



# DATA IMAGE CORPORATION

## CTP Module Specification

Preliminary

ITEM NO.: SCF0403526GGU38

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	ALEX	PRETTY	DAVID	KEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	3	09/JUL/15'		41

**2. RECORD OF REVISION**

Rev	Date	Item	Page	Comment	Source
1	07/APR/14'			Initial preliminary	ESR0304001
2	06/DEC/14'	4.2 8.1	3 9	Add LED life time. Add Report rate, Response time&(X,Y)position.	11S-EC0012
3	09/JUL/15'	8.1 11.2 14	9 34 40	Update General Specifications, Add fw Update Inspection Judgment standard Modify OUTLINE DRAWING from Rev 1 to 2.	11S-F70004

### 3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Display resolution	480X R.G.B x 272	dot
LCD Active area	95.04(W) x 53.856(H)	mm
Sensor A A	98.7(W) x 57.5(H)	
Screen size	4.3(Diagonal)	inch
Pixel pitch	0.198 (W) x 0.198(H)	mm
Color configuration	R.G.B. Stripe	
Overall dimension	110.5 (W) x 72.7(H) x 5.1(D)	mm
Weight	TBD	g
Surface treatment	Glare	
LCM model number	FX04032BDSSWBG01	
View Angle direction(Gray inversion)	6 o'clock	
Our components and processes are compliant to RoHS standard		

### 4. ELECTRICAL CHARACTERISTICS

#### 4.1 Operating Conditions

GND=0V, Ta=25°C

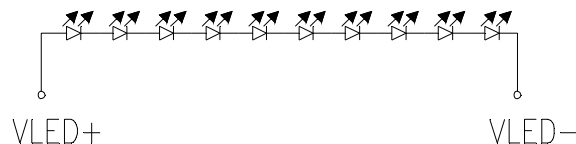
Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	Note1
Power Supply Current	I <sub>DD</sub>	--	17	20	mA	V <sub>DD</sub> =3.3V
Ripple Voltage	V <sub>RPVDD</sub>	--	--	100	mVp-p	
"H" level logical input voltage	V <sub>IH</sub>	0.8VDD	--	VDD	V	
"L" level logical input voltage	V <sub>IL</sub>	0	--	0.2VDD	V	
Operating temperature	Topa	-20	--	70	°C	Ambient temperature
Storage temperature	Tstg	-30	--	80	°C	Ambient temperature

Note1:VDD Absolute Maximum Ratings -0.3V~+6V

#### 4.2 Backlight driving for power conditions

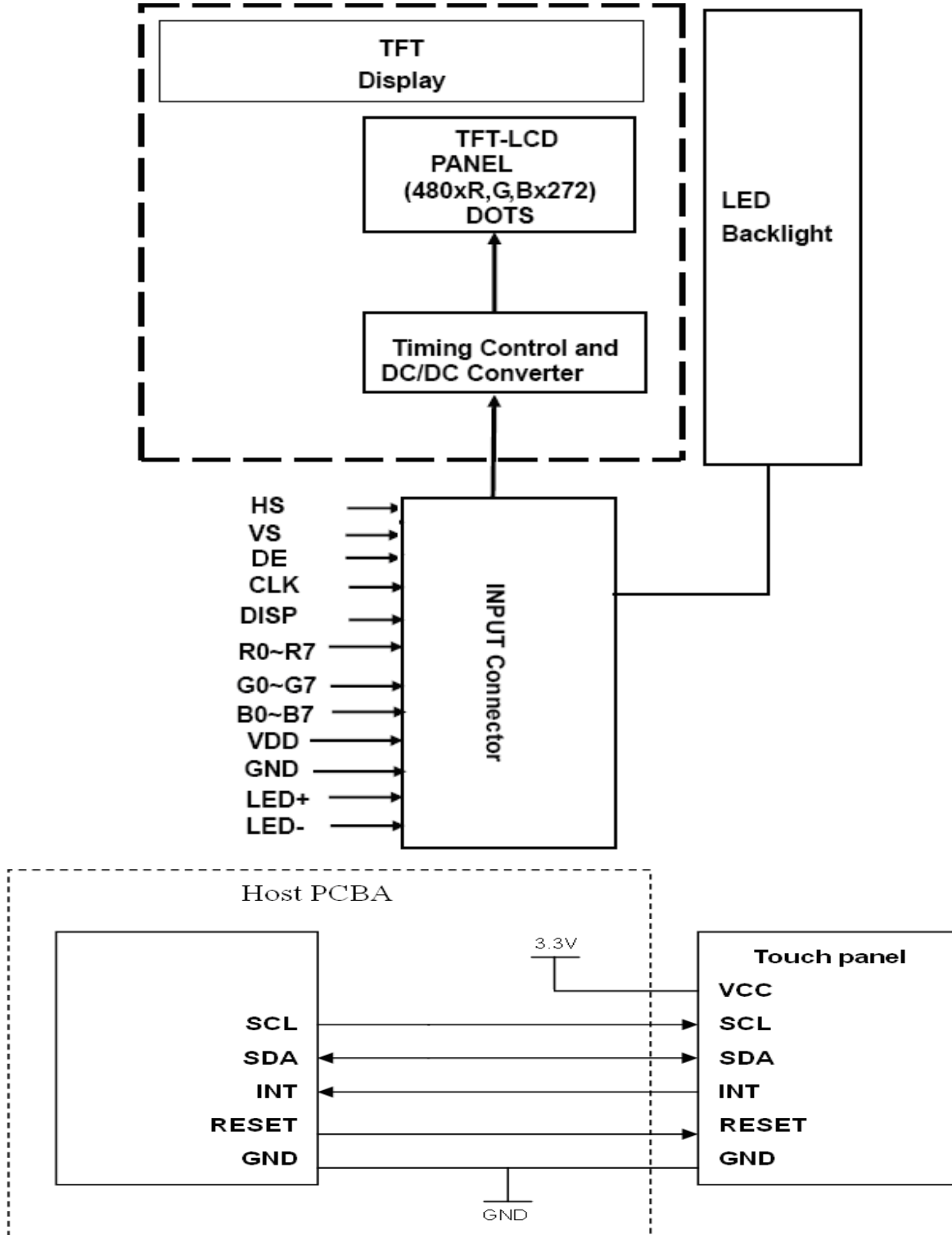
Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I <sub>LED</sub>	--	15	--	mA	
VLED voltage	V <sub>LED</sub>	28	--	36	V	I <sub>LED</sub> =15 mA
LED life time		15,000	30,000	--	Hours	Note 1

 Note 1 under room temperature (25 °C, Humidity 30-60% RH)and I<sub>LED</sub>=15mA.

 Voltage : V<sub>LED</sub>= 28V~36V

Current : 15mA

### 5. BLOCK DIAGRAM



## 6. PIN CONNECTIONS

### 6.1 Input Pins Connection

Pin No	Symbol	Function	Remark
1	LED-	LED Power Source input terminal (Cathode side)	
2	LED+	LED Power Source input terminal (Anode side)	
3	NC	No Connect	
4	VDD	Power Supply : +3.3V	
5	R0	Digital data input. R0 is LSB and R7 is MSB	
6	R1		
7	R2		
8	R3		
9	R4		
10	R5		
11	R6		
12	R7		
13	G0	Digital data input. G0 is LSB and G7 is MSB	
14	G1		
15	G2		
16	G3		
17	G4		
18	G5		
19	G6		
20	G7		
21	B0	Digital data input. B0 is LSB and B7 is MSB	
22	B1		
23	B2		
24	B3		
25	B4		
26	B5		
27	B6		
28	B7		
29	GND	Ground	
30	CLK	clock signal to sample each data	
31	DISP	Display ON/OFF Control ON=H(VDD), OFF=L(GND)	
32	HS	Horizontal synchronous signal	
33	VS	Vertical synchronous signal	
34	DE	Data enable	
35	NC	No Connect	
36	GND	Ground	
37	NC	No Connect	
38	NC	No Connect	
39	NC	No Connect	
40	NC	No Connect	

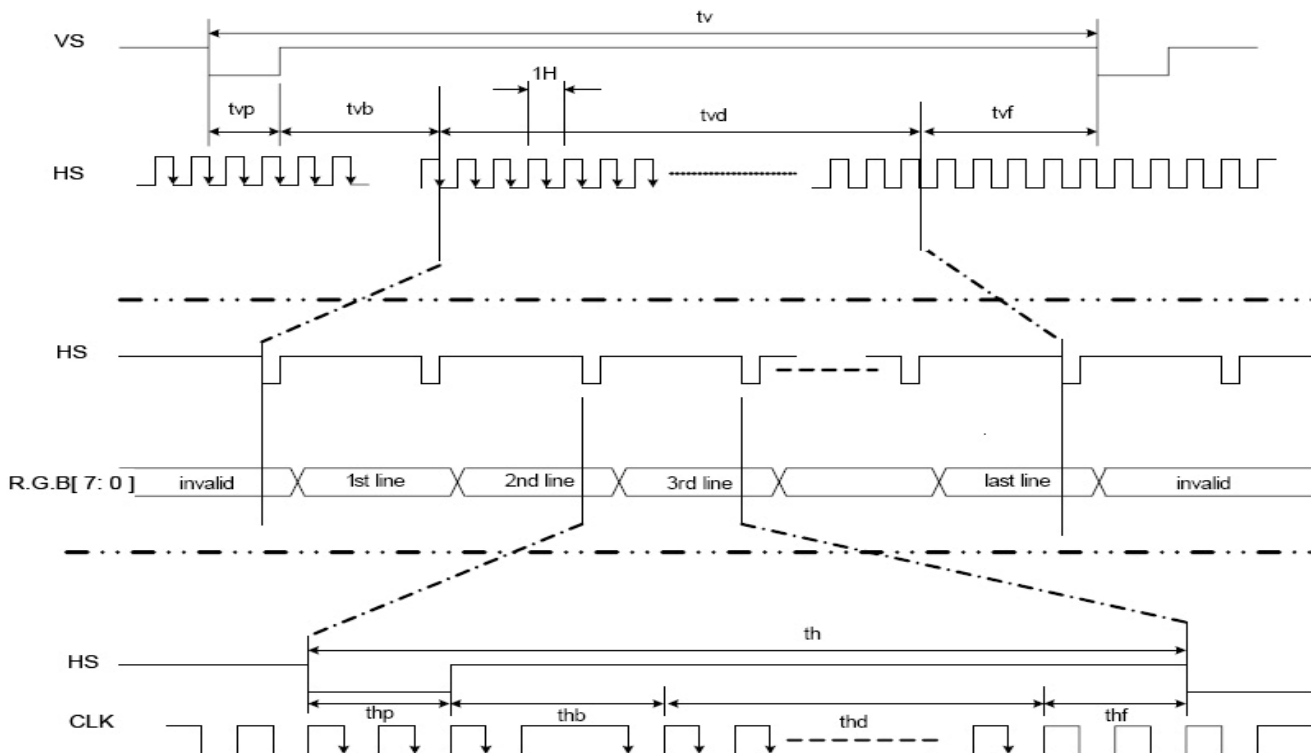
## 7. AC CHARACTERISTICS

### 7.1 Input Timing Requirement

 (480RGBx272,  $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 3.3\text{V}$   $GND = 0\text{V}$ )

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Clock cycle	$f_{\text{CLK}(1)}$	-	9	15	MHz
HS cycle	$1/\text{th}$	-	17.14	-	KHz
VS cycle	$1/\text{tv}$	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	$\text{thp}^{(2)}$	2	41	41	CLK
Horizontal back porch	$\text{thb}^{(2)}$	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	511	$\text{H}^{(1)}$
Vertical display period	tvd	272	272	272	$\text{H}^{(1)}$
Vertical front porch	tvf	1	2	227	$\text{H}^{(1)}$
Vertical pulse width	$\text{tvp}^{(2)}$	1	10	11	$\text{H}^{(1)}$
Vertical back porch	$\text{tvb}^{(2)}$	1	2	11	$\text{H}^{(1)}$

**Note:** (1) Unit:  $\text{CLK} = 1/f_{\text{CLK}}$ ,  $\text{H} = \text{th}$ ,

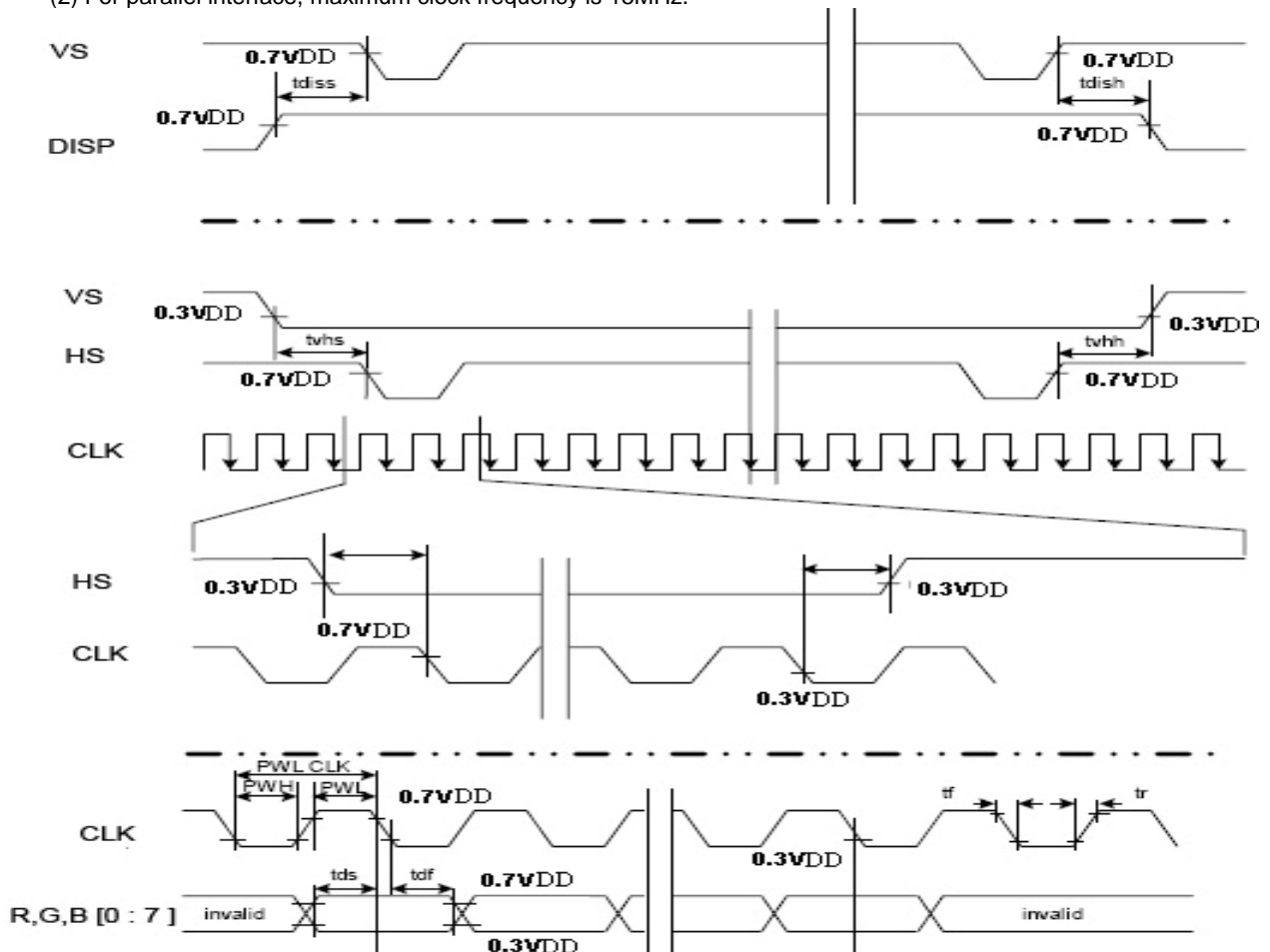
 (2) It is necessary to keep  $\text{tvp} + \text{tvb} = 12$  and  $\text{thp} + \text{thb} = 43$  in sync mode.

**Fig 1. Parallel RGB input timing**

**7.2 Input Setup Timing Requirement**

(Ta=25°C, VDD=3.3V, GND= 0V, tr(1)=tf(1)=2ns)

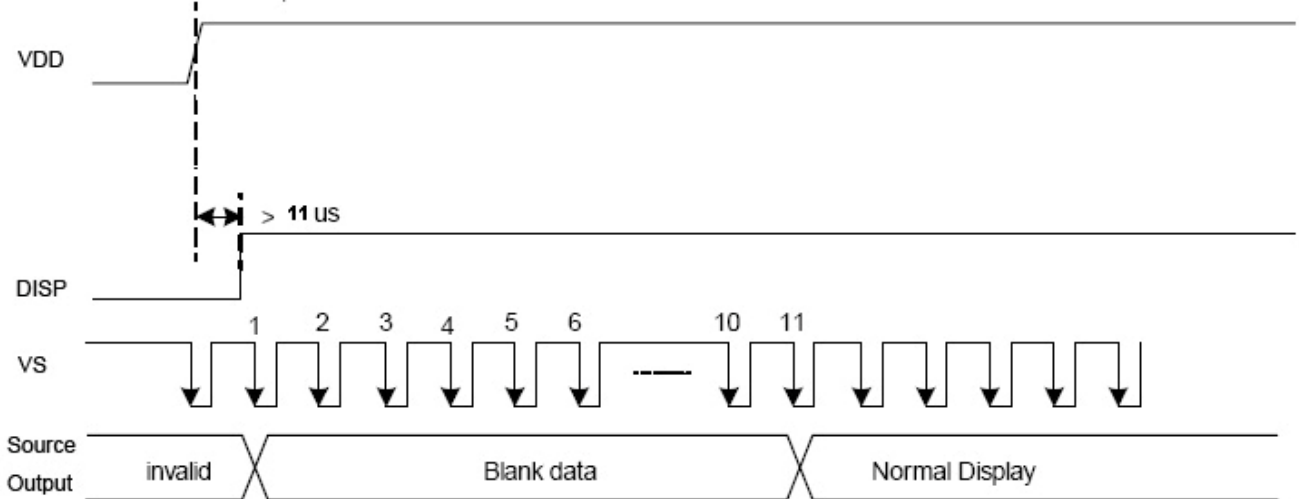
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
DISP setup time	t <sub>diss</sub>	10	-	-	ns
DISP hold time	t <sub>dish</sub>	10	-	-	ns
Clock period	PW <sub>CLK(2)</sub>	66.7	-	-	ns
Clock pulse high period	PWH <sub>(2)</sub>	26.7	-	-	ns
Clock pulse low period	PWL <sub>(2)</sub>	26.7	-	-	ns
HS setup time	t <sub>hs</sub>	10	-	-	ns
HS hold time	t <sub>hh</sub>	10	-	-	ns
Data setup time	t <sub>ds</sub>	10	-	-	ns
Data hold time	t <sub>dh</sub>	10	-	-	ns
VS setup time	t <sub>vhs</sub>	10	-	-	ns
VS hold time	t <sub>vhh</sub>	10	-	-	ns

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

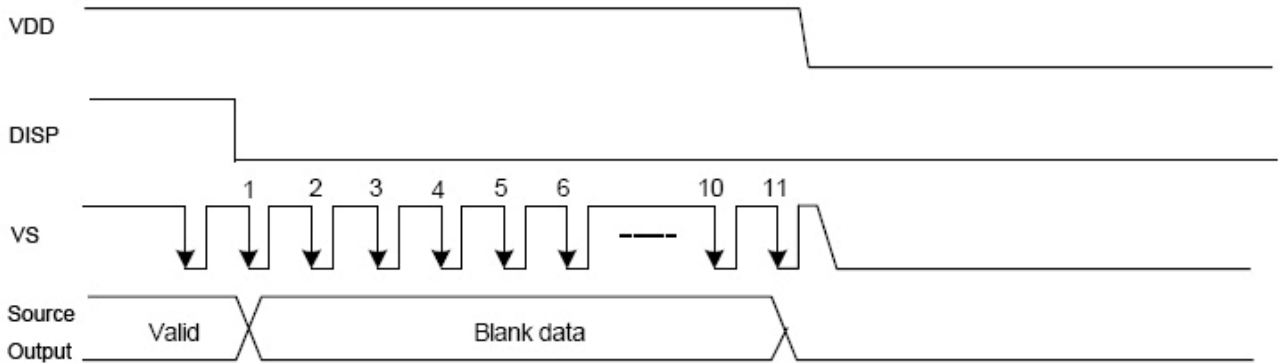

**Fig 2. Input setup timing requirement**

### 7.3 TCON Power ON/OFF Control

The TCON IC has a power ON/OFF sequence control function. When DISP pin is pulled "H", blank data is outputted for 10-frames first, from the falling edge of the following VSYNC signal. Similarly, when DISP is pulled "L", 10-frames of blank data will be outputted from the falling edge of the following VSYNC, too.



**Fig 3. Power On Sequence**

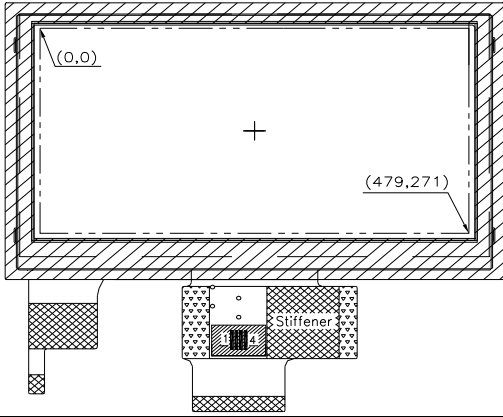


**Fig 4. Power Off Sequence**



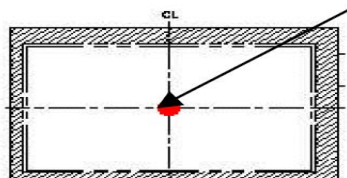
## 8. CTP INTERFACE AND DATA FORMAT

### 8.1 GENERAL SPECIFICATIONS

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Multi touch	2	Point
Interface	IIC	
Report rate	Max : 122	Points/sec
Response time	15	ms
(X,Y)position		
Point hitting life time	1,000,000 times min.	Note 1
F/W:DataImage_CTP_C12_TEST_C12_2014-04-22_1156.Bin		
Ver: C12.		

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.

central point



## 8.2 Electrical Characteristic

### 8.2.1 Absolute Maximum Rating

Parameter	Symbol	Spec.			Unit
Supply voltage	VCC	-0.3	-	7	V
Switch control signals output current	Output current	-	50	-	mA
Enable control voltage range	Logic Input	-0.3	-	VCC+0.3	V
Output Control Driver	Output voltage	-0.3	-	VCC	V

### 8.2.2 DC Characteristic

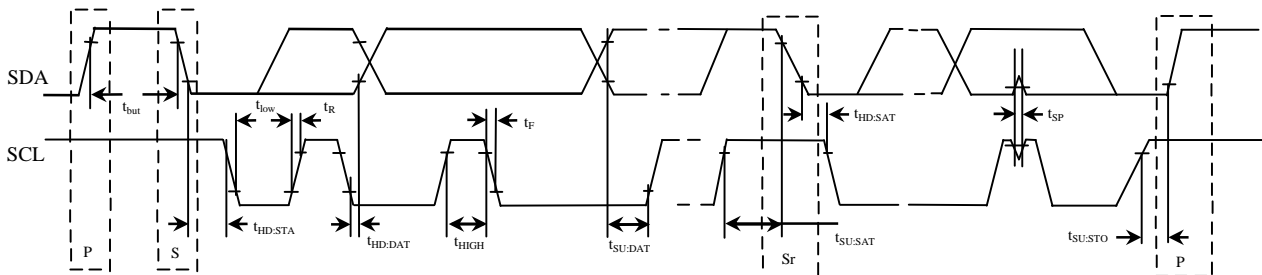
Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC	Supply voltage	2.7	3.3	3.5	V	
Ivcc	Supply current		12		mA	
IST	sleep mode		30		uA	

### 8.3 CTP Pin Connections

No.	Name	I/O	Description
1	VCC	-	Power; VCC=3.3V
2	GND	-	Ground
3	/INT	O	Interrupt, Active low
4	SCL	I	Serial clock
5	SDA	I/O	Serial data
6	/RESET	I	Reset, Active LOW.

### 8.4 Interface and Data Format (Slave address is 0x94H)

#### AC characteristics of the SDA and SCL bus lines for I<sup>2</sup>C-bus devices



Parameter	Symbol	Standard-Mode I <sup>2</sup> C-BUS		Fast-Mode I <sup>2</sup> C-BUS		Unit
		Min.	Max.	Min.	Max.	
SCL clock frequency	$f_{SCL}$	0	100	0	400	KHz
Bus free time between STOP and START condition	$t_{BUF}$	4.7	-	1.3	-	$\mu$ s
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD:STA}$	4.0	-	0.6	-	$\mu$ s
LOW period of the SCL clock	$t_{LOW}$	4.7	-	1.3	-	$\mu$ s
HIGH period of the SCL clock	$t_{HIGH}$	4.0	-	0.6	-	$\mu$ s
Set-up time for a repeated START condition	$t_{SU:STA}$	4.7	-	0.6	-	$\mu$ s
Data hold time	$t_{HD:DAT}$	0	-	0	0.9	$\mu$ s
Data set-up time	$t_{SU:DAT}$	250	-	100	-	$\mu$ s
Rise time of both SDA and SCL signals	$t_R$	-	1000	$20+0.1C_b$	300	$\mu$ s
Fall time of both SDA and SCL signals	$t_F$	-	300	$20+0.1C_b$	300	$\mu$ s
Set-up time for STOP condition	$t_{SU:STO}$	4.0	-	0.6	-	$\mu$ s
Capacitive load for each bus line.	$C_b$	-	400	-	400	pF

#### Note:

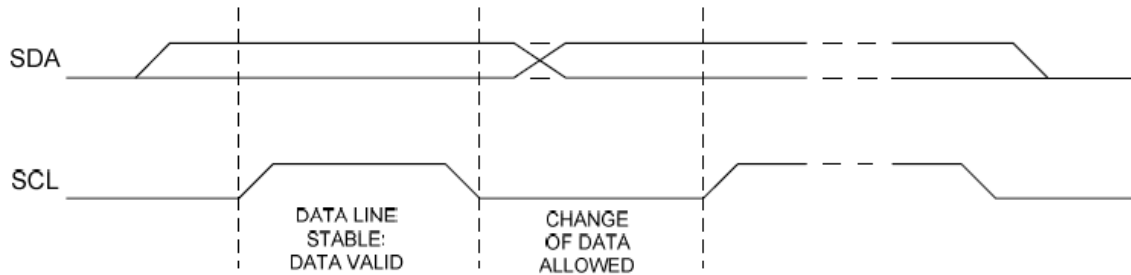
- (1) All values are referred to VIH (0.7xVCC) and VIL (0.3xVCC) level.
- (2) A device must internally provide a hold time of at least 300ns for the SDA signal (referred to the VIH of the SCL signal) in order to bridge the undefined region of the falling edge of SCL.
- (3) The maximum  $t_{HD:DAT}$  has only to be met if the device does not stretch the LOW period ( $t_{LOW}$ ) of the SCL signal.
- (4) A fast-mode I<sup>2</sup>C-bus device can be used in a standard-mode I<sup>2</sup>C-bus system, but the requirement  $t_{SU:DAT} \geq 250$ ns must then be met. This will automatically be the case if the device does not stretch the LOW period of the SCL signal. If such a device does stretch the LOW period of the SCL signal, it must output the next data bit to the SDA line  $t_{R,max} \quad t_{SU:DAT} = 1000+250=1250$ ns (according to the standard-mode I<sup>2</sup>C-bus specification) before the SCL line is released.
- (5)  $C_b$  = total capacitance of one bus line in pF.

## 8.5. Interface and Data Format

### 8.5.1 Transfer protocol (I<sup>2</sup>C interface)

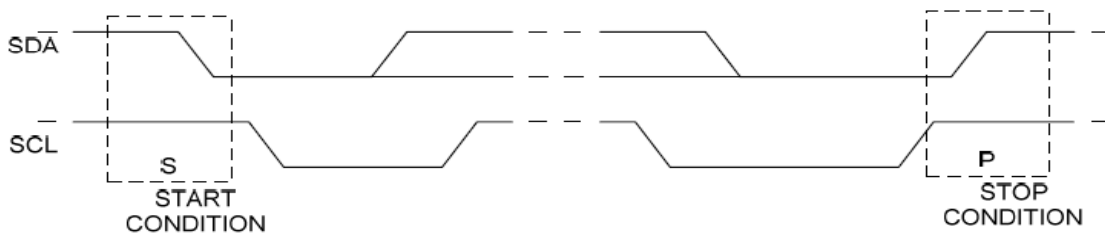
HX8526-A support I<sup>2</sup>C interface that need 2 hardware pin – serial data (SDA) and serial clock (SCL), carry information between the devices connected to the bus. The I<sup>2</sup>C bus supports serial, 8-bit oriented, bi-directional data transferred at a rate up to 100Kbit/s in the standard-mode, or up to 400Kbit/s in the fast-mode.

The data on the SDA line must be stable during the HIGH period of the clock. The HIGH or LOW state of the data line can only change when the clock signal on the SCL line is LOW.



**Figure 8.5.1: I<sup>2</sup>C Signal timing**

Within the procedure of the I<sup>2</sup>C -bus, unique situations arise which are defined as START and STOP conditions. A HIGH to LOW transition on the SDA line while SCL is HIGH is one such unique case. This situation indicates a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition. START and STOP conditions are always generated by the master. The I<sup>2</sup>C bus is considered to be busy after the START condition. The I<sup>2</sup>C bus is considered to be free again a certain time after the STOP condition.



**Figure 8.5.2: I<sup>2</sup>C Start/Stop**

#### The slave address of I<sup>2</sup>C is defined at the follow description

- A. The HX8526-A QFN48 Type 1 and UFBGA Type 1 only support I<sup>2</sup>C interface and the slave address is 90h.
- B. The HX8526-A QFN 48 type 2 , UFBGA Type 2, QFN64 and QFN40 support I<sup>2</sup>C interface and the slave address is selected by A0. If A0="L", the slaver address is 90h. If A0="H", the slaver address is 92h.

In I<sup>2</sup>C slave mode, HX8526-A waits for Master reading the data and acknowledges. Every byte put on the SDA line must be 8-bits long. The number of bytes that can be transmitted per transfer is unrestricted. Each byte has to be followed by an acknowledge bit. Data is transferred with the most significant bit (MSB) first. If HX8526-A can't receive or transmit another complete byte of data until it has performed some other function, for example servicing an internal interrupt, it can hold the clock line SCL LOW to force the master into a wait state. Data transfer then continues when the HX8526-A is ready for another

byte of data and releases clock line SCL

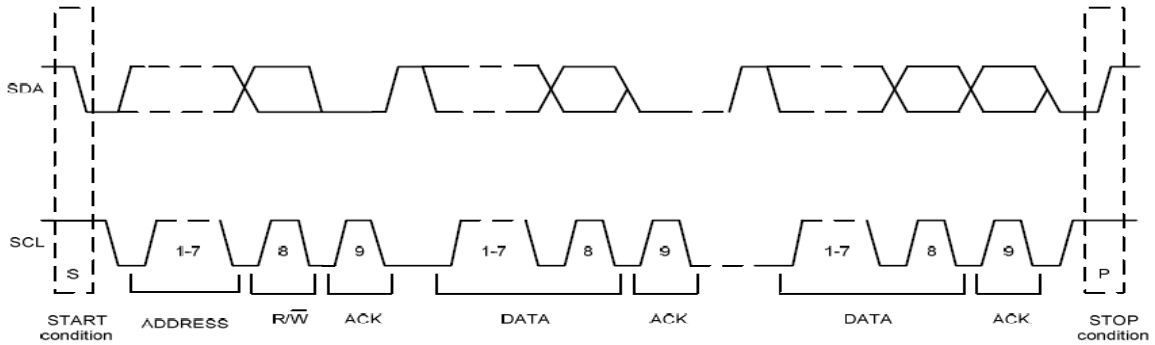
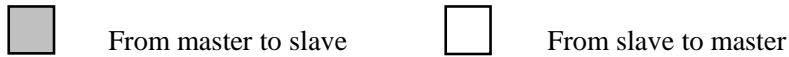
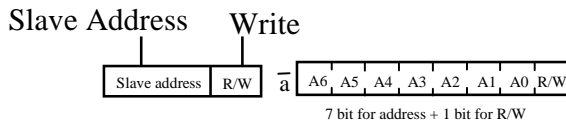
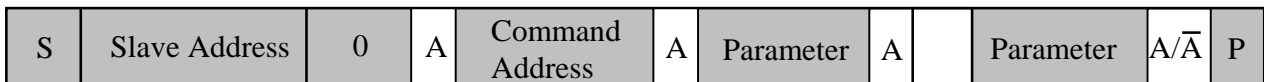


Figure 8.5.3: I<sup>2</sup>C data transfer

### 8.5.2 Format of data frame (I<sup>2</sup>C interface)

When master sends the command which be received by HX8526-A, the HX8526-A will responses the code and data .The format of communication is shown as Figure 11.4. The Command table that is written by master is defined on Table11.1 Command Table. HX8526-A will response the response code first and data later

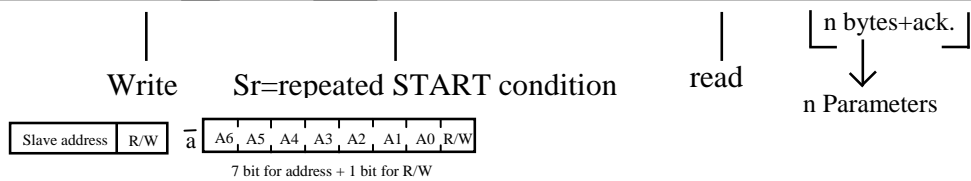
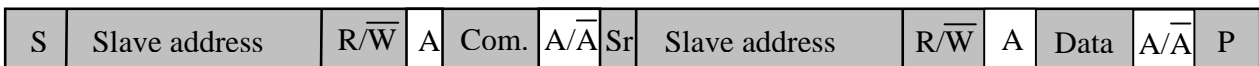
#### Write mode



$\bar{A}$  = acknowledge (SDA LOW)  
 A = not acknowledge (SDA HIGH)  
 S = START condition  
 P = STOP condition

#### Data Format of writing mode

#### Read mode



$\bar{A}$  = acknowledge (SDA LOW)  
 A = not acknowledge (SDA HIGH)  
 S = START condition  
 P = STOP condition

#### Data Format of reading mode

## 9. COMMAND

### 9.1 Command list

Hex	Operation Code	D7	D6	D5	D4	D3	D2	D1	D0	Function
0	No operation	0	0	0	0	0	0	0	0	-
80	Sleep IN	1	0	0	0	0	0	0	0	-
81	Sleep Out	1	0	0	0	0	0	0	1	-
82	Sense Off	1	0	0	0	0	0	1	0	-
83	Sense On	1	0	0	0	0	0	1	1	-
85	Read Event	1	0	0	0	0	1	0	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
86	Read All Events	1	0	0	0	0	1	1	0	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
	5th parameter	E3	E2	E1	E0	F1	P2	P1	P0	-
	6th parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	...	:	:	:	:	:	:	:	:	-
(n+1)th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-	
87	Read Latest Event	1	0	0	0	0	1	1	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
88	Clear Stack	1	0	0	0	1	0	0	0	-
9E	TS Software Reset	1	0	0	1	1	1	1	0	-

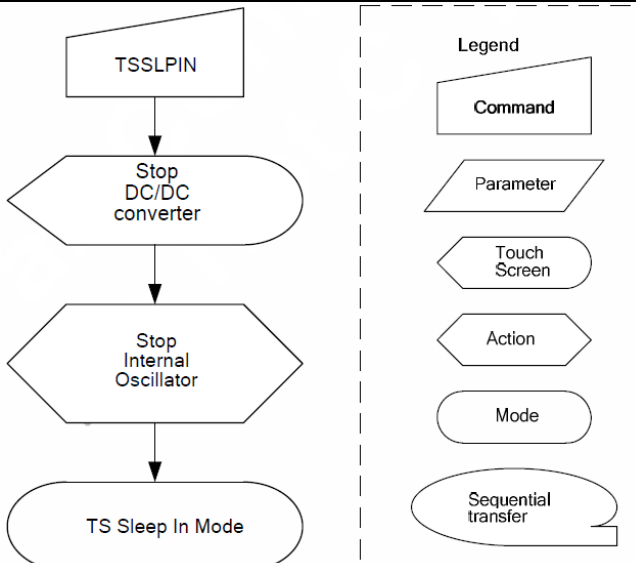
### 9.2 User define command list table

Hex	Operation Code	D7	D6	D5	D4	D3	D2	D1	D0	Function
31h	Device ID	0	0	1	1	0	0	0	1	Response Device ID Code
	1st parameter	85								-
	2nd parameter	26								-
	3rd parameter	01								-
32h	Version ID	0	0	1	1	0	0	0	1	Read Firmware version

### 9.3CTP COMMAND DESCRIPTION

#### NOP

00 H	NOP (No Operation)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	0	0	0	0	0	0	0	0	00
Parameter	No parameter									
Description	This command is an empty command and it does not have any effect on the touch screen.									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					N/A				
	TS S/W Reset					N/A				
	H/W Reset					N/A				
Flow Chart										

80H	TSSLPIN (Touch Screen Sleep In)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	0	0	80
parameter	No parameter									
Description	This command causes the touch screen to enter the minimum power consumption mode. MCU interface are register are still working and keeps their contents.									
Restriction	This command has no effect when the touch screen is already in TS Sleep In mode. TS Sleep In Mode can only be left by the TS Sleep Out Command (81h). It will be necessary to wait 5msec before sending next command. This is to allow time for the supply voltages and clock circuits to stabilize. It will be necessary to wait 5msec after sending TS Sleep Out command (when in TS Sleep In Mode) before TS Sleep In command can be sent.									
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sleep In Mode				
	TS S/W Reset					TS Sleep In Mode				
	H/W Reset					TS Sleep In Mode				
Flow Chart	 <pre>                     graph TD                         TSSLPIN[TSSLPIN] --&gt; StopDCDC{{Stop DC/DC converter}}                         StopDCDC --&gt; StopOscillator{{Stop Internal Oscillator}}                         StopOscillator --&gt; TSSleepInMode([TS Sleep In Mode])                     </pre>									

**TS sleep out (81h)**

81H	TSSLPOUT (Touch Screen Sleep Out)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	0	1	81
parameter	No parameter									
Description	This command turns off TS Sleep In mode.									
Restriction	<p>This command has no effect when touch screen is already in TS Sleep Out mode. TS Sleep Out Mode can only be left by the TS Sleep In Command (80h). It will be necessary to wait 5msec before sending next command. This is to allow time for the supply voltages and clock circuits to stabilize.</p> <p>The touch screen loads all touch screen supplier's factory default values to the registers during this 5msec and there cannot be any abnormal effect on the touch screen functionality if factory default and register values are same when this load is done and when the touch screen is already TS Sleep Out – mode.</p> <p>It will be necessary to wait 5msec after sending TS Sleep In command (when in TS Sleep Out mode) before TS Sleep Out command can be sent.</p>									
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sleep In Mode				
	TS S/W Reset					TS Sleep In Mode				
	H/W Reset					TS Sleep In Mode				
Flow Chart	<pre> graph TD     A[TSSLPOUT] --&gt; B{{Start Internal Oscillator}}     B --&gt; C{{Start up DC/DC converter}}     C --&gt; D([TS Sleep Out Mode])   </pre>									



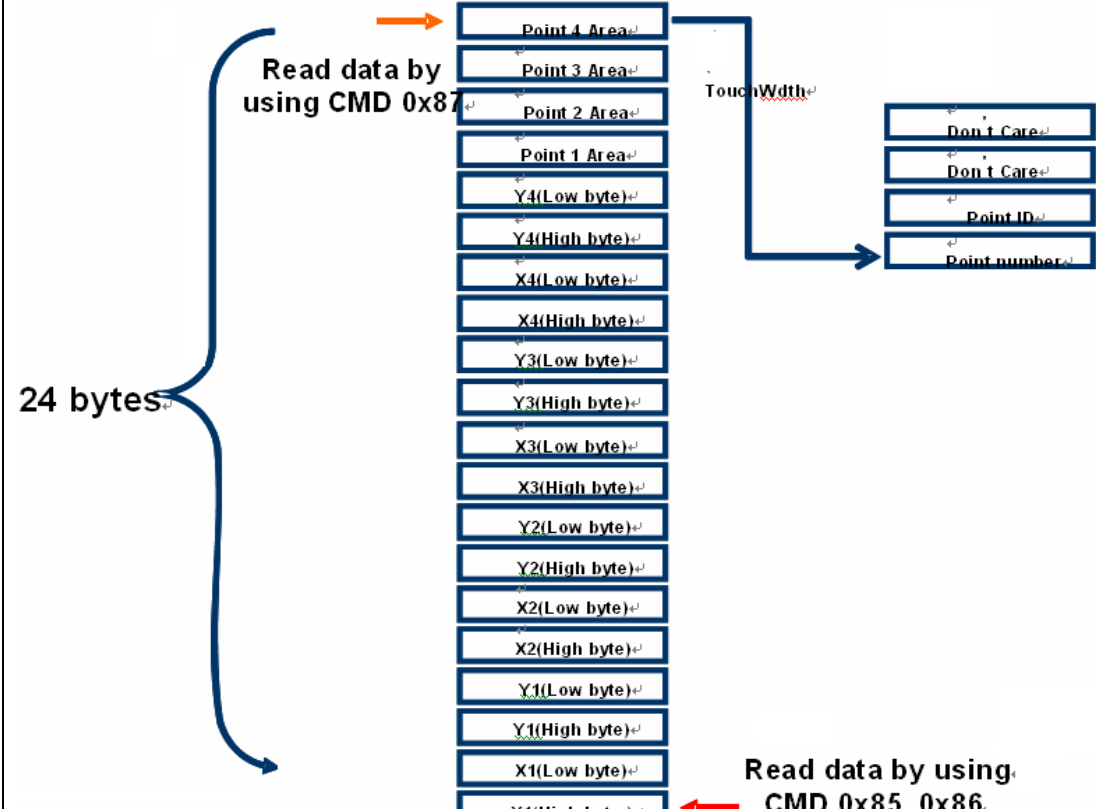
**TS sense off (82h)**

82H	TSSOFF (Touch Screen Sense Off)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	1	0	82
parameter	No parameter									
Description	The touch screen is not sensing touches (= No new events), but the touch screen is still scanning.									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sense Off				
	TS S/W Reset					TS Sense Off				
	H/W Reset					TS Sense Off				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; transform: rotate(-15deg);"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-top: none; border-bottom: none;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> </div> </div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;">↓</div> <div style="border: 1px solid black; width: 100px; height: 30px; border-radius: 15px;"></div> </div>									

**TS sense on (83h)**

83H	TSSON (Touch Screen Sense On)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	1	1	83
parameter	No parameter									
Description	The touch screen is sensing touches (= No new events).									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sense Off				
	TS SW Reset					TS Sense Off				
	H/W Reset					TS Sense Off				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Command</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Parameter</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Touch Screen</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Action</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Mode</div> <div style="border: 1px solid black; padding: 5px;">Sequential transfer</div> </div> </div> <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">TSSON</div> <div style="text-align: center; margin: 5px 0;">↓</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 0 auto;">TS Sense On</div> </div>									

**Read One Event (85h)**

85H		ROE (Read One Event)									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	1	0	0	0	0	1	0	1	85
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx
Description		<p>This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. The event stack is empty after this command.                      A returning value can be "No Event" if the stock is empty.                      co-ordinates and related touch information:                      Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.                      Point ID: Report the ID of touched points.                      Points number: Report the touch number.</p> <div style="text-align: center;">  </div> <p>When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.                      Example 1: Support 4 points, one point has been touched.                      X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)                      X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)                      X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)                      X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)                      Totally data length = 4 x 4 + 8 = 24 bytes</p>									

<b>Point 1</b> Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x06 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x01 Date[21] = 0x01 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	1 point enter, point Area = 4  1 point enter, point count = 1 First point enter, Point ID = 1  No use, invalid data

Example 2: Support 4 points, 2 points have been touched, and then first point leave.

(1) 2 points enter

X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)  
 X2 = 264 (0x0108H), Y2 = 318 (0x013EH)  
 X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)  
 X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x06 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x02 Date[21] = 0x03 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0x01 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	2 points enter, point1 Area = 6 point2 Area = 4  2 point enter, point count = 2 First and second point enter, Point ID = 0x03  No use, invalid data

(2) First point leave

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH)  
 X2 = 264 (0x0108H), Y2 = 318 (0x013EH)  
 X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)  
 X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x00 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x01 Date[21] = 0x02 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0x08 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	1 point enter, point1 Area = 0 point2 Area = 4  First point leave, point count = 1 First point leave, Point ID = 0x02  No use, invalid data

(3) All point leave

When all point leave, touch controller will report all point leave event data one time and then stop interrupt until next touch.

All point leave data will be fill 0xFFFF and optional information will be fill 0x0000

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH)  
 X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)  
 X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)  
 X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x00 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x00 Date[21] = 0x00 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	No enter, All points area = 0  All point leave Point count = 0 All point leave ID = 0x00  No use, invalid data

When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not

Raw counter:  
 If we read out the max stacks in once time  $32 \times 4 = 128$  bytes. The first 4 bytes for header.  
 Header format :  $\{0x0?, 0x0?, 0x0?, 0x0?\}$  (? is for 1, 2, 3 ... N)  
 After Header then it will follow Raw Count Value, the raw count value contain 2 bytes for each block. So we can read out  $31 \times 4 = 124$  bytes = 62 blocks  
 Example: TP1 total block = 150 blocks, It will be separated by 3 time for read out

```

for(j=0;j<STACK_inte;j++)
{
    write_event4 = j+1;
    write_event3 = j+1;
    write_event2 = j+1;
    write_event1 = j+1;
    Header

    for(i=(j*31);i<((j+1)*31);i++)
    {
        write_event4 = dc_ex[2*i]>>8;
        write_event3 = dc_ex[2*i+1];
        write_event2 = dc_ex[2*i+1]>>8;
        write_event1 = dc_ex[2*i+1];
    }
    for(k=0;k<200;k++)
        for(m=0;m<140;m++);
}
    
```

155	488	263	473	266	461	266	459	257	488	310	334	261	397	218
223	268	257	313	236	442	237	292	165	393	210	481	277	224	191
278	222	223	222	231	297	216	259	178	293	246	378	287	223	231
230	231	181	258	185	264	200	256	173	254	239	252	262	243	218
244	156	148	189	209	220	214	196	247	292	187	161	210	227	488
329	160	206	215	341	173	176	187	142	230	190	158	230	159	229
273	171	185	173	197	283	142	358	141	231	178	252	179	153	262
299	165	189	344	162	248	135	190	143	282	219	229	206	166	288
285	186	208	153	181	177	219	216	228	299	279	187	312	201	297
392	246	328	166	294	285	356	241	308	300	425	185	365	149	418

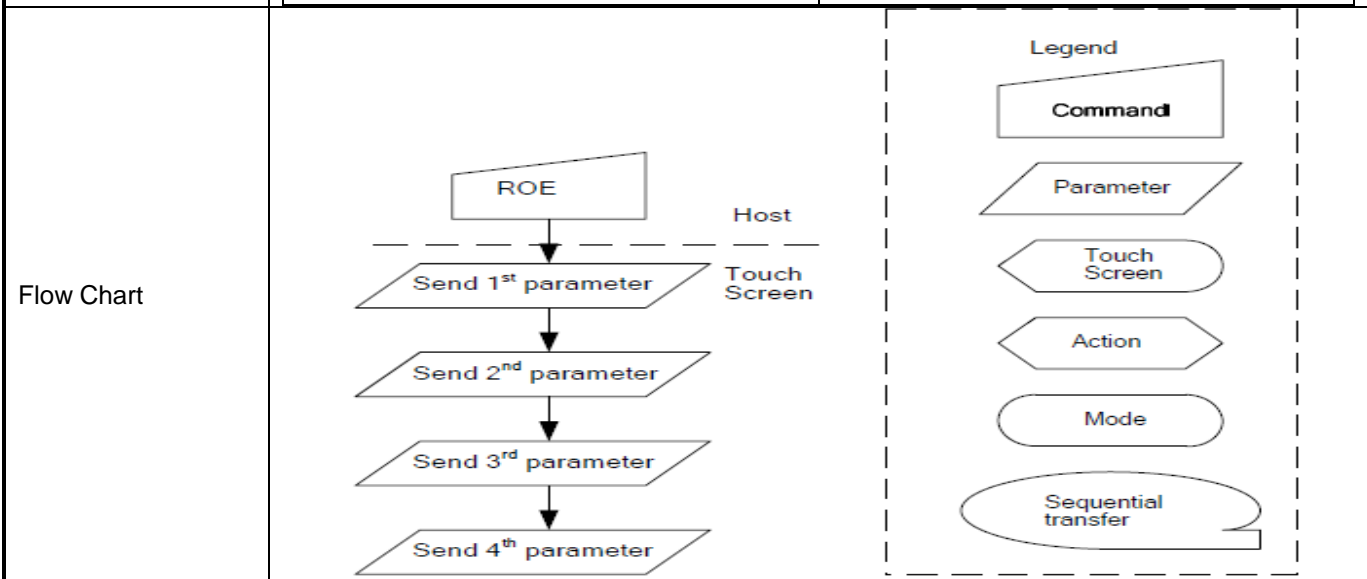
155	488	263	473	266	461	266	459	257	488	310	334	261	397	218
223	268	257	313	236	442	237	292	165	393	210	481	277	224	191
278	222	223	222	231	297	216	259	178	293	246	378	287	223	231
230	231	181	258	185	264	200	256	173	254	239	252	262	243	218
244	156	148	189	209	220	214	196	247	292	187	161	210	227	488
329	160	206	215	341	173	176	187	142	230	190	158	230	159	229
273	171	185	173	197	283	142	358	141	231	178	252	179	153	262
299	165	189	344	162	248	135	190	143	282	219	229	206	166	288
285	186	208	153	181	177	219	216	228	299	279	187	312	201	297
392	246	328	166	294	285	356	241	308	300	425	185	365	149	418

1<sup>st</sup> Header + 62blocks  
 1<sup>st</sup> Header:  
 {0x01, 0x01, 0x01, 0x01}

2<sup>nd</sup> Header + 62blocks  
 2<sup>nd</sup> Header:  
 {0x02, 0x02, 0x02, 0x02}

3<sup>rd</sup> Header + 26blocks  
 3<sup>rd</sup> Header:  
 {0x03, 0x03, 0x03, 0x03}

Register Availability	Status	Availability
	TS Sleep Out	Yes
	TS Sleep In	Yes
Default	Status	Default Value
	Power Up Sequence	0000 0000h
	TS S/W Reset	0000 0000h
	H/W Reset	0000 0000h

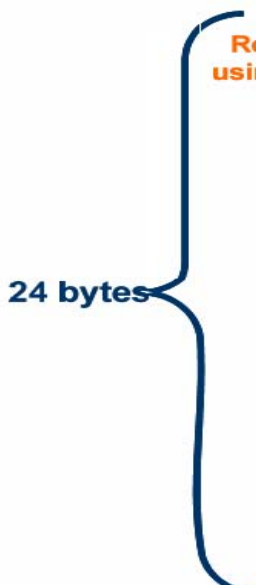


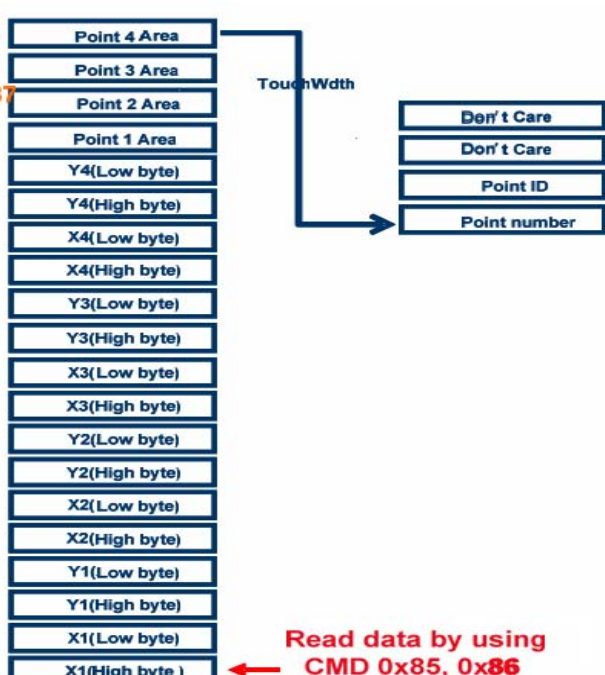
**Read All Event (86h)**

86H		RAE (Read All Events)									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	1	0	0	0	0	1	1	0	86
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx
5	parameter	-	E3	E2	E1	E0	F1	P2	P1	P0	xx
6	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
:		-	:	:	:	:	:	:	:	:	:
(n+1) Parameter		-	B7	B6	B5	B4	B3	B2	B1	B0	xx

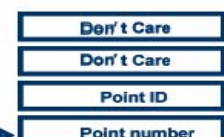
This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. A returning value can be "No Event" if the stock is empty. co-ordinates and related touch information:  
 Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.  
 Point ID: Report the ID of touched points.  
 Points number: Report the touch number.

24 bytes





TouchWdth



When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.  
 Example 1: Support 4 points, one point has been touched.  
 X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)  
 X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)  
 X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)  
 X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

Totally data length = 4 x 4 + 8 = 24 bytes.

<p><b>Point 1</b></p> <p>Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6</p>	<p><b>Point 3</b></p> <p>Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF</p>	<p><b>Point 2</b></p> <p>Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF</p>	<p><b>Point 4</b></p> <p>Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF</p>	<p>Date[16] = 0x06 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00</p> <p>Date[20] = 0x01 Date[21] = 0x01 Date[22] = 0xFF Date[23] = 0xFF</p>
--	--	--	--	---

1 point enter, point Area = 4

1 point enter, point count = 1  
First point enter, Point ID = 1

No use, invalid data

Example 2: Support 4 points, 2 points have been touched, and then first point leave. (2) 2 points enter

X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)

X2 = 264 (0x0108H), Y2 = 318 (0x013EH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<p><b>Point 1</b></p> <p>Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6</p>	<p><b>Point 3</b></p> <p>Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF</p>	<p><b>Point 2</b></p> <p>Date[4] = 0x01 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E</p>	<p><b>Point 4</b></p> <p>Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF</p>	<p>Date[16] = 0x06 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00</p> <p>Date[20] = 0x02 Date[21] = 0x03 Date[22] = 0xFF Date[23] = 0xFF</p>
--	--	--	--	---

2 points enter, point1 Area = 6  
point2 Area = 4

2 point enter, point count = 2  
First and second point enter, Point ID = 0x03

No use, invalid data

(2) First point leave

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH)

X2 = 264 (0x0108H), Y2 = 318 (0x013EH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<p><b>Point 1</b></p> <p>Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF</p>	<p><b>Point 3</b></p> <p>Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF</p>	<p><b>Point 2</b></p> <p>Date[4] = 0x01 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E</p>	<p><b>Point 4</b></p> <p>Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF</p>	<p>Date[16] = 0x00 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00</p> <p>Date[20] = 0x01 Date[21] = 0x02 Date[22] = 0xFF Date[23] = 0xFF</p>
--	--	--	--	---

1 point enter, point1 Area = 0  
point2 Area = 4

First point leave, point count = 1  
First point leave, Point ID = 0x02

No use, invalid data

(3) All point leave

When all point leave, touch controller will report all point leave event data one time and then stop interrupt until next touch.

All point leave data will be fill 0xFFFF and optional information will be fill 0x0000.

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH)

X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

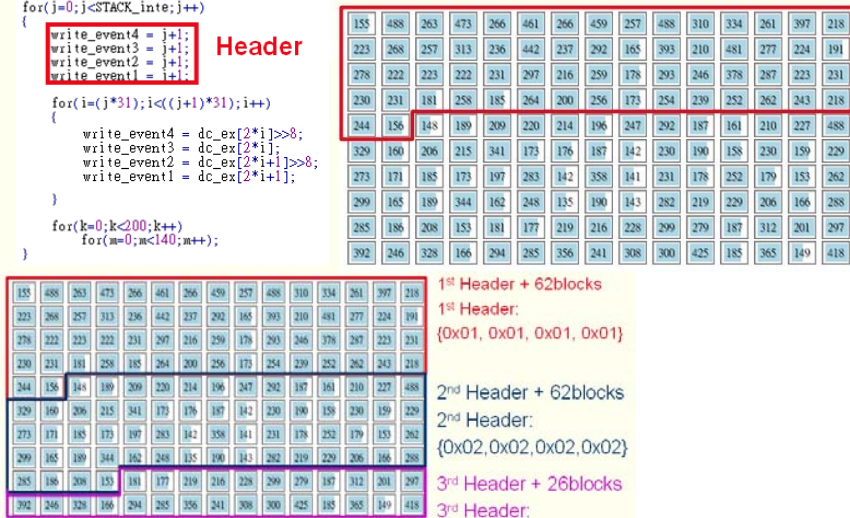
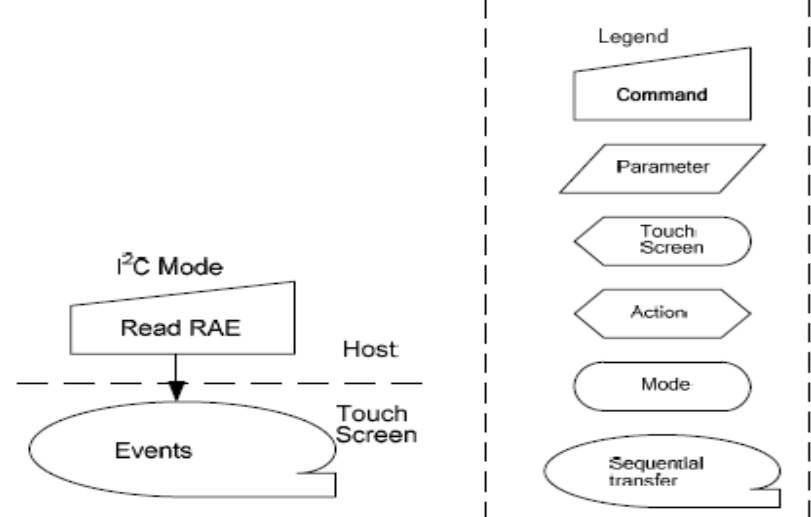
<p><b>Point 1</b></p> <p>Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF</p>	<p><b>Point 3</b></p> <p>Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF</p>	<p><b>Point 2</b></p> <p>Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF</p>	<p><b>Point 4</b></p> <p>Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF</p>	<p>Date[16] = 0x00 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00</p> <p>Date[20] = 0x00 Date[21] = 0x00 Date[22] = 0xFF Date[23] = 0xFF</p>
--	--	--	--	---

No enter, All points area = 0

All point leave  
Point count = 0  
All point leave ID = 0x00

No use, invalid data

When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.

	<p>Raw counter:                  If we read out the max stacks in once time 32x4 = 128 bytes. The first 4 bytes for header.                  Header format : {0x0?, 0x0?, 0x0?, 0x0?} (? is for 1, 2, 3 ... N)                  After Header then it will follow Raw Count Value, the raw count value contain 2 bytes for each block. So we can read out 31x4 = 124 bytes = 62 blocks                  Example: TP1 total block = 150 blocks, It will be separated by 3 time for read out.</p> <pre>                 for(j=0;j&lt;STACK_inte;j++)                 {                     write_event4 = j+1;                     write_event3 = j+1;                     write_event2 = j+1;                     write_event1 = j+1;                     Header                     for(i=(j*31);i&lt;((j+1)*31);i++)                     {                         write_event4 = dc_ex[2*i]&gt;&gt;8;                         write_event3 = dc_ex[2*i];                         write_event2 = dc_ex[2*i+1]&gt;&gt;8;                         write_event1 = dc_ex[2*i+1];                     }                     for(k=0;k&lt;200;k++)                     for(m=0;m&lt;140;m++);                 }                 </pre>  <p>1<sup>st</sup> Header + 62blocks                  1<sup>st</sup> Header:                  {0x01, 0x01, 0x01, 0x01}</p> <p>2<sup>nd</sup> Header + 62blocks                  2<sup>nd</sup> Header:                  {0x02, 0x02, 0x02, 0x02}</p> <p>3<sup>rd</sup> Header + 26blocks                  3<sup>rd</sup> Header:                  {0x03, 0x03, 0x03, 0x03}</p>	
Register Availability	Status	Availability
Default	Status Power Up Sequence TS S/W Reset	Default Value All Values 0000 0000h All Values 0000 0000h
Flow Chart		



**Read Latest Event (87h)**

87H		RLE (Read Latest Event)									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	1	0	0	0	0	1	1	1	87
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx

**Description**

This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. The event stack is empty after this command.

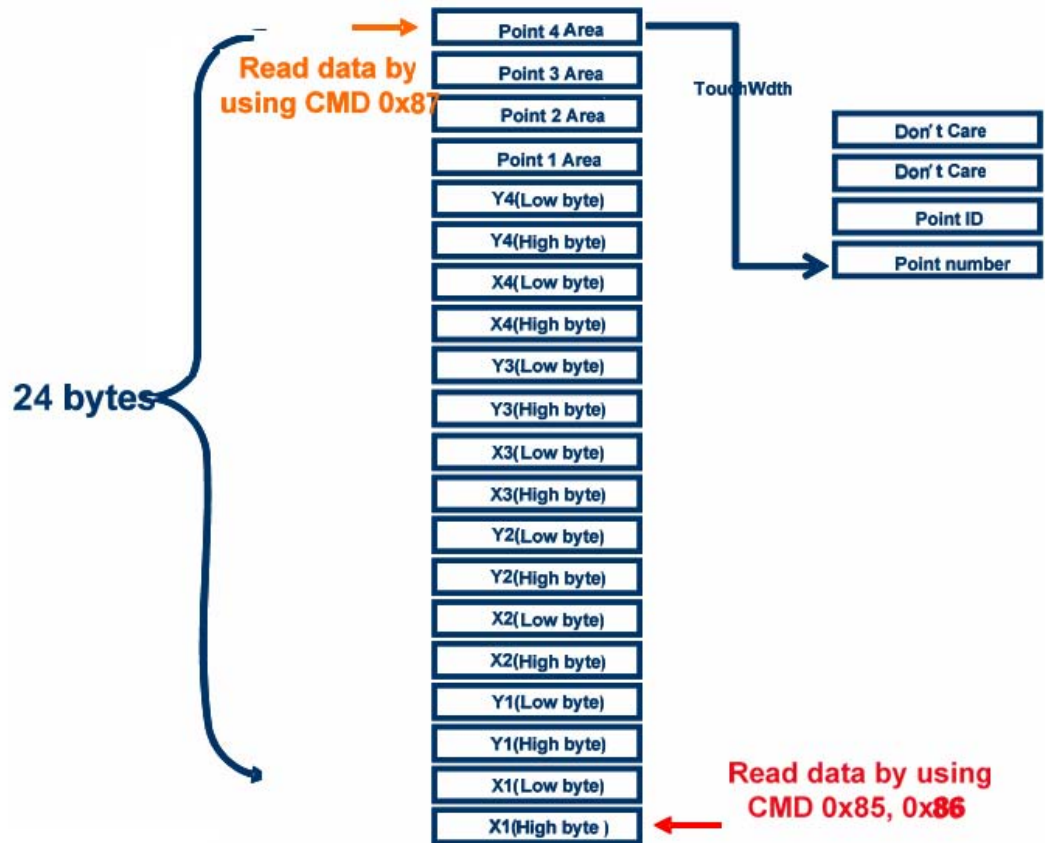
A returning value can be "No Event" if the stock is empty.

co-ordinates and related touch information:

Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.

Point ID: Report the ID of touched points.

Points number: Report the touch number.



When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.

Example 1: Support 4 points, one point has been touched.

X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)

X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

Totally data length = 4 x 4 + 8 = 24 bytes

<b>Point 1</b> Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x06 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x01 Date[21] = 0x01 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	1 point enter, point Area = 4  1 point enter, point count = 1 First point enter, Point ID = 1  No use, invalid data

Example 2: Support 4 points, 2 points have been touched, and then first point leave.

(1) 2 points enter

X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)

X2 = 264 (0x0108H), Y2 = 318 (0x013EH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0x00 Date[1] = 0x96 Date[2] = 0x00 Date[3] = 0xE6	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x06 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x02 Date[21] = 0x03 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0x01 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	2 points enter, point1 Area = 6 point2 Area = 4  2 point enter, point count = 2 First and second point enter, Point ID = 0x03  No use, invalid data

(2) First point leave

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH) X2 =

264 (0x0108H), Y2 = 318 (0x013EH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x00 Date[17] = 0x04 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x01 Date[21] = 0x02 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0x01 Date[5] = 0x08 Date[6] = 0x01 Date[7] = 0x3E	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	1 point enter, point1 Area = 0 point2 Area = 4  First point leave, point count = 1 First point leave, Point ID = 0x02  No use, invalid data

(3) All point leave

When all point leave, touch controller will report all point leave event data one time and then stop interrupt until next touch.

All point leave data will be fill 0xFFFF and optional information will be fill 0x0000.

X1 = 65535 (0xFFFFH), Y1 = 65535 (0xFFFFH)

X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)

X3 = 65535 (0xFFFFH), Y3 = 65535 (0xFFFFH)

X4 = 65535 (0xFFFFH), Y4 = 65535 (0xFFFFH)

<b>Point 1</b> Date[0] = 0xFF Date[1] = 0xFF Date[2] = 0xFF Date[3] = 0xFF	<b>Point 3</b> Date[8] = 0xFF Date[9] = 0xFF Date[10] = 0xFF Date[11] = 0xFF	Date[16] = 0x00 Date[17] = 0x00 Date[18] = 0x00 Date[19] = 0x00  Date[20] = 0x00 Date[21] = 0x00 Date[22] = 0xFF Date[23] = 0xFF
<b>Point 2</b> Date[4] = 0xFF Date[5] = 0xFF Date[6] = 0xFF Date[7] = 0xFF	<b>Point 4</b> Date[12] = 0xFF Date[13] = 0xFF Date[14] = 0xFF Date[15] = 0xFF	No enter, All points area = 0  All point leave Point count = 0 All point leave ID = 0x00  No use, invalid data

When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.

Raw counter:

If we read out the max stacks in once time  $32 \times 4 = 128$  bytes. The first 4 bytes for header.

Header format : {0x0?, 0x0?, 0x0?, 0x0?} (? is for 1, 2, 3 ... N)

After Header then it will follow Raw Count Value, the raw count value contain 2 bytes for each block. So we can read out  $31 \times 4 = 124$  bytes = 62 blocks

Example: TP1 total block = 150 blocks, It will be separated by 3 time for read out

```

for(j=0;j<STACK_inte;j++)
{
    write_event4 = j++;
    write_event3 = j++;
    write_event2 = j++;
    write_event1 = j++;
    Header
    for(i=(j*31);i<((j+1)*31);i++)
    {
        write_event4 = dc_ex[2*i]>>8;
        write_event3 = dc_ex[2*i+1];
        write_event2 = dc_ex[2*i+1]>>8;
        write_event1 = dc_ex[2*i+1];
    }
    for(k=0;k<200;k++)
        for(m=0;m<140;m++);
}
    
```

155	488	263	473	266	461	266	459	257	488	310	334	261	397	218
223	268	257	313	236	442	237	292	165	393	210	481	277	224	191
278	222	223	222	231	297	216	259	178	293	246	378	287	223	231
230	231	181	258	185	264	200	256	173	254	239	252	262	243	218
244	156	148	189	209	220	214	196	247	292	187	161	210	227	488
329	160	206	215	341	173	176	187	142	230	190	158	230	159	229
273	171	185	173	197	283	142	358	141	231	178	252	179	153	262
299	165	189	344	162	248	135	190	143	282	219	229	206	166	288
285	186	208	153	181	177	219	216	228	299	279	187	312	201	297
392	246	328	166	294	285	356	241	308	300	425	185	365	149	418

155	488	263	473	266	461	266	459	257	488	310	334	261	397	218
223	268	257	313	236	442	237	292	165	393	210	481	277	224	191
278	222	223	222	231	297	216	259	178	293	246	378	287	223	231
230	231	181	258	185	264	200	256	173	254	239	252	262	243	218
244	156	148	189	209	220	214	196	247	292	187	161	210	227	488
329	160	206	215	341	173	176	187	142	230	190	158	230	159	229
273	171	185	173	197	283	142	358	141	231	178	252	179	153	262
299	165	189	344	162	248	135	190	143	282	219	229	206	166	288
285	186	208	153	181	177	219	216	228	299	279	187	312	201	297
392	246	328	166	294	285	356	241	308	300	425	185	365	149	418

1<sup>st</sup> Header + 62blocks

1<sup>st</sup> Header:

{0x01, 0x01, 0x01, 0x01}

2<sup>nd</sup> Header + 62blocks

2<sup>nd</sup> Header:

{0x02, 0x02, 0x02, 0x02}

3<sup>rd</sup> Header + 26blocks

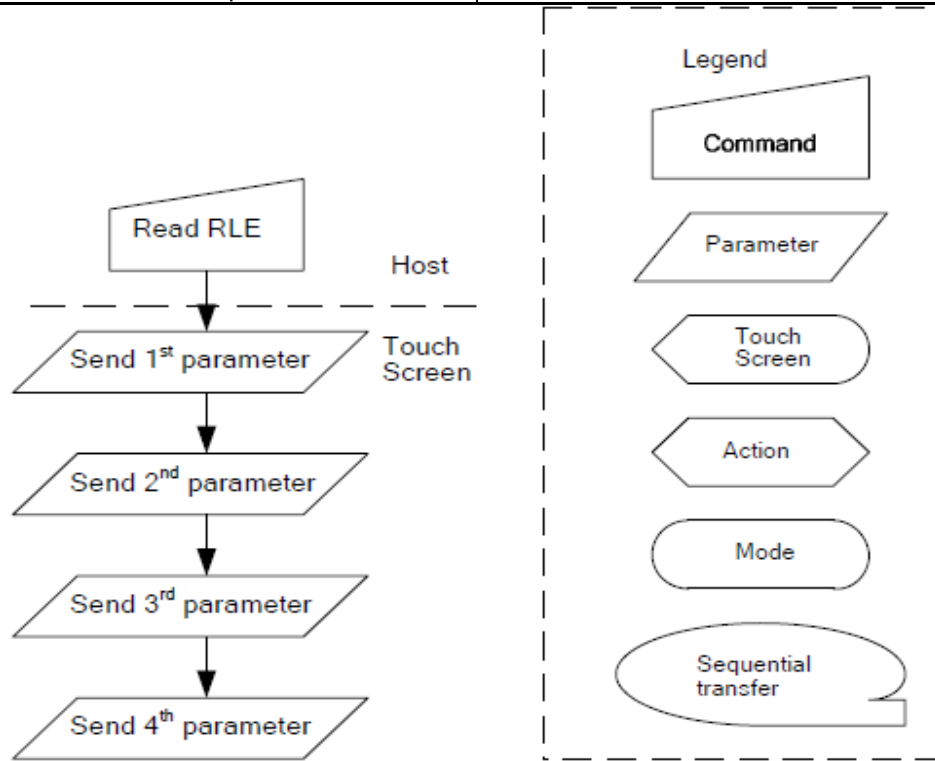
3<sup>rd</sup> Header:

{0x03, 0x03, 0x03, 0x03}

Register Availability

Status	Availability
TS Sleep Out	Yes
TS Sleep In	Yes

Flow Chart



**Clear Event Stack (88h)**

88H	CLRES (Clear Event Stack)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	1	0	0	0	88
parameter	No parameter									
Description	This command clears event stack when the only return event can be "No Event".									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					Empty Stack				
	TS S/W Reset					Empty Stack				
	H/W Reset					Empty Stack				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; transform: rotate(-15deg);"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> </div> </div> <div style="text-align: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto;"></div> <p style="text-align: center;">CLRES</p> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; width: 150px; height: 40px; margin: 0 auto; border-radius: 20px;"></div> <p style="text-align: center;">Clear Event Stack</p> </div>									

**TS Software Reset (9Eh)**

9E H	TSSWRESET (Touch Screen Software Reset)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	1	1	1	1	0	9E
parameter	No parameter									
Description	When the Touch Screen Software Reset command is written, it causes a software reset. It resets the commands and parameters to their TS S/W Reset default values. (See default tables in each command description.) Note: The Memory contents are unaffected by this command									
Restriction	It will be necessary to wait 5msec before sending new command following software reset. The touch screen loads all touch screen supplier's factory default values to the registers during this 5msec. If Software Reset is applied during TS Sleep Out mode, it will be necessary to wait 5msec before sending TS Sleep Out command. Touch Screen Software Reset Command cannot be sent during TS Sleep Out sequence.									
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					N/A				
	TS S/W Reset					N/A				
	H/W Reset					N/A				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;"><b>Legend</b></p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Command</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Parameter</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Touch Screen</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Action</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Mode</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Sequential transfer</div> </div>   <pre>                     graph TD                         A[TSSWRESET] --&gt; B{{Set Commands to TS S/W Default value}}                         B --&gt; C([TS Sleep In Mode])                     </pre> </div>									

**Device ID Command (31h)**

31 H		Device ID									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	0	0	1	1	0	0	0	1	31
1	parameter	1	85						00..FF		
2	parameter	1	26						00..FF		
3	parameter	1	01						00..FF		
Description		When the Device ID command is written, IC will echo the device ID to master. The index of Device ID command is 31h									
Register Availability		Status					Availability				
		TS Sleep Out					Yes				
		TS Sleep In					Yes				
Default		Status					Default Value				
		Power Up Sequence					N/A				
		TS S/W Reset					N/A				
		H/W Reset					N/A				
Flow Chart											

**Version ID Command (32h)**

32 H		Device ID									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	0	0	1	1	0	0	1	0	31
1	parameter	1	SF_Version[3:0]				F_Version[3:0]				00..FF
Description		This command will report the ID code of firmware Version. F_Version [3:0]: The firmware version of flash code. SF_Version [3:0]: The firmware version of self test code.									
Register Availability		Status					Availability				
		TS Sleep Out					Yes				
		TS Sleep In					Yes				
Default		Status					Default Value				
		Power Up Sequence					N/A				
		TS S/W Reset					N/A				
		H/W Reset					N/A				
Flow Chart											

**10. OPTICAL CHARACTERISTICS**

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	$\theta=0^\circ$	--	5	10	ms	Note 4
	Fall	Tf		--	15	20	ms	
Contrast ratio		CR	At optimized viewing angle	200	300	--		Note 5
Viewing angle	Top		$CR \geq 10$	40	50	--	Deg.	Note 6
	Bottom			60	70	--		
	Left			60	70	--		
	Right			60	70	-		
Luminance			$\theta=0^\circ$	238	297	--	cd/m <sup>2</sup>	Note 7
Uniformity		B-uni		70	80		%	Note 8
White chromaticity	X		$\theta=0^\circ$	0.27	0.32	0.37		Note 7
	y			0.28	0.33	0.38		

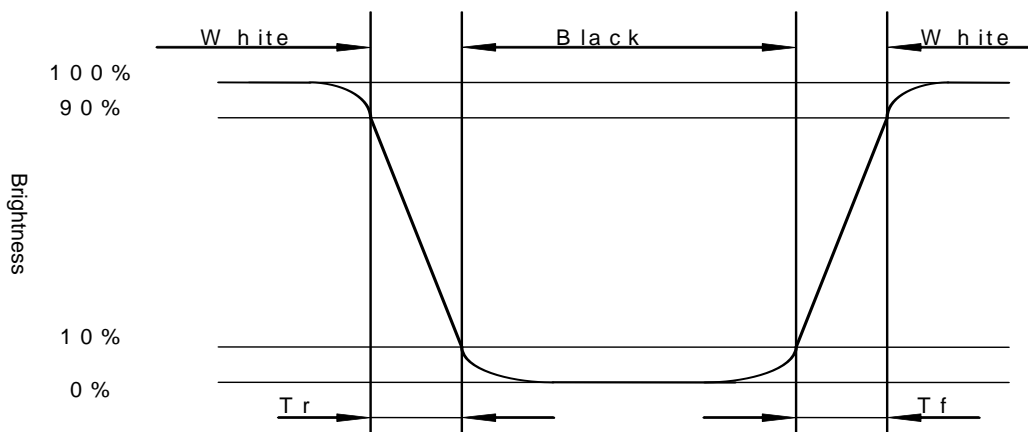
Note 1: Ambient temperature =25°C. LED current  $I_L= 15$  mA.

Note 2: To be measured in the dark room.

Note 3: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7A, after 2 minutes operation.

Note 4: Definition of response time:

The output signals of photo-detector are measured when the input signals are changed from "white" to "black"(rising time) and from "black" to "white"(falling time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as shown below.



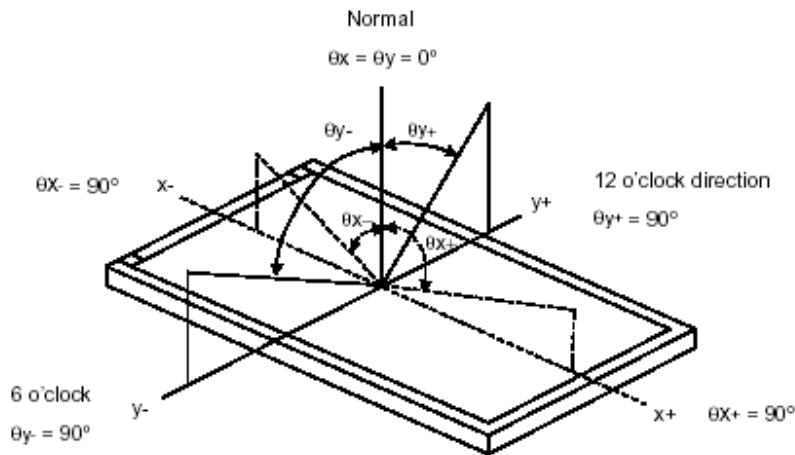
Note5: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo-detector output when LCD is at "White" state}}{\text{Photo-detector output when LCD is at "Black" state}}$$

Note 6: Definition of viewing angle:

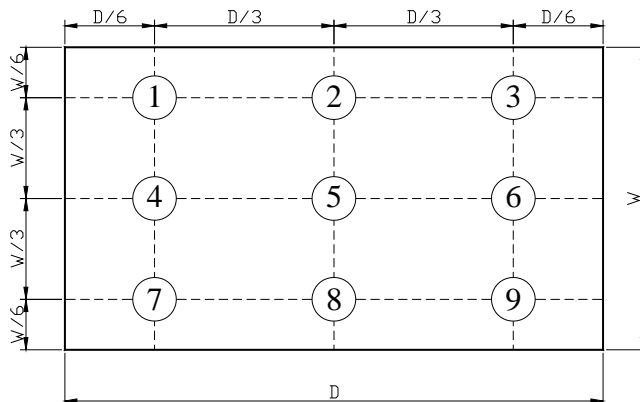
Refer to figure as below.



Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8: Definition of Brightness Uniformity (B-uni):

### Luminance Measuring Points



$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}}$$



## 11. QUALITY ASSURANCE

### 11.1 RA Test Condition

#### 11.1.1 Temperature and Humidity(Ambient Temperature)

Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65 \pm 5\%$

#### 11.1.2 Operation

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

#### 11.1.3 Container

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

#### 11.1.4 Test Frequency

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

#### 11.1.5 Test Method

No.	Reliability Test Item & Level	Test Level	Remark
1	High temperature storage test	T=80°C,240H	IEC68-2-2
2	Low temperature storage test	T= -30°C,240H	IEC68-2-1
3	High temperature operation test	T=70°C,240H	IEC68-2-2
4	Low temperature operation test	T=-20°C,240H	IEC68-2-1
5	High temperature and high humidity operation test	T=60°C,90%RH,240H	IEC68-2-3
6	Thermal cycling storage test	-30°C ----25°C -----80°C ,200Cycle 30min 5min 30min	IEC68-2-14
7	Vibration Test	Frequency:10 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z	IEC68-2-6
8	Shock test	100G,6ms,Direction:±X±Y±Z Cycle:3times	IEC68-2-27
9	Drop test	Height :60cm 1 conner,3edges,6surfaces	IEC68-2-32
10	Electrostatic Discharge Test	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 4kV Air +/-8kV Criteria: Class C	IEC-61000-4-2

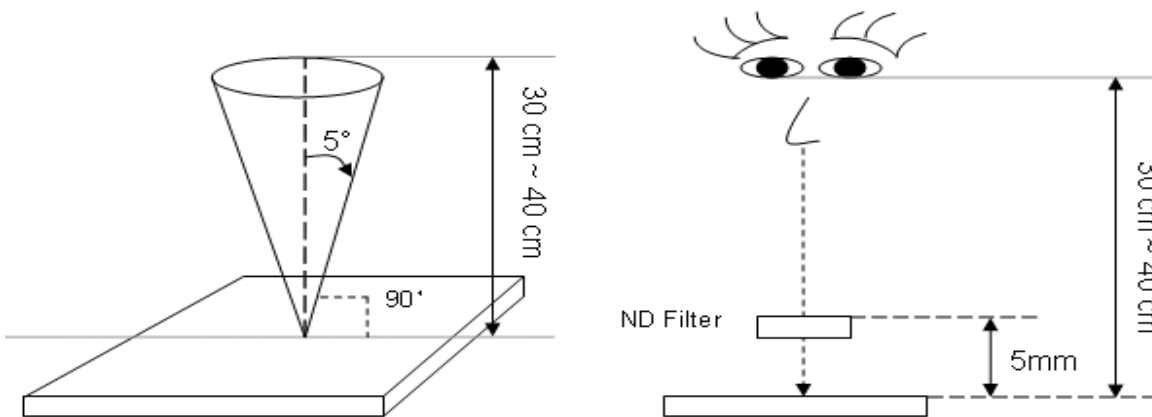
## 11.2 Inspection Judgment standard

### 11.2.1 Inspection conditions

11.2.1.1 Inspection Distance :  $35 \pm 5$  cm

11.2.1.2 View Angle :

- (1) Inspection that light pervious to the product:  $\pm 5^\circ$
- (2) Inspection that light reflects on the product:  $\pm 45^\circ$




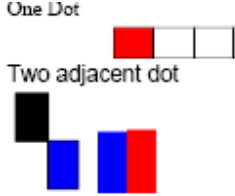
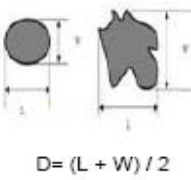
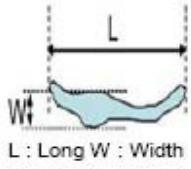
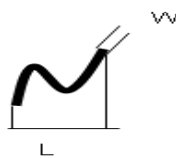
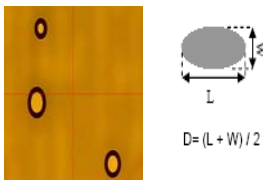
### 11.2.2 Environment conditions :

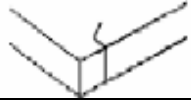
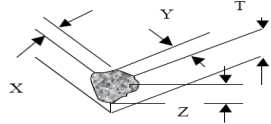
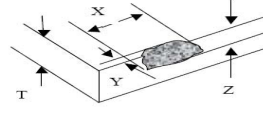
Ambient Temperature :	$25 \pm 5^\circ\text{C}$
Ambient Humidity :	30~75%RH
Ambient Illumination	600~800 lux

### 11.2.3 Inspection Parameters

Appearance inspection standard (D: diameter, L: length; W: width, Z: height, T: glass thickness, n: number)

Inspection item	Inspection standard	Description
No image	Prohibited	
Image abnormal	Prohibited	
Bright line	Prohibited	
Mura	It is acceptable that the defect can not be seen with 2% ND filter.	

Dot	Item	Acceptable Visible area	Total	
	Bright dot	2	5	
	Dark dot	4		
	Bright adjacent dots	1	1	
	Dark adjacent dots	2	2	
	Adjacent dots with a bright dot and a dark dot	1	1	
Foreign material in dot shape	SPEC (unit: mm)	Acceptable		 <p><math>D = (L + W) / 2</math></p>
	$D \leq 0.3$	Ignored		
	$0.3 < D \leq 0.5$ , distance > 5	$n \leq 5$		
	$D > 0.5$	0		
Inspection item	Inspection standard		Description	
Foreign material in line shape	SPEC (unit: mm)	Acceptable	 <p>L : Long W : Width</p>	
	$W \leq 0.05$ and $L \leq 7$	Ignored		
	$0.05 < W \leq 0.1$ , $L \leq 7$ , distance > 5	$n \leq 5$		
	$W > 0.1$ or $L > 7$	0		
Contamination	It is acceptable if the dirt can be wiped.			
Inspection item	Inspection standard		Description	
Scratch	SPEC (unit: mm)	Acceptable		
	$W \leq 0.05$ and $L \leq 7$	Ignored		
	$0.05 < W \leq 0.08$ , $L \leq 7$ , distance > 5	$n \leq 5$		
	$0.08 < W \leq 0.1$ , $L \leq 7$ , distance > 5	$n \leq 3$		
	$W > 0.1$ or $L > 7$	0		
Bubble	SPEC (unit: mm)	Acceptable	 <p><math>D = (L + W) / 2</math></p>	
	$D \leq 0.2$	Ignored		
	Non visible area	Ignored		
	$0.2 < D \leq 0.3$ , distance > 5	$n \leq 5$		
	$D > 0.3$	0		

Insufficient glue	SPEC (unit: mm)	Acceptable	
	Non visible area	Ignored	
	Visible area	0	
Cover & Sensor Crack	Prohibited		
Sensor angle missing & edge break	SPEC (unit: mm)	Acceptable	
	Damage circuit or effect function	0	
Cover/Sensor angle missing	SPEC (unit: mm)	Acceptable	
	$X \leq 3.0, Y \leq 3.0, Z \leq T$	Ignored	
	$X > 3.0, Y > 3.0, Z > T$	0	
Cover/Sensor edge break	SPEC (unit: mm)	Acceptable	
	$X \leq 3.0, Y \leq 3.0, Z \leq T$	Ignored	
	$X > 3.0, Y > 3.0, Z > T$	0	
Inspection item	SPEC		Description
Ink	SPEC (unit: mm)	Acceptable	
	word unclear, inverted, mistake, break line	0	
Bubble under protection film	SPEC (unit: mm)	Acceptable	
	NA		
Function	Prohibited		

### 11.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

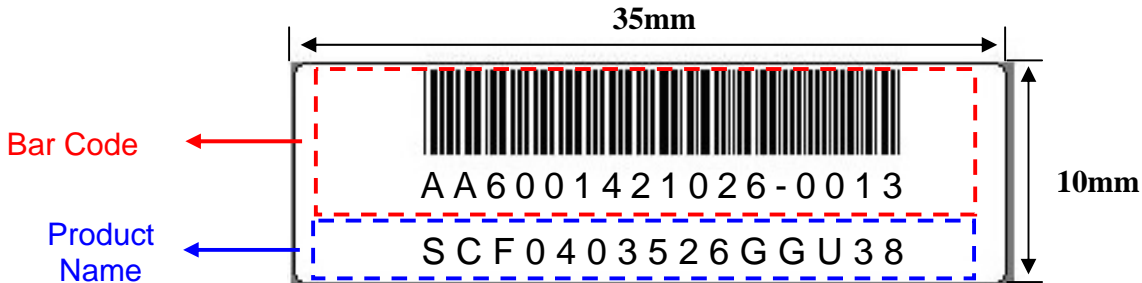
Sampling table: MIL-STD-105E

Inspection level: Level II

Class of defects	Definition		
	<b>Major</b>	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
<b>Minor</b>	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.	

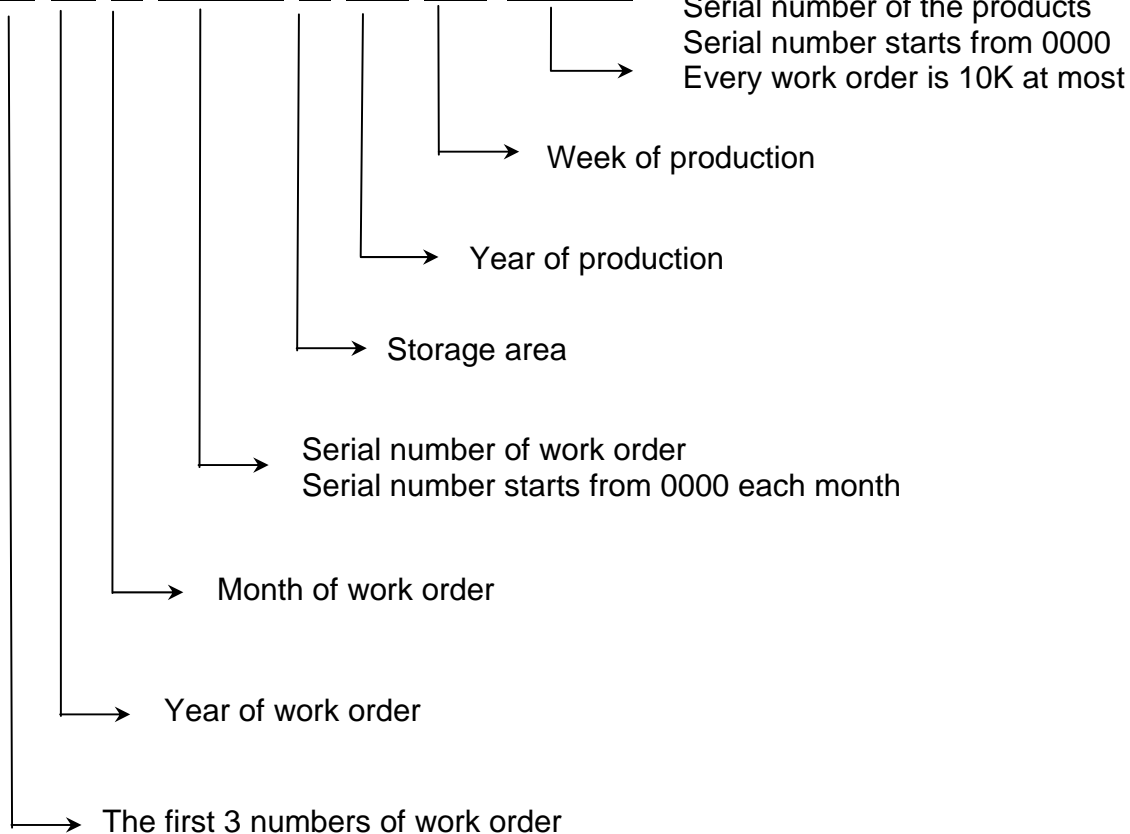
## 12. LCM PRODUCT LABEL DEFINE

**Product Label style:**

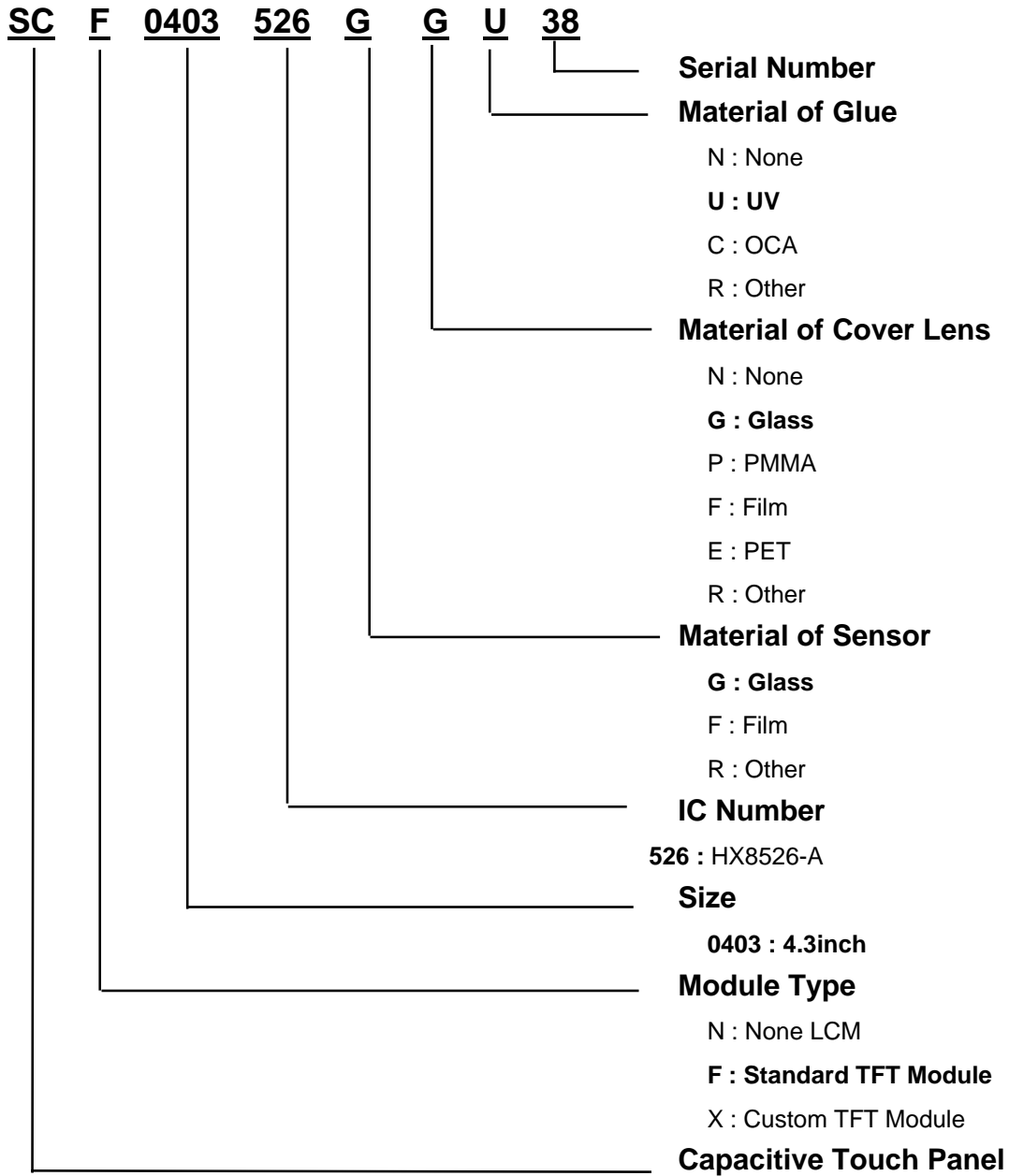


**BarCode Define:**

**A A 6 0014 2 10 26-0013**



**Product Name Define:**



### 13. PRECAUTION FOR USING LCM

#### 1. ASSEMBLY PRECAUTIONS

- (1) You must mount a module using holes arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (5) Do not open the case because inside circuits do not have sufficient strength.
- (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
- (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

#### 2. OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

#### 3. ELECTROSTATIC DISCHARGE CONTROL

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

parts of the human body.

- (1) The modules should be kept in antistatic bags or other containers resistant to static for storage.
- (2) Only properly grounded soldering irons should be used.
- (3) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
- (4) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
- (5) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

#### 4. STORAGE PRECAUTIONS

- (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
- (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

#### 5. OTHERS

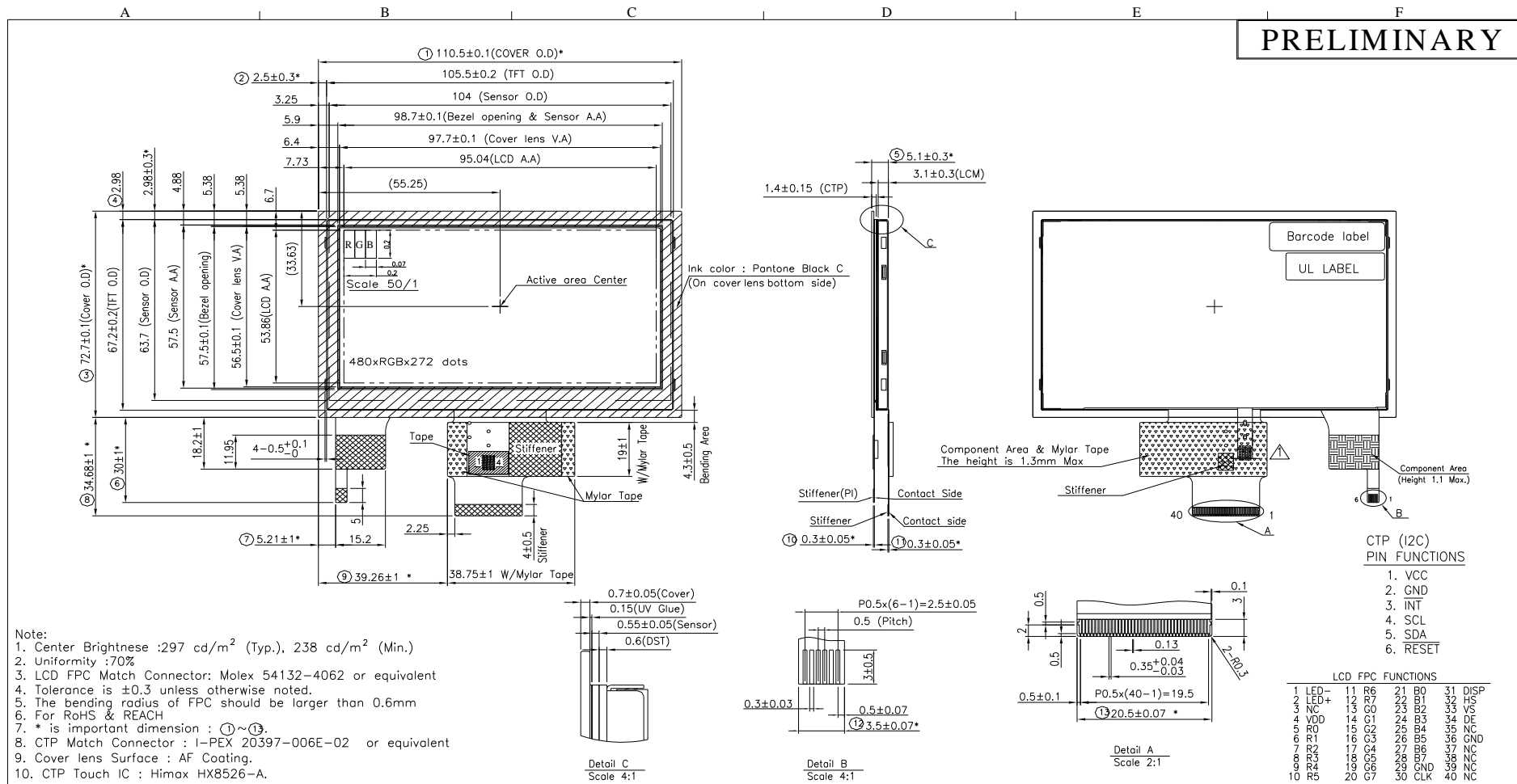
- (1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight and strong UV rays
- (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- (3) For the packaging box, please pay attention to the followings:
- (4) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
- (5) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- (6) Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

#### 6. LIMITED WARRANTY

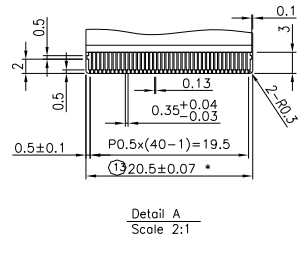
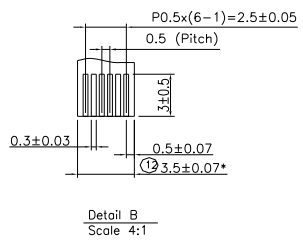
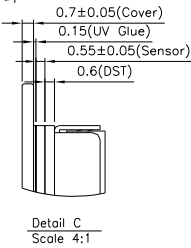
Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of 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.

Confidential Document  
**14. OUTLINE DRAWING**

**PRELIMINARY**



- Note:
- Center Brightness :297 cd/m<sup>2</sup> (Typ.), 238 cd/m<sup>2</sup> (Min.)
  - Uniformity :70%
  - LCD FPC Match Connector: Molex 54132-4062 or equivalent
  - Tolerance is ±0.3 unless otherwise noted.
  - The bending radius of FPC should be larger than 0.6mm For RoHS & REACH
  - \* is important dimension : ①~⑩.
  - CTP Match Connector : I-PEX 20397-006E-02 or equivalent
  - Cover lens Surface : AF Coating.
  - CTP Touch IC : Himax HX8526-A.



CTP (I2C) PIN FUNCTIONS

- VCC
- GND
- INT
- SCL
- SDA
- RESET

LCD FPC FUNCTIONS

1 LED-	11 R6	21 B0	31 DISP
2 LED+	12 R7	22 B1	32 HS
3 NC	13 G0	23 B2	33 VS
4 VDD	14 G1	24 B3	34 DE
5 R0	15 G2	25 B4	35 NC
6 R1	16 G3	26 B5	36 GND
7 R2	17 G4	27 B6	37 NC
8 R3	18 G5	28 B7	38 NC
9 R4	19 G6	29 GND	39 NC
10 R5	20 G7	30 CLK	40 NC

				DATE:	2014/04/03	TITLE:		4.3" CTP With Mouldle Outline Dimension													
				DRAWN:		DWG. NO.		SCF0403526GGU38													
				CHECK:		UNITS	M M	REV.	2												
				APPROVE:		SCALE	1 : 1	SHEET 1 OF 1													
<table border="1"> <thead> <tr> <th>AUTH</th> <th>DESCRIPTION</th> <th>DATE</th> <th>APPROVED</th> </tr> </thead> <tbody> <tr> <td></td> <td>Remove the tape at the Backlight welding</td> <td>2015/7/3</td> <td></td> </tr> <tr> <td></td> <td>ESR0304001</td> <td></td> <td></td> </tr> </tbody> </table>				AUTH	DESCRIPTION	DATE	APPROVED		Remove the tape at the Backlight welding	2015/7/3			ESR0304001								
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	ESR0304001																				



## 15. PACKAGE INFORMATION

TBD