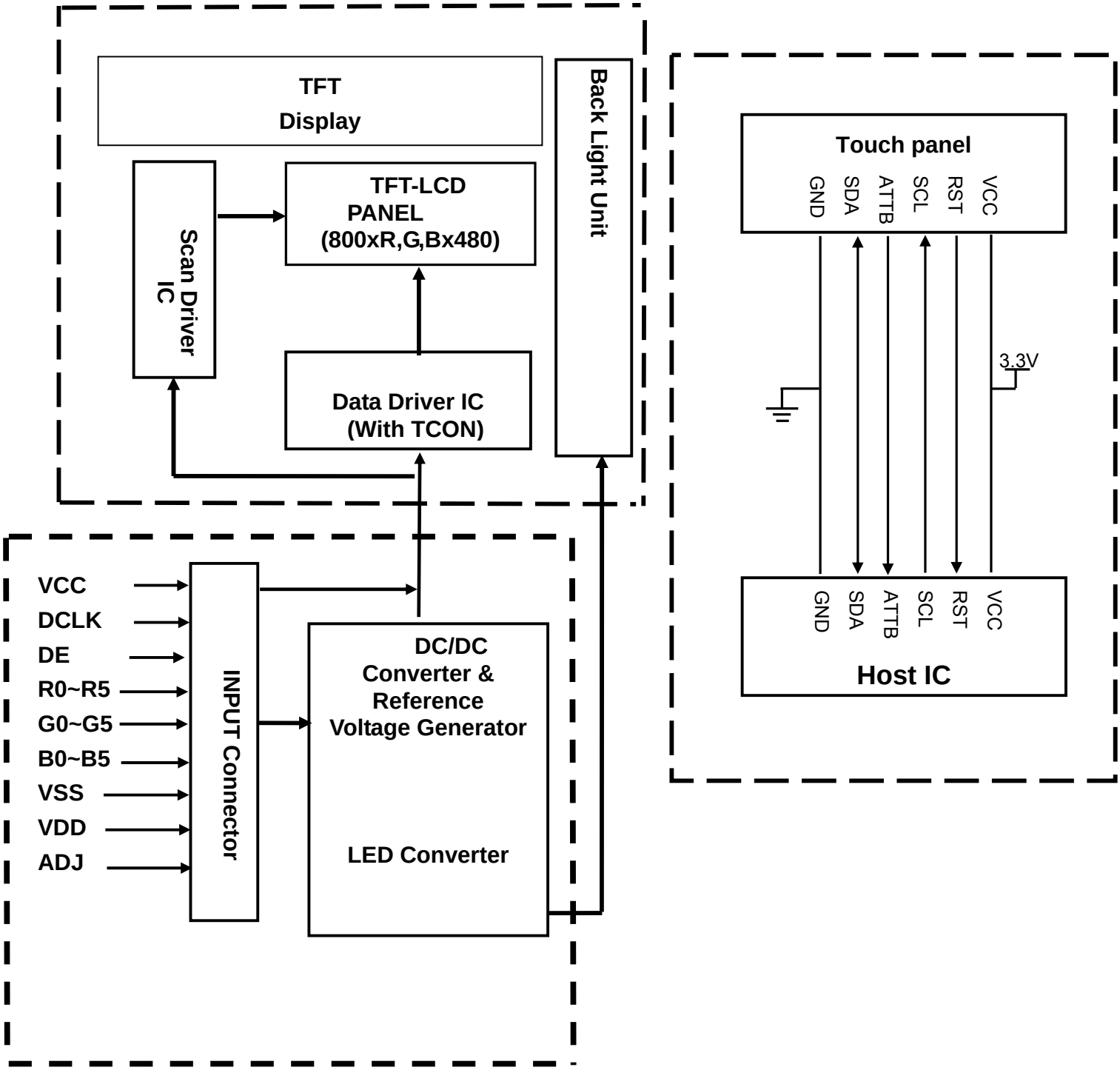
9. BLOCK DIAGRAM



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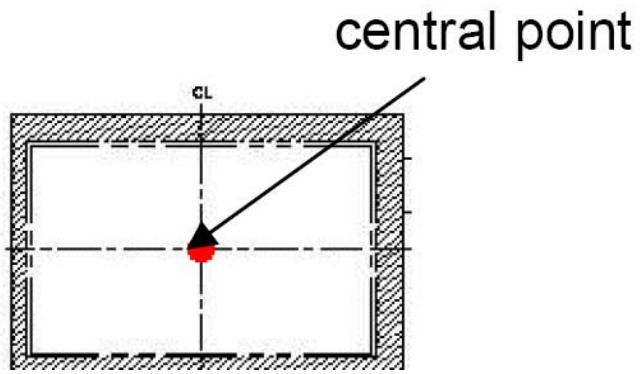
10. CTP General specifications

10.1 CTP main feature

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	2	
Transparency	≧85%	%
Haze	≦5.0%	%
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.



10.2 CTP Absolute Maximum Rating

Symbol	Description	Min	Typ	Max	Unit	Notes
VCC	Supply voltage	-0.3	-	6.5	V	
VIO	DC input voltage	-0.3	-	VCC+0.3	V	

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10.3 CTP Electrical Characteristic

Symbol	Description	Min	Typ	Max	Unit	Notes
VCC	Supply voltage	3.0	3.3	5.5	V	
GND	Supply voltage	-	0	-	V	
I	Active Mode	-	-	7.0	mA	At VCC=3.3V
VIH	Input H voltage		0.8VCC	-	VCC	
VIL	Input L voltage		0		0.2VCC	
	System clock frequency			20	MHz	
	CPU clock frequency			20	MHz	
ISLEEP	Sleep mode(52Hz)	-	-	2.0	mA	At VCC=3.3V
	Sleep mode(26Hz)	-	-	1.1	mA	At VCC=3.3V
	Sleep mode(17Hz)	-	-	0.75	mA	At VCC=3.3V
	Sleep mode(13Hz)	-	-	0.56	mA	At VCC=3.3V
	Sleep mode(10Hz)	-	-	0.42	mA	At VCC=3.3V
	Deep Sleep mode(1Hz)	-	-	46	uA	At VCC=3.3V
IFREEZE	Freeze Mode	-	-	1.9	uA	At VCC=3.3V

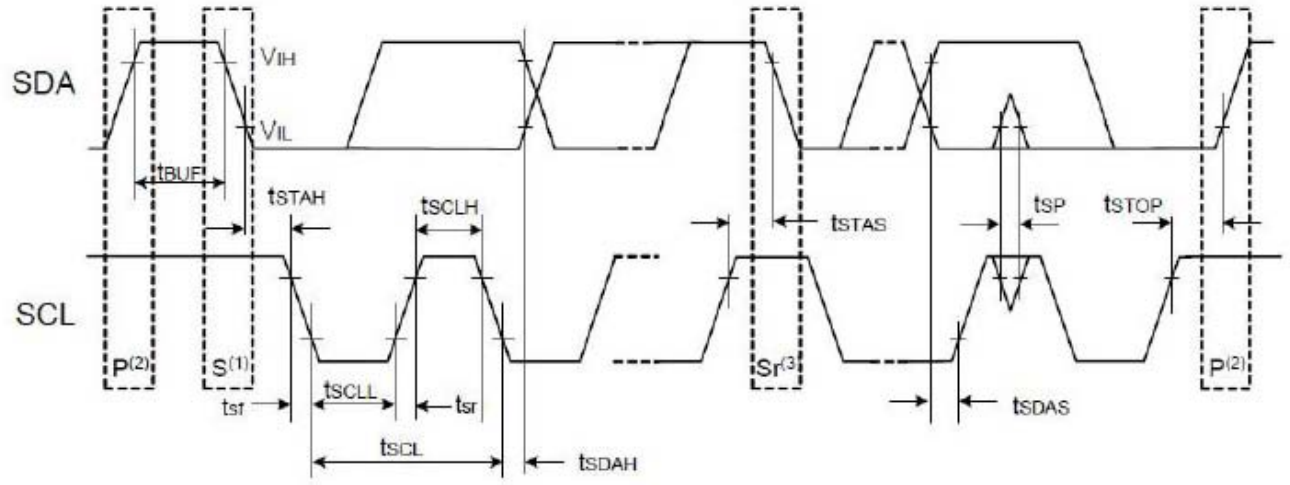
10.4 CTP Pin Connections

No.	Name	I/O	Description
1	VCC	-	Power; VCC=3.3V(typ.)
2	RST	I	Reset. Active low
3	SCL	I	Clock; 100KHz
4	ATTB	O	Interrupt. Active low when data output from touch panel
5	SDA	I/O	Serial data access
6	GND	-	Ground
7	NC	-	Not connect
8	NC	-	Not connect
9	NC	-	Not connect
10	NC	-	Not connect

10.5 CTP Interface and Data Format [Slave address is 0x5C（7 bit addressing）]

Communication protocol: I^2C

Clock frequency : 100Khz （400Khz Fast mode）



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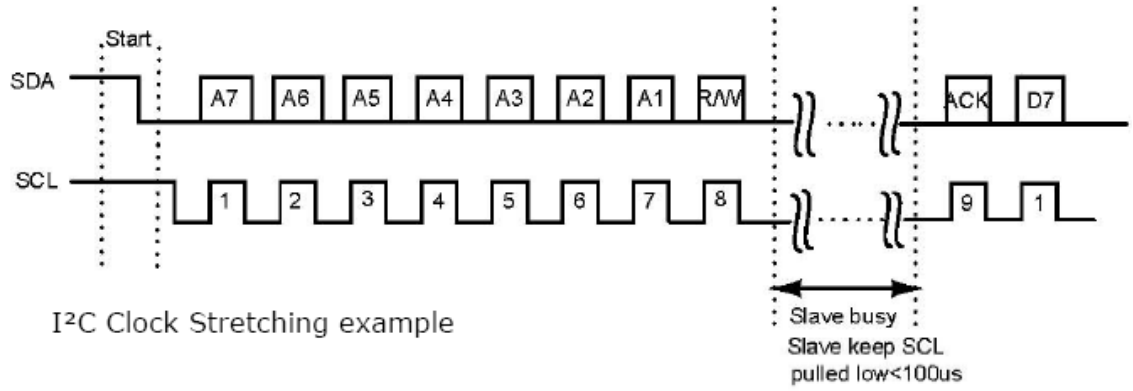
Note：(1) Start Condition;(2)Stop Condition;(3)Retransmit start condition

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

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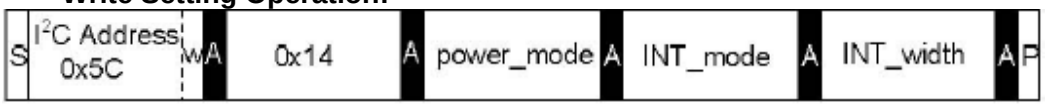
10.6 Timing Characteristic

Write Bytes to I2C Slave：

Write packets have variable content length decided by the host. Write operation stops when host issue and I²C STOP symbol. The write packet is illustrated in below Write Operation & Write Setting Operation protocol. Following the I²C device address, the first byte of the write packet is always the destination register address, referred in Note1 registers table. Subsequent data values are written at the register pointed by the address, immediately upon reception of the byte. The address counter is automatically incremented. Subsequent data bytes are treated in continuations of the writing operation.

Write Operation:

Write Setting Operation:

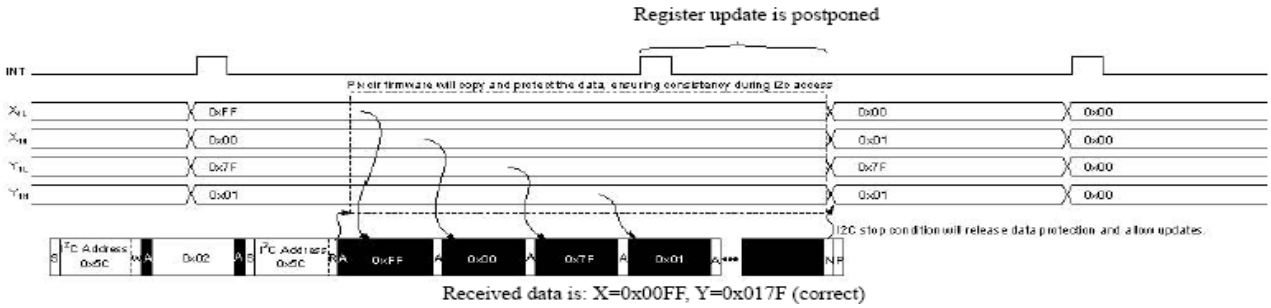


Read Bytes from Slave

Read packets have variable content length decided by the host. It's available to do a single read operation or a sequential read operation. Therefore, the beginning register address is need to set before a read operation. And the data sent exactly follow the Note1 MSI register table afterward. And the firmware in the slave will use a memory copy of the register fro I²C slave read operation, so that it can continue updates and I²C slave is still using a consistent but old coordinates for read operation as below,

In a sequential read operation, the first data sent by the MSI device is therefore the touching register, and then the old touching, then X and Y coordinates of the 1st finger, then coordinates of the 2nd , and so on. Refer below,

If the host does not finish the read operation when the INT line is set again, the slave firmware will delay to update coordinates registers for I²C read operation until the host finish the read operation referred to below



Received data is: X=0x00FF, Y=0x017F (correct)

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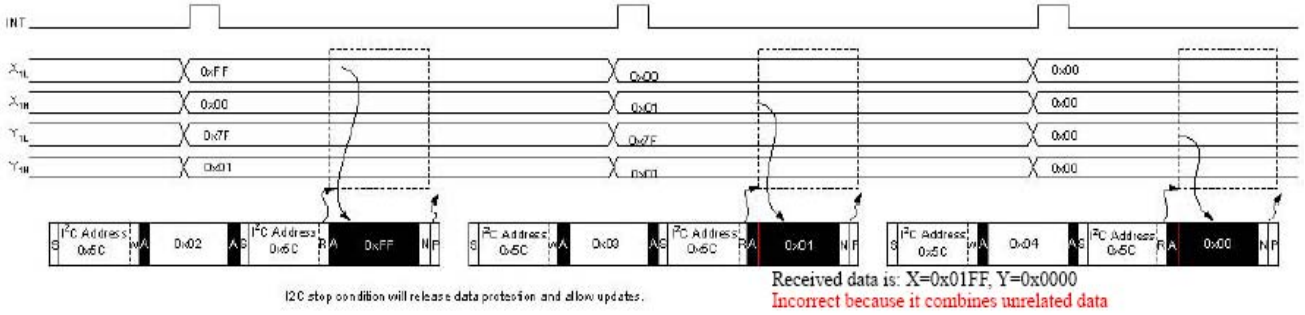
I²C stop condition will release data protection and allow the slave firmware update the coordinates registers for I²C read operation. So, the host has the change to give incorrect data when it gets the coordinates data with single read operation. Because the host sends many times for I²C stop condition in each multi-fingers coordinate's position reading, it will give the slave firmware chance to update the coordinates registers for I²C read operation, the host will give a combine unrelated data combines new and old coordinates together, referred to below



Note1：Registers

Address	Name	Description	R/W
0	touching	Number of fingers touching	R
1	old touching	Previous scan number of fingers touching	R
2 (low part)	posX	X coordinate of the first finger Only valid if touch>0	R
3 (high part)			
4 (low part)	posY	Y coordinate of the first finger Only valid if touch>0	R
5 (high part)			
6 (low part)	posX2	X coordinate of the second finger. Only valid if touch>1	R
7 (high part)			
8 (low part)	posY2	Y coordinate of the second finger. Only valid if touch>1	R
9 (high part)			
20	Power_mode	Power_mode switching register	R/W
53	CRC	Whole program memory checksum	R
54			
55	specop	Special operation	R/W

10.7 Operating Mode Register

10.7.1 POWER_MODE Register

Address	Name	Description of POWER_MODE Register
7-4	IDLE_PERIOD[3-0]	Refer to ALLOW_SLEEP function description
3	-	Not used
2	ALLOW_SLEEP	Allow self demotion from active to sleep mode, provide that this flag is set. If the MSI device is in active mode and no fingers is detected for more than IDLE_PERIOD time, then it allow AUTO JUMP to sleep mode. If this flag is not set, the host must explicitly switch the device from active to sleep mode.
1-0	POWER_MODE[1-0]	Power mode setting of the MSI device: 00:Active Mode 01:Sleep Mode 10:Deep Sleep Mode 11:Freeze Mode

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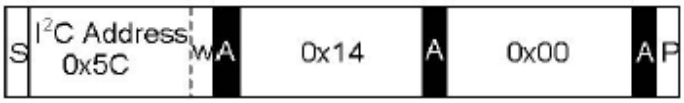
10.7.2 ATTB_MODE Register

Address	Name	Description
7-4	-	Not used
3	EN_ATTB	0:disable interrupt mode 1:enable interrupt mode
2	ATTB_POL	0:the interrupt is low active(default) 1:the interrupt is high active
1-0	ATTB_MODE[1-0]	00:ATTB assert periodically 01:ATTB assert only when finger moving 10:ATTB assert only when finger touch(default)

10.7.3 Power management

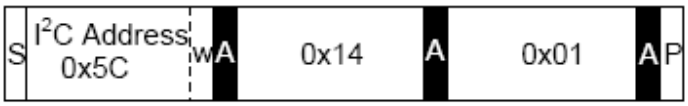
Active mode

In this mode, the slave resumes with a new scan directly after each I²C transfer (after ATTb rising edge). This is used to reach the highest refresh rate, but also has the highest current consumption. Below shows how to force the slave into Active mode.



Sleep mode

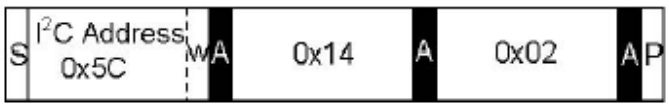
This mode is selected to decrease the current consumption during low activity phases on the sensor, which need a lower refresh rate. The MSI can automatically switch to Active mode(when finger is detected, provided that ALLOW_SLEEP bit is set in the POWER_MODE register. Also, the MSI can automatically switch from Active to Sleep mode when no finger is detected for more than IDLE_PERIOD time, provided that ALLOW_SLEEP bit is set in the POWER_MODE register. Below sequence shows how to force the slave into Sleep mode and how to force the slave into sleep mode can automatically switch, provided IDLE_PERIOD=10.



Sleep mode sequence

Deep Sleep mode

This mode is selected to achieve the minimum consumption during very low activity phases on the sensor, which need a lowest refresh rate(1Hz). The MSI only can switch to Deep Sleep mode by set POWER_MODE register. Below shows how to force the slave into Deep Sleep mode.



Deep Sleep Mode Sequence

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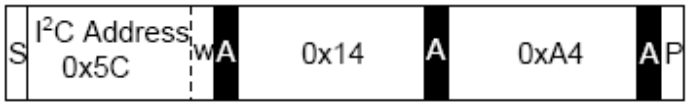
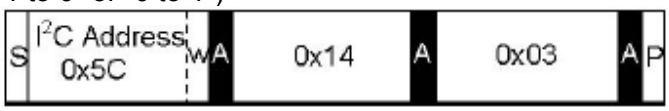


Sleep mode automatically switch sequence

Freeze mode

In this mode, the slave MCU internal clock source is stopped, and consumption is only MOS leakage. Below shows how to force the slave into Freeze mode. There is one way to wake up from freeze mode.

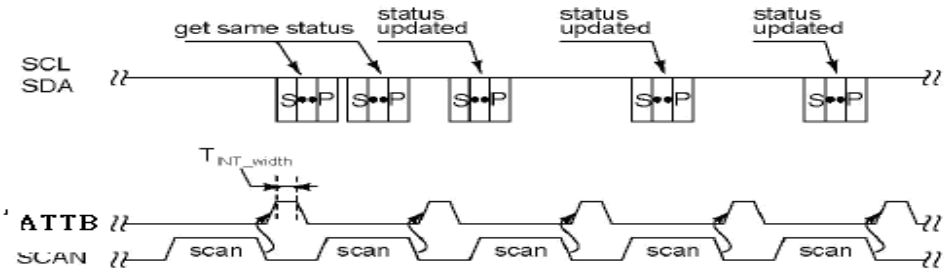
• INT pin change (“1 to 0” or “0 to 1”)



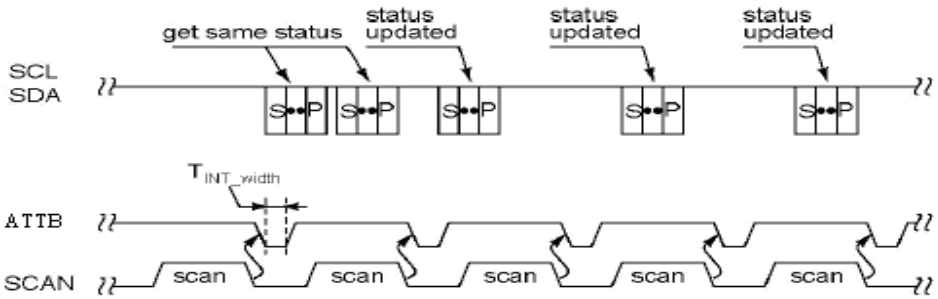
Freeze Mode sequence

10.7.4 Transition of ATTB

When ATTB_MODE=00 in the ATTB MODE register, the slave will set the ATTB line with ATTB_width pulse width after each scan in order to request the attention from the host, as shown in below



ATTB line pull up by slave (ATTB_POL=1, ATTB_MODE=00 in the ATTB mode register)



ATTB line pull down by slave (ATTB_POL=0, ATTB_MODE=00 in the ATTB mode register)

When ATTB_Mode=01 in the ATTB mode register and finger moving on the panel, the slave will set The ATTB line after each scan, as shown in below.

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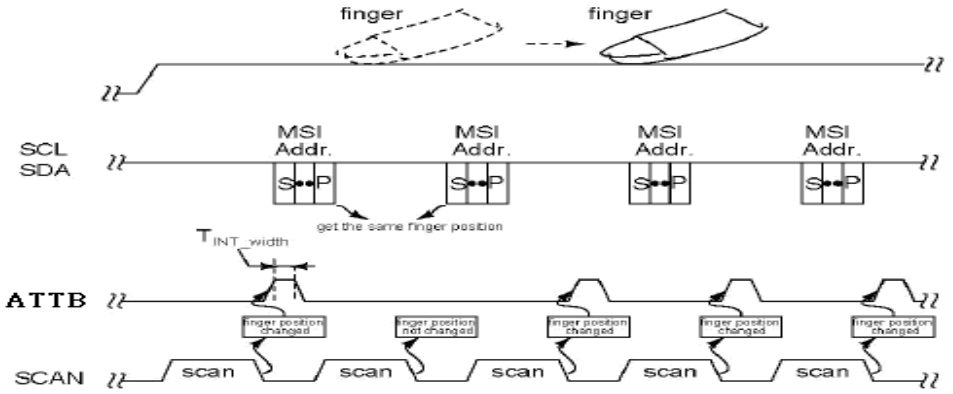
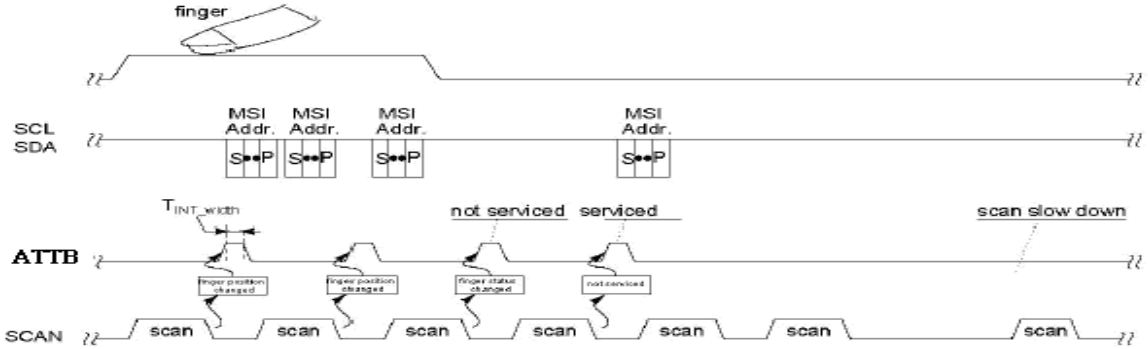


ATTB line pull up when finger moving (ATTB_POL=1, ATTB_MODE=01 in the ATTB mode register)

When fingers leaves the panel, the slave will continue to pulse ATTB line for each scan; but once the master has serviced this request and become now aware that there is no more finger touching, the slave will stop pulse the ATTB line, and will also gradually reduce the scan speed, as shown in below

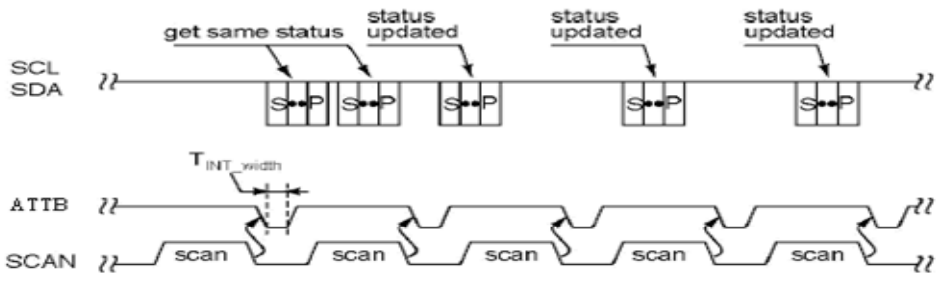


ATTB line will stop pulse when finger leaves and master has acknowledge the situation (ATTB_POL=1 in the ATTB mode register)

When ATTB_Mode=10 in the ATTB mode register and finger touch the panel, the slave will set The ATTB line after each scan as shown in below.

ATTB line pull up when finger touch (ATTB_POL=1,ATTB_MODE=10 in the ATTB mode register)

When fingers leaves the panel, the slave will continue keep ATTB line status for each scan; but once the master has serviced this request and become now aware that there is no more finger touching, the slave will release the ATTB line, and will also gradually reduce the scan speed, as shown in below



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ATTB line will stop pulse when finger leaves and master has acknowledge the situation (ATTB_POL=1 in the ATTB mode register)

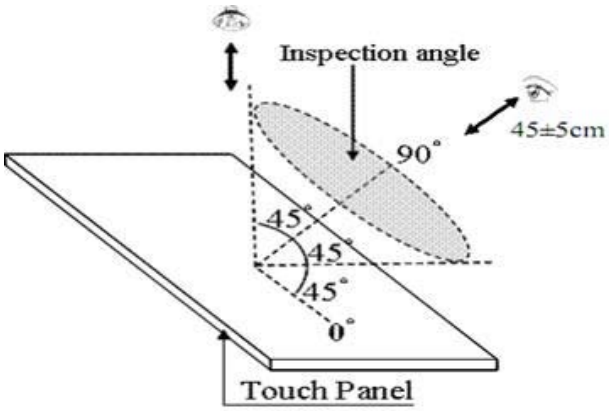
11. Appearance Specification

11.1Inspection and Environment conditions

11.1.1 Temperature: 22±2℃
11.1.2 Humidity: 55±5%RH
11.1.3 Light source: Fluorescent Light
11.1.4 Inspection: Viewing distance: 35±5cm
11.1.5 Ambient Illumination:
(1) Cosmetic Inspection: 500 ~ 800 lux
(2) Functional Inspection: 400 ~ 600 lux
11.1.6 Inspection View angle:
(1) Inspection under operating condition : ±5°
(2) Inspection under non-operating condition : ± 45°

11.2 Appearance inspection

Appearance inspection method:
Front visual distance: 30-40CM



11.3 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.

11.4 Cosmetic Specification and Inspection Items

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

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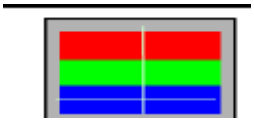
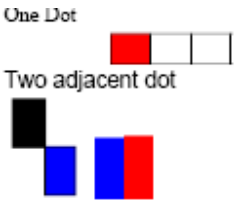
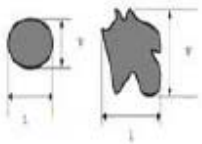
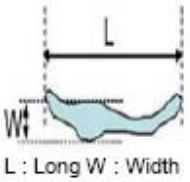
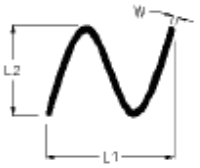
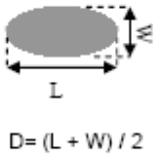
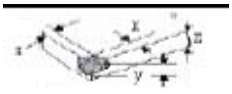
Line defect	No obvious vertical or horizontal line defect (black line or white line)	
Dot defect	Item / Acceptable quantity / Total quantity Bright dot 2 Dark dot 4 Two adjacent dark dots 2 2	
Dot of foreign material	SPEC / Acceptable quantity D>0.8mm 0 0.3mm≦D≦0.8mm 5 D<0.3mm Ignorable	
Line of foreign 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	

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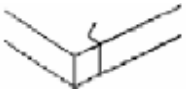
Edge damage	X<3mm Y<3mm Z<glass	
TP crack	prohibited	
Bubble in protective film	SPEC Acceptable quantity D>1.0mm N=0 0.5<D<1.0mm N=2 D<0.5 Ignorable	
TP deviation	According to customer drawing spec	
Bubble	D≦0.2mm ignorable 0.2mm＜D≦0.5mm 2 bubbles accepted 0.5mm＜D prohibited	
Printing ink	Light leak 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	

11.5 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.

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12. QUALITY ASSURANCE

12.1 Test Condition

12.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

12.1.2 Operation

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

12.1.3 Container

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

12.1.4 Test Frequency

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

12.1.5 Test Method

Reliability Test Item & Level		Test Level
No.	Test Item	
1	High Temperature Storage Test	T=+80℃,240hrs
2	Low Temperature Storage Test	T=-30℃,240hrs
3	High Temperature Operation Test	T=+70℃,240hrs
4	Low Temperature Operation Test	T=-20℃,240hrs
5	High Temperature and High Humidity (No operation)	T=40℃,90%RH,240hrs
6	Thermal Cycling Test (No operation)	-30℃ → +25℃ → +80℃, 100 Cycles 30 min 5 min 30 min
7	Vibration Test (No operation)	Frequency :10 ~ 55 H_Z Amplitude :1.5 mm Sweep time : 11 mins Test Period: 6 Cycles for each direction of X, Y, Z

12.2 Judgment standard

The Judgment of the above test should be made 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.

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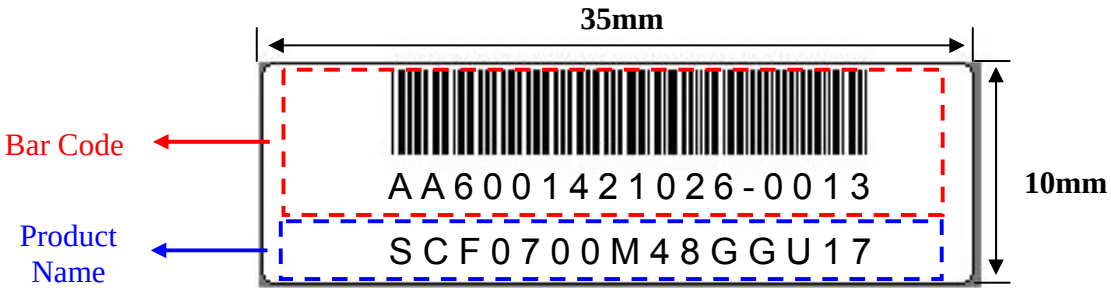
13. PRODUCT LABEL DEFINE

Product Label style:



BarCode Define:

A A 6 0014 2 10 26-0013

- Serial number of the products
  Serial number starts from 0000
  Every work order is 10K at most
- Week of production
- Year of production
- Storage area
- Serial number of work order
  Serial number starts from 0000 each month
- Month of work order
- Year of work order
- The first 3 numbers of work order

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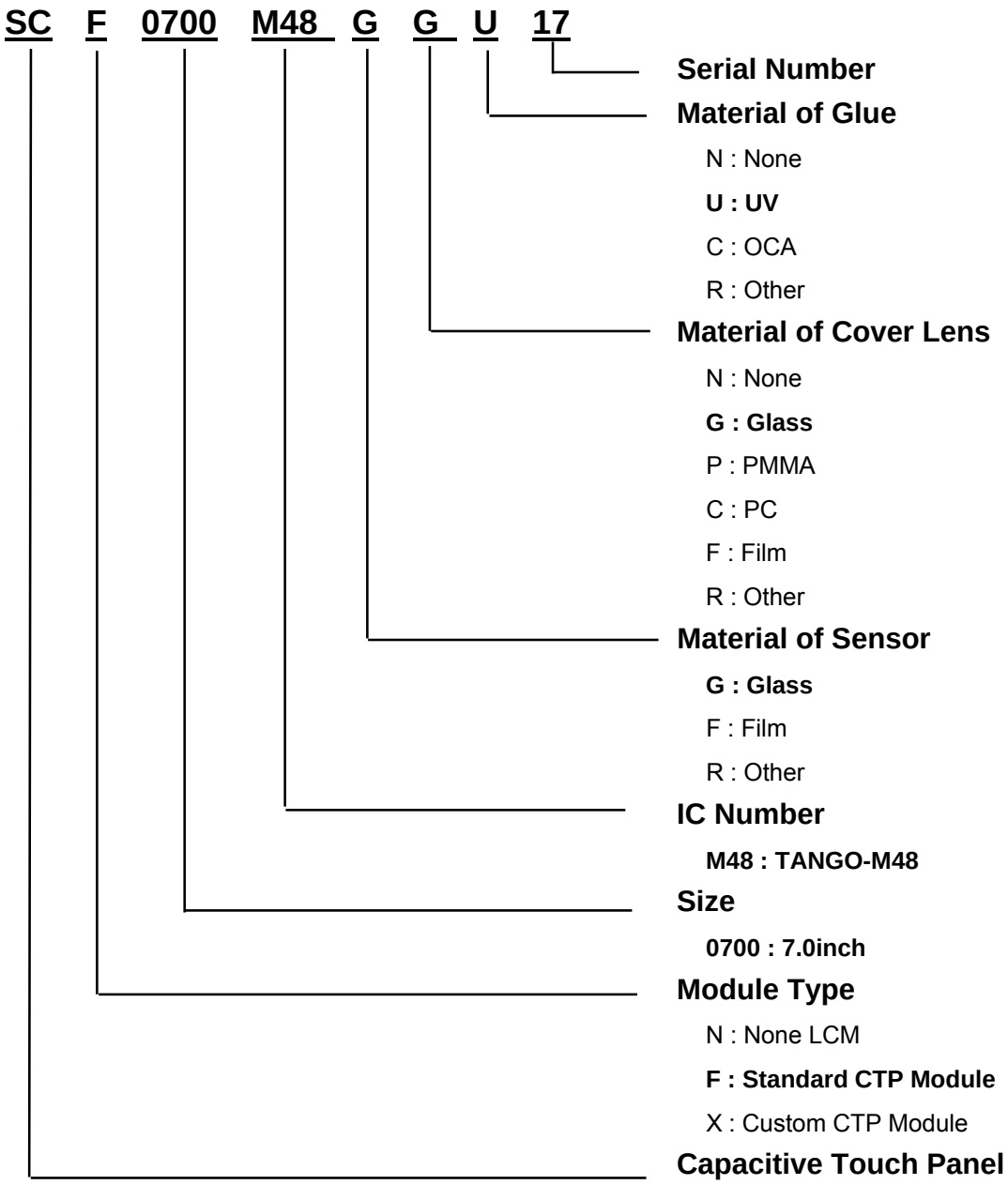
Product Name Define:



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14. 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.

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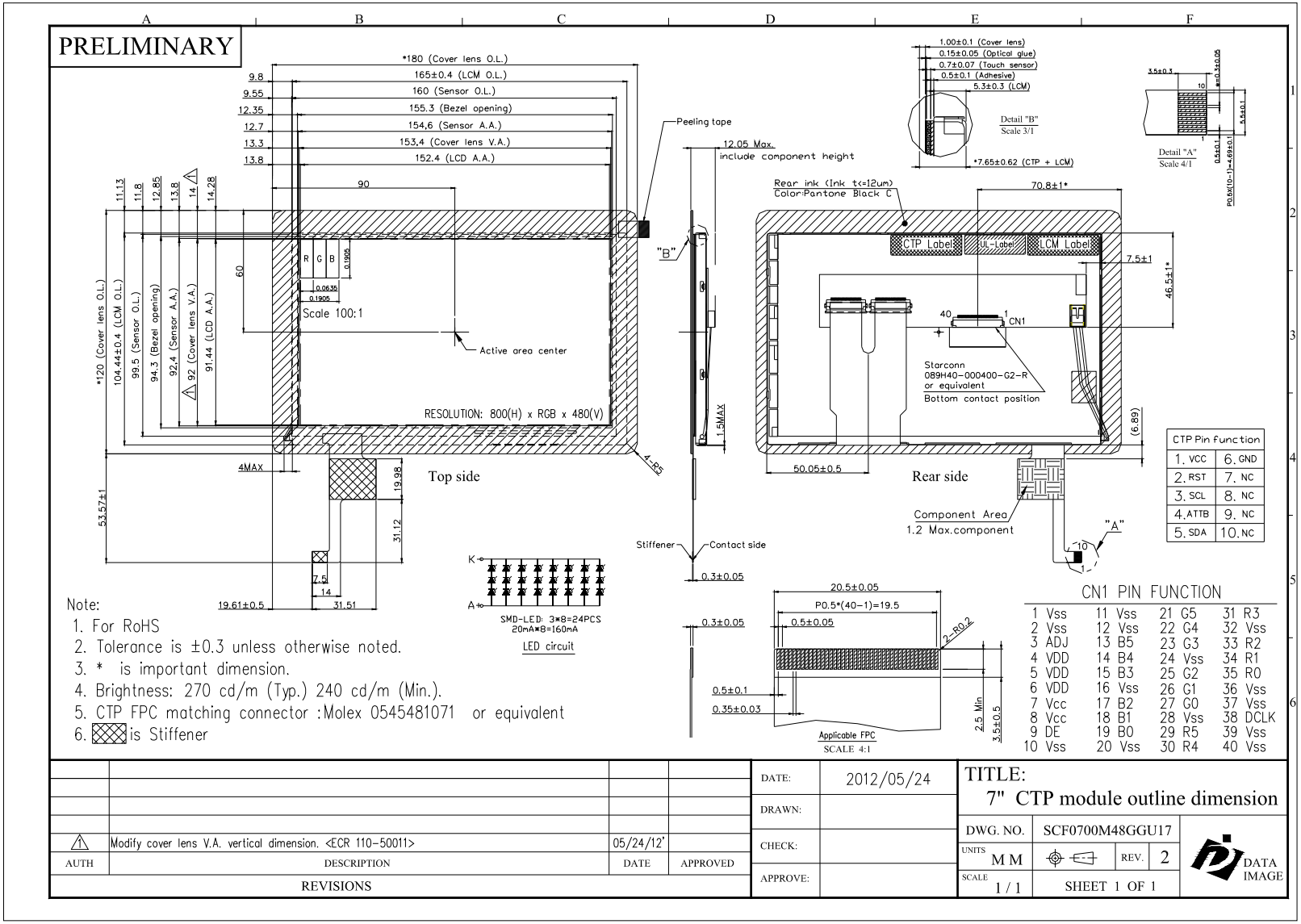
15. OUTLINE DRAWING



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16. PACKAGE INFORMATION

TBD

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