Confidential Document

DATA IMAGE CORPORATION

CTP Module Specification

Preliminary

ITEM NO.: SCF0403236FGC00

Table of Contents

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:
	1	07/MAY/15’		22

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	07/MAY/15’			Initial preliminary	ESR0404011

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Display resolution	480X R.G.B x 272	dot
LCD Active area	95.04(W) x 53.86(H)	mm
Sensor Active Area	97.04 (W) x 55.86 (H)	mm
Screen size	4.3(Diagonal)	inch
Pixel pitch	0.198 (W) x 0.198(H)	mm
Color configuration	R.G.B. Stripe	
Overall dimension	105.5 (W) x 68.48(H) x 4.925(D)	mm
Weight	TBD	g
Surface treatment	Glare	
View Angle direction(Gray inversion)	6 o'clock	
LCD model number	FX04032BDSSWBG01	
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_{DD}	3.0	3.3	3.6	V	Note1
Power Supply Current	I_{DD}	--	17	20	mA	V_{DD} =3.3V
Ripple Voltage	V_{RPVDD}	--	--	100	mVp-p	
"H" level logical input voltage	V_{IH}	0.8VDD	--	VDD	V	
"L" level logical input voltage	V_{IL}	0	--	0.2VDD	V	
Operating temperature	Topa	-20	--	70	°C	Ambient temperature
Storage temperature	Tstg	-30	--	80	°C	Ambient temperature

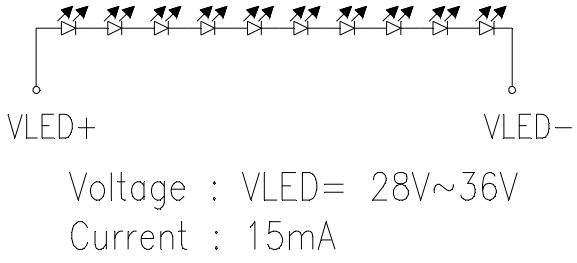
Note1:VDD Absolute Maximum Ratings -0.3V~+6V

4.2 Backlight driving for power conditions

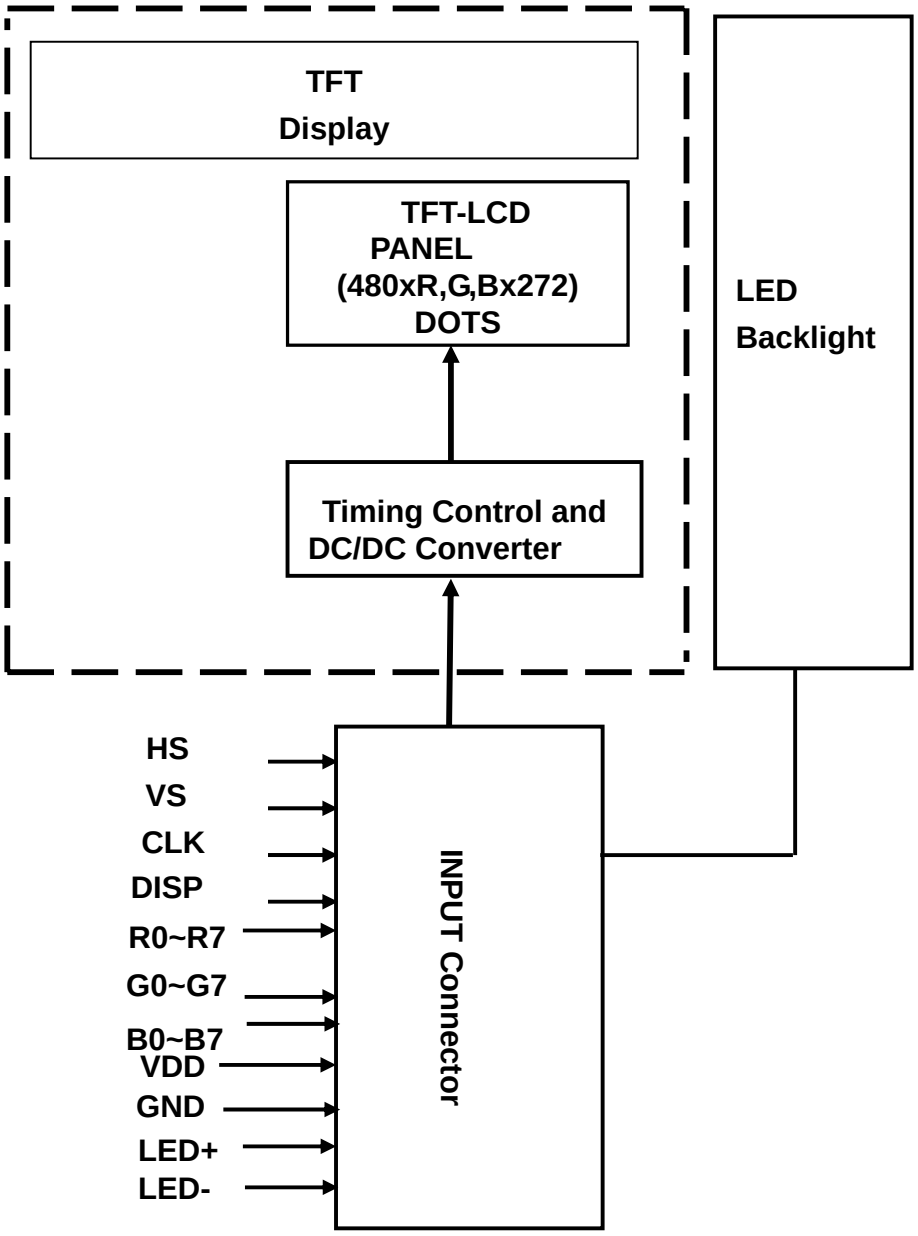
Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_{LED}	--	15	--	mA	
VLED voltage	V_{LED}	28	--	36	V	$I_{LED=15}$ mA
LED life time		--	TBD	--	Hours	Note 1

Note 1 under room temperature (25 °C, Humidity 30-60% RH)and ILED=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, Ta =25ºC, VDD=3.3V GND= 0V)

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

Note: (1) Unit: CLK=1/ fCLK , H=th,
(2) It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode.

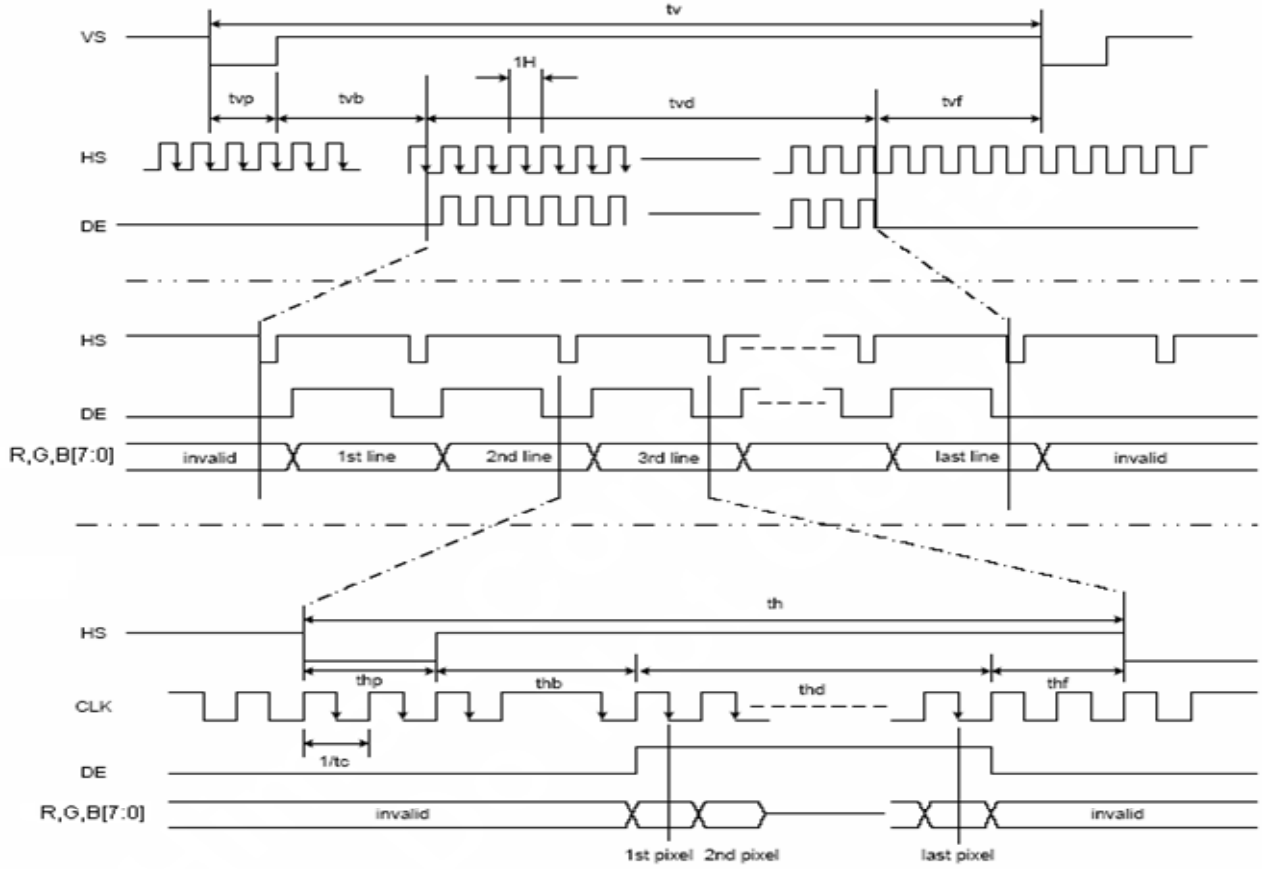


Fig 1. Parallel RGB input timing

7.2 Input Setup Timing Requirement

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	$PW_{CLK(2)}$	66.7	-	-	ns
Clock pulse high period	$PWH_{(2)}$	26.7	-	-	ns
Clock pulse low period	$PWL_{(2)}$	26.7	-	-	ns
HS setup time	t_{hs}	10	-	-	ns
HS hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
VS setup time	t_{vhs}	10	-	-	ns
VS hold time	t_{vhh}	10	-	-	ns

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

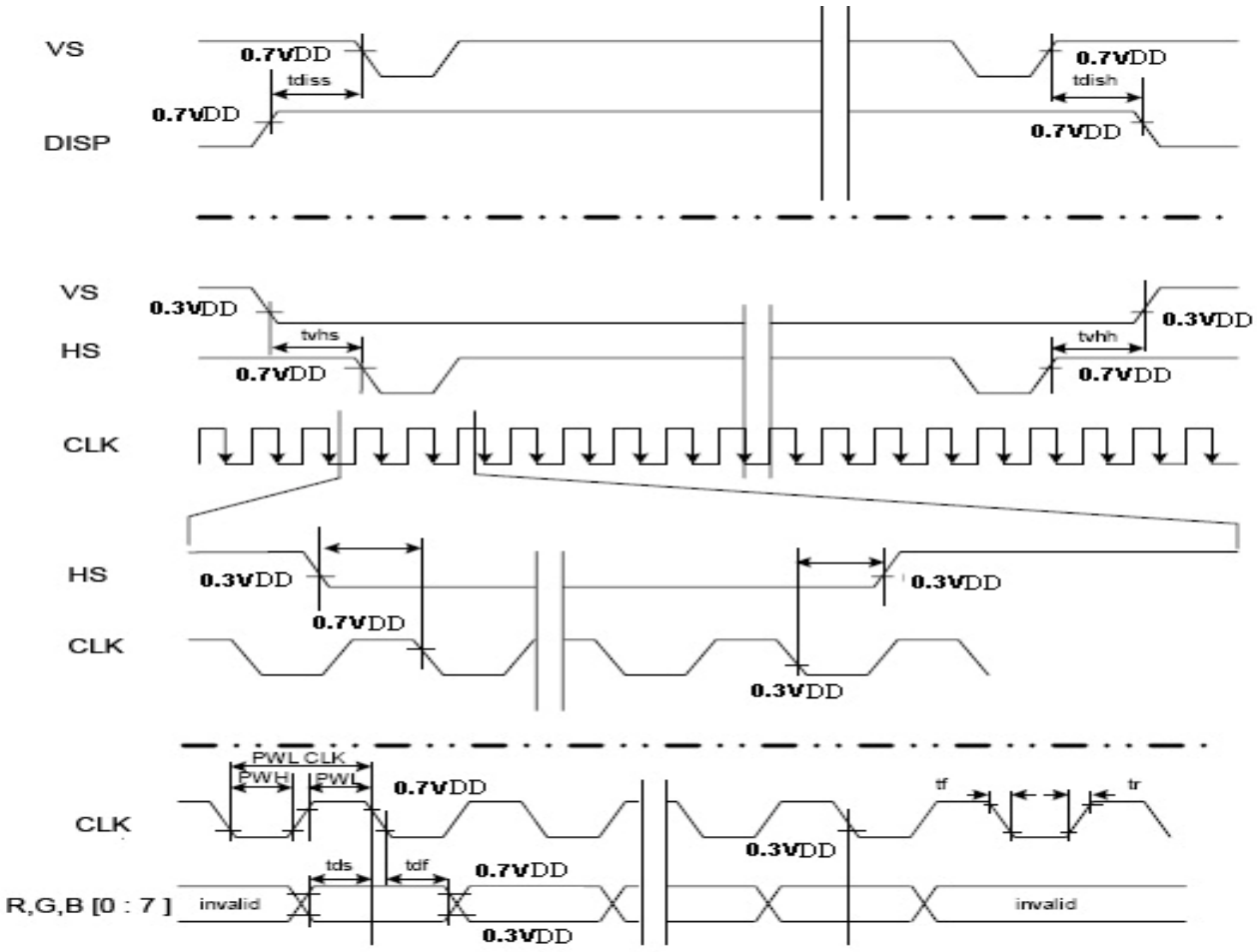


Fig 2. Input setup timing requirement

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.

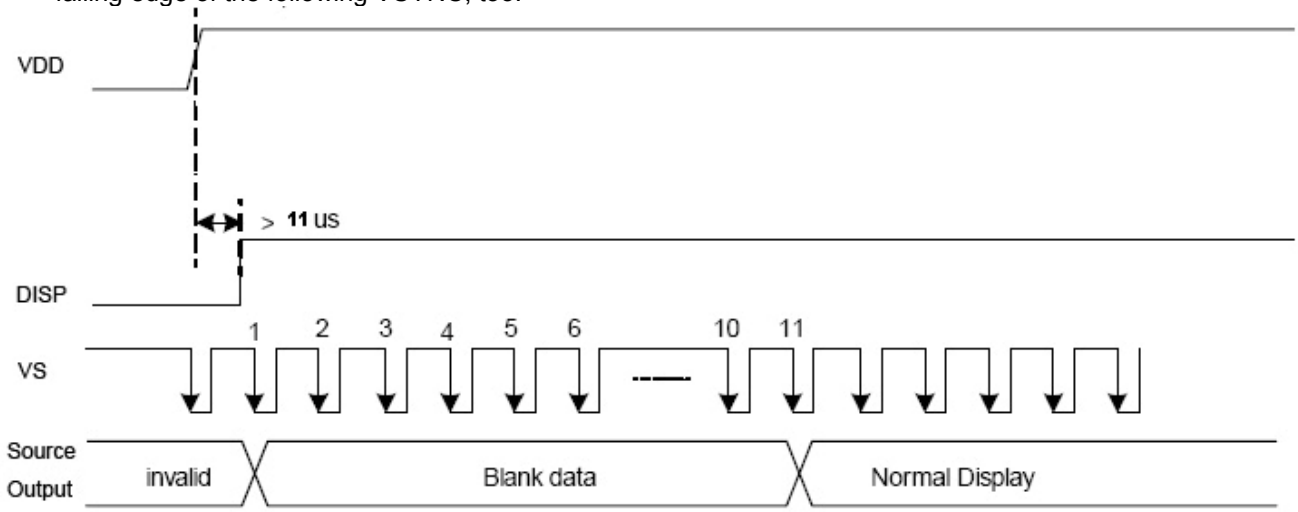


Fig 3. Power On Sequence

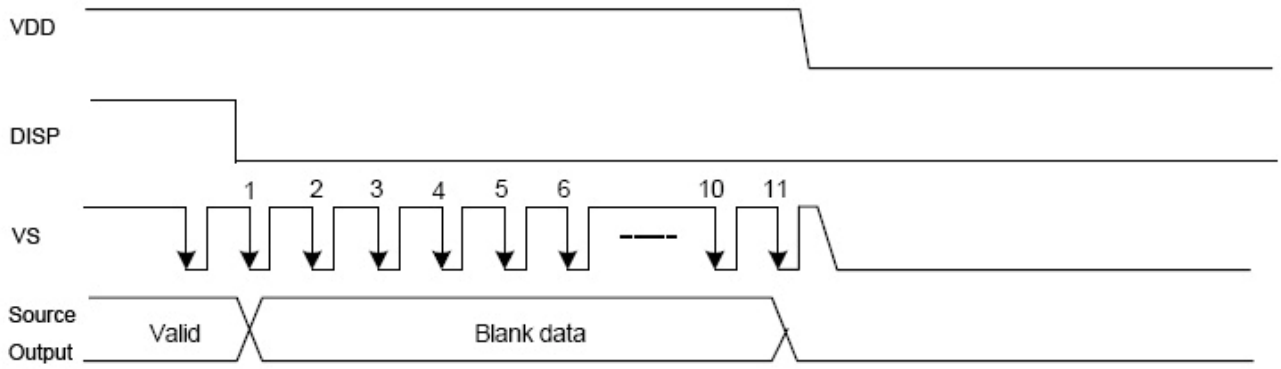
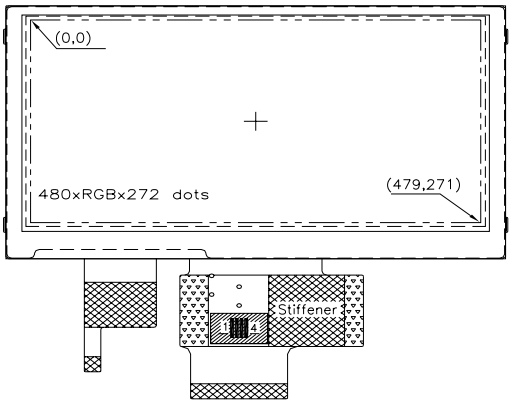


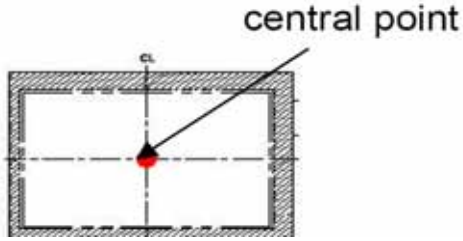
Fig 4. Power Off Sequence

8. CTP SPECIFICATIONS

8.1 GENERAL SPECIFICATIONS

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Resolution	480x272	Dots
Input mode	Human's finger	
Multi touch	One point + Gesture	Point
Interface	I²C	
(X,Y) Position		
Report point rate	Up to 100	Hz
Point hitting life time	1,000,000 times min.	Note 1
FW	TBD	

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.



8.2 ELECTRICAL CHARACTERISTICS

8.2.1 Absolute Maximum Ratings

Symbol	Description	Min	Max	Unit	Notes
VCC	Power Supply voltage	-0.3	+3.6	V	

8.2.2 DC characteristics

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC	Power Supply voltage	2.8	-	3.6	V	
IVCC	Normal operation current		2.1		mA	
Isleep	Sleep Mode current		0.03		mA	

8.3 PIN CONNECTIONS

No.	Name	I/O	Description
1	VCC	P	Power supply voltage.
2	/ RES	I	Reset, Active low
3	/INT	O	Interrupt
4	SDA	I/O	Data line for I²C interface.
5	SCL	I	Serial clock line for I²C interface.
6	VSS	P	Ground

8.4 SERIAL INTERFACE

FT6x06 supports the I2C interfaces, which can be used by a host processor or other devices

I2C

The I2C is always configured in the Slave mode. The data transfer format is shown in Figure12-1

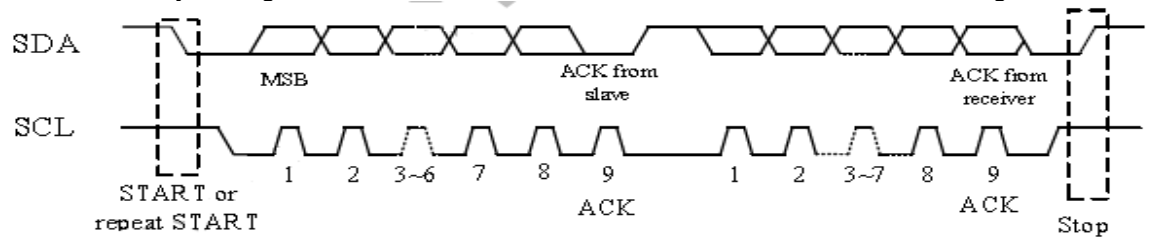


Figure 8-1 I2C Serial Data Transfer Format

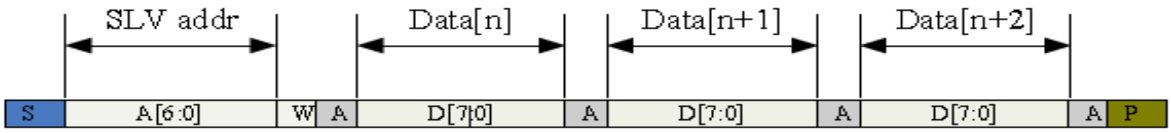


Figure8-2 I2C master write, slave read

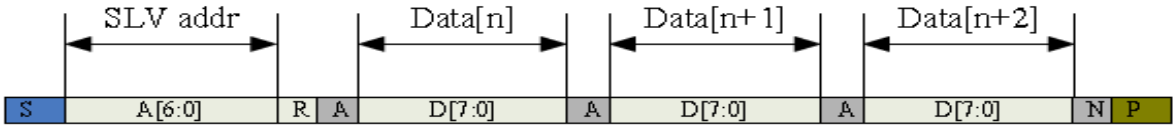


Figure8-3 I2C master read, slave write

Table 8-1 lists the meanings of the mnemonics used in the above figures

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address
R/W	READ/WRITE bit, ‘1’ for read, ‘0’for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

Table 8-1 Mnemonics Description

I2C Interface Timing Characteristics is shown in Table 8-2.

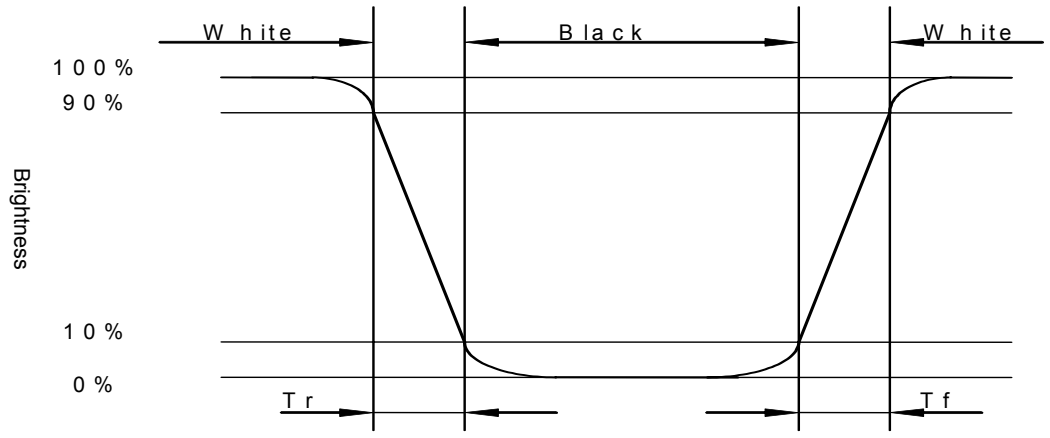
Parameter	Min	Max	Unit
SCL frequency	10	400	KHz
Bus free time between a STOP and START condition	4.7	\	us
Hold time (repeated) START condition	4.0	\	us
Data setup time	250	\	ns
Setup time for a repeated START condition	4.7	\	us
Setup Time for STOP condition	4.0	\	us

Table 8-2 I2C Timing Characteristics

9. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	θ=0°	--	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≥10	40	50	--	Deg.	Note 6
	Bottom			60	70	--		
	Left			60	70	--		
	Right			60	70	-		
Luminance			θ=0°	240	300	--	cd/m^2	Note 7
Uniformity		B-uni		70	--		%	Note 8
White chromaticity		X	θ=0°	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.



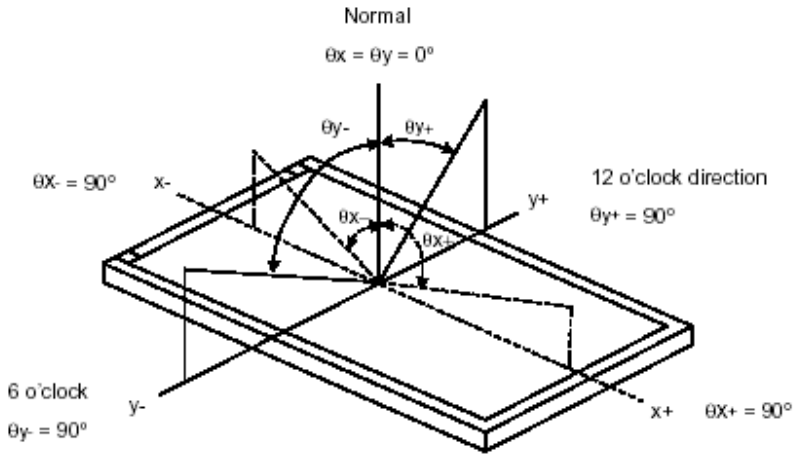
Note5: Definition of contrast ratio:

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:

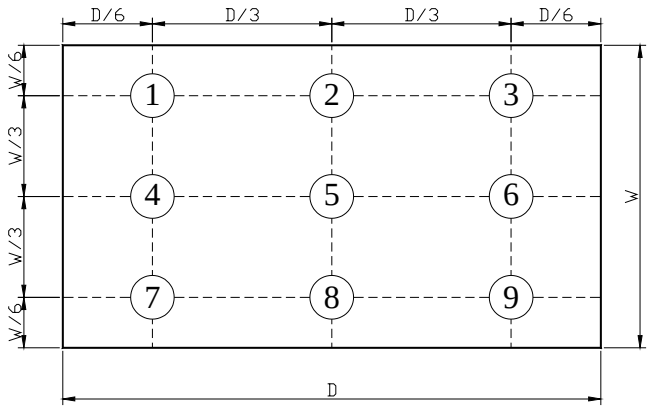
Refer to figure as below.



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



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

10. QUALITY ASSURANCE

10.1 RA Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C
Humidity : 65 ± 5%

10.1.2 Operation

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

10.1.3 Container

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

10.1.4 Test Frequency

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

10.1.5 Test Method

No.	Reliability Test Item & Level	Test Level	Remark
1	High Temperature Storage Test	T=80°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-30°C,240hrs	IEC68-2-1
3	High Temperature Operation Test	T=70°C,240hrs	IEC68-2-2
4	Low Temperature Operation Test	T=-20°C,240hrs	IEC68-2-1
5	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs	IEC68-2-3
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +80°C,200 Cycles 30 min 5min 30 min	IEC68-2-14
7	Vibration Test (No operation)	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	Drop test	Height :60cm 1 conner,3edges,6surfaces	IEC68-2-32
9	Shock test	100G,6ms,Direction:±X±Y±Z Cycle:3times	IEC68-2-27
10	Electrostatic Discharge Test (No operation)	State: operating Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 4kV Air +/-8kV Criteria: Class C	IEC-61000-4-2

10.2 Inspection Judgment standard

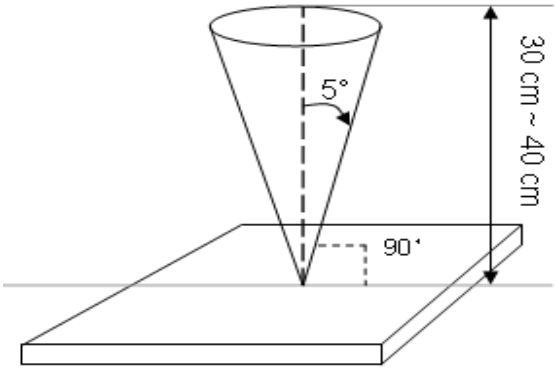
10.2.1 Inspection conditions

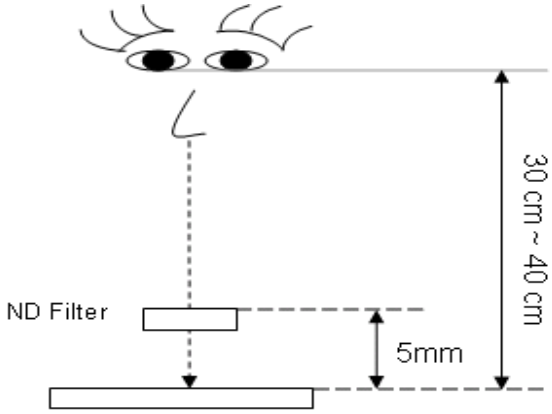
10.2.1.1 Inspection Distance : 35 ± 5 cm

10.2.1.2 View Angle :

(1) Inspection that light pervious to the product: ±5°

(2) Inspection that light reflects on the product: ±45°



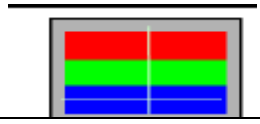


10.2.2 Environment conditions :

Ambient Temperature :	25±5℃
Ambient Humidity :	30~75%RH
Ambient Illumination	600~800 lux

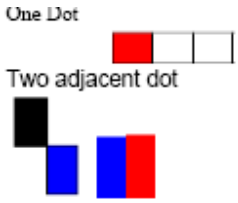
10.2.3 Inspection Parameters

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.	

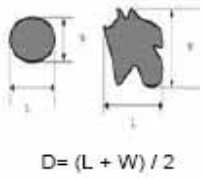
Dot

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

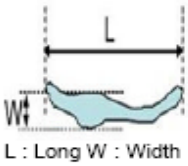
SPEC (unit: mm)	Acceptable
D≦0.3	Ignored
0.3<D≦0.5, distance>5	n≦5
D＞0.5	0



Inspection item	Inspection standard	Description

Foreign material in line shape

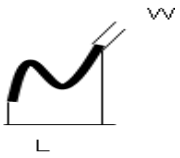
SPEC (unit: mm)	Acceptable
W≦0.05 and L≦7	Ignored
0.05<W≦0.1, L≦7, distance >5	n≦5
W>0.1 or L>7	0



Contamination	It is acceptable if the dirt can be wiped.	
Inspection item	Inspection standard	Description

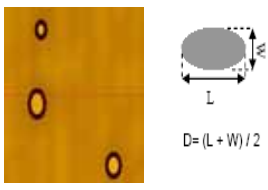
Scratch

SPEC (unit: mm)	Acceptable
W≦0.05 and L≦7	Ignored
0.05<W≦0.08, L≦7, distance >5	n≦5
0.08<W≦0.1, L≦7, distance >5	n≦3
W>0.1 or L>7	0



Bubble

SPEC (unit: mm)	Acceptable
D≦0.2	Ignored
Non visible area	Ignored
0.2<D≦0.3, distance >5	n≦5
D＞0.3	0



<table>
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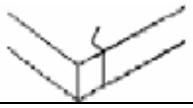
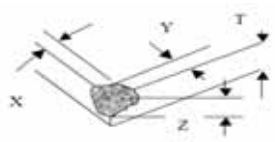
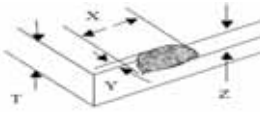
<tr><td>Cover & Sensor Crack</td><td>Prohibited</td><td>  </td></tr>
<tr><td>Sensor angle missing & edge break</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>Damage circuit or effect function</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>Cover/Sensor angle missing</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>X≦3.0, Y≦3.0, Z≦T</td><td>Ignored</td></tr><tr><td>X>3.0, Y>3.0, Z＞T</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Cover/Sensor edge break</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>X≦3.0, Y≦3.0, Z≦T</td><td>Ignored</td></tr><tr><td>X>3.0, Y>3.0, Z＞T</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Inspection item</td><td>SPEC</td><td>Description</td></tr>
<tr><td>Ink</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>word unclear, inverted, mistake, break line</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>Bubble under protection film</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>NA</td><td></td></tr></table></td><td></td></tr>
<tr><td>Function</td><td>Prohibited</td><td></td></tr>
</table>

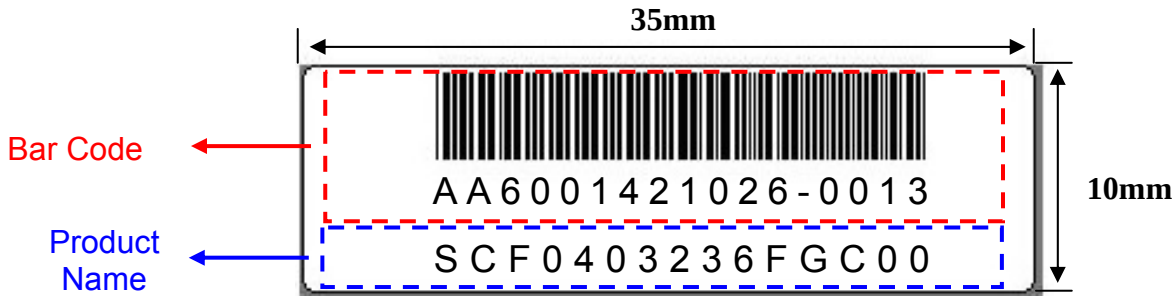
10.3 Sampling Condition

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

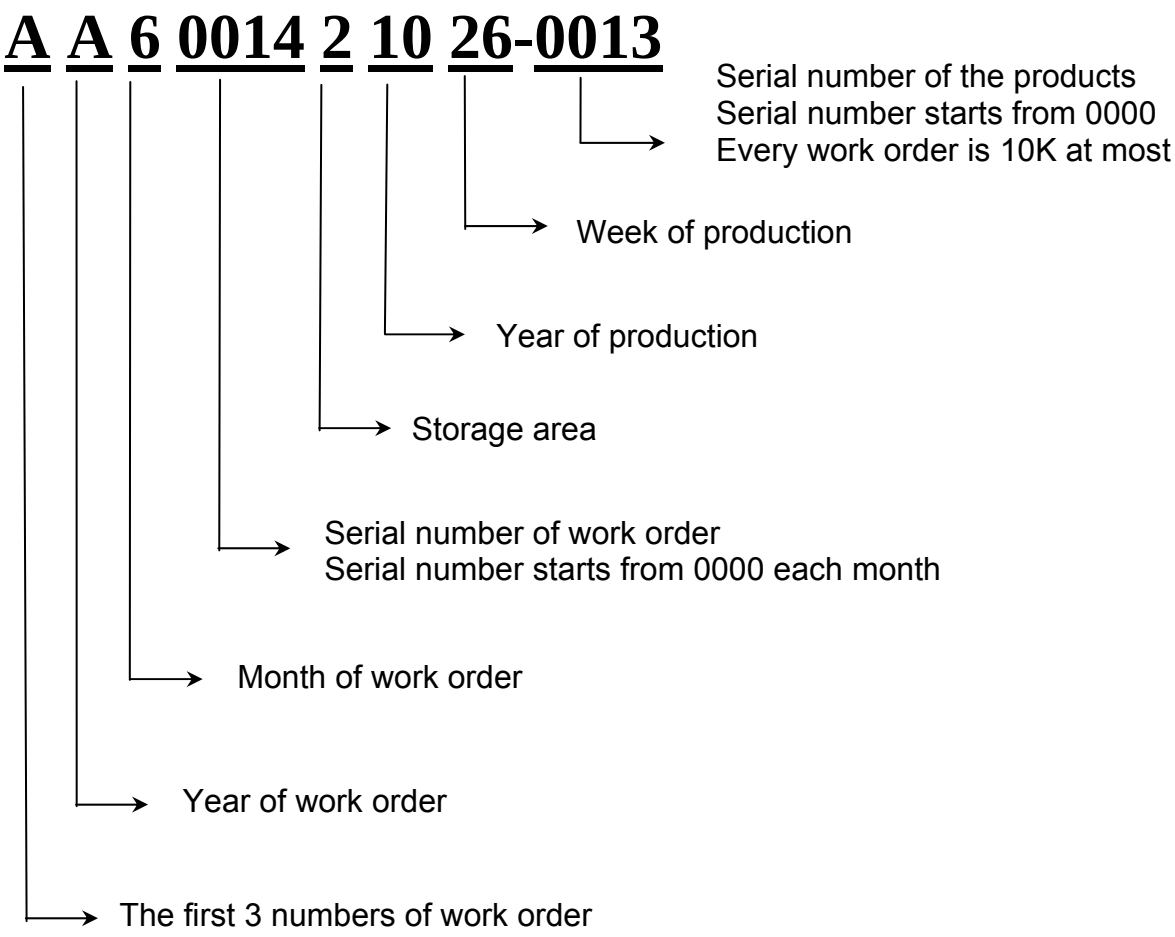
Class of defects	**Definition**		
	Major	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.

11. LCM PRODUCT LABEL DEFINE

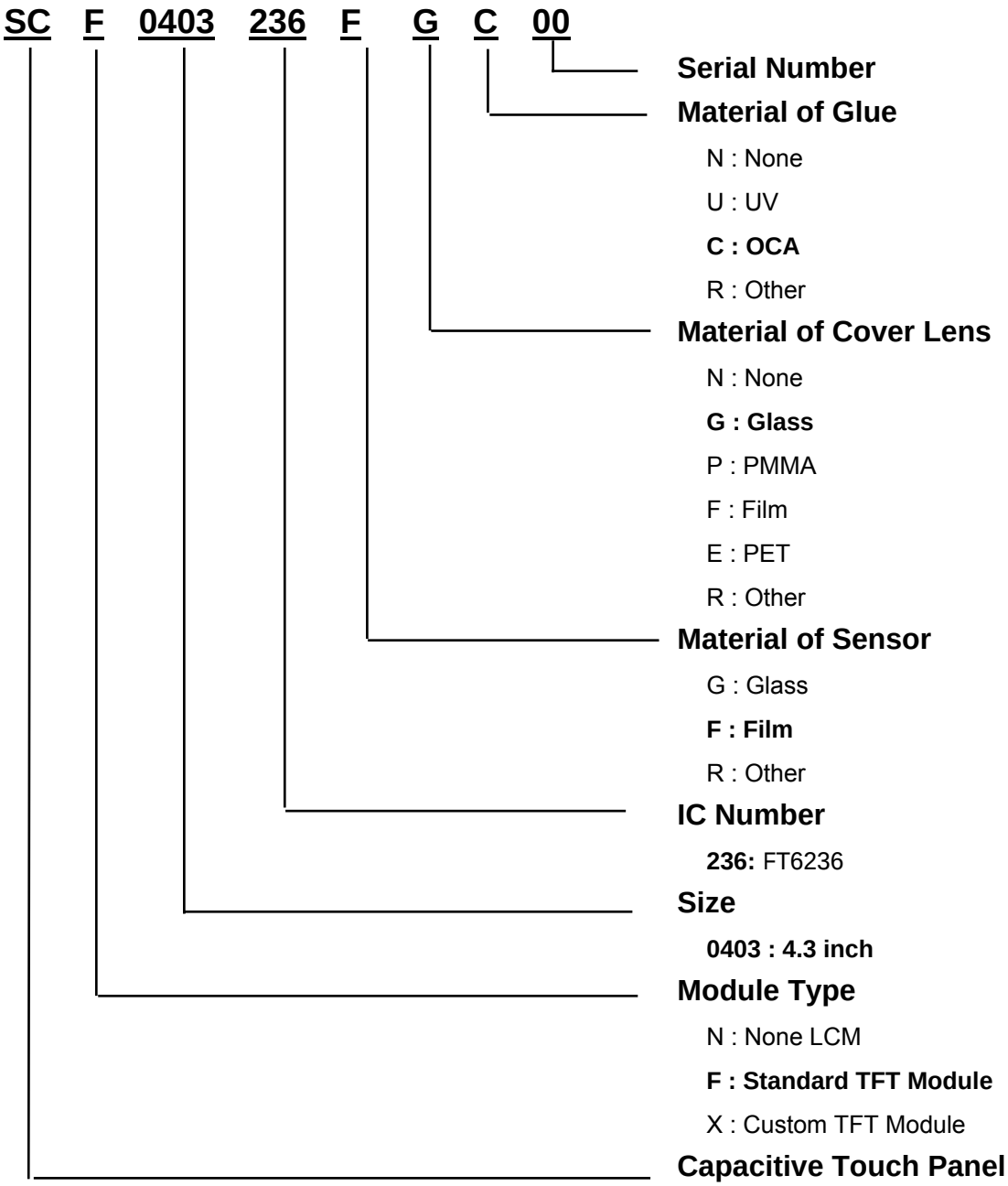
Product Label style:



BarCode Define:



Product Name Define:

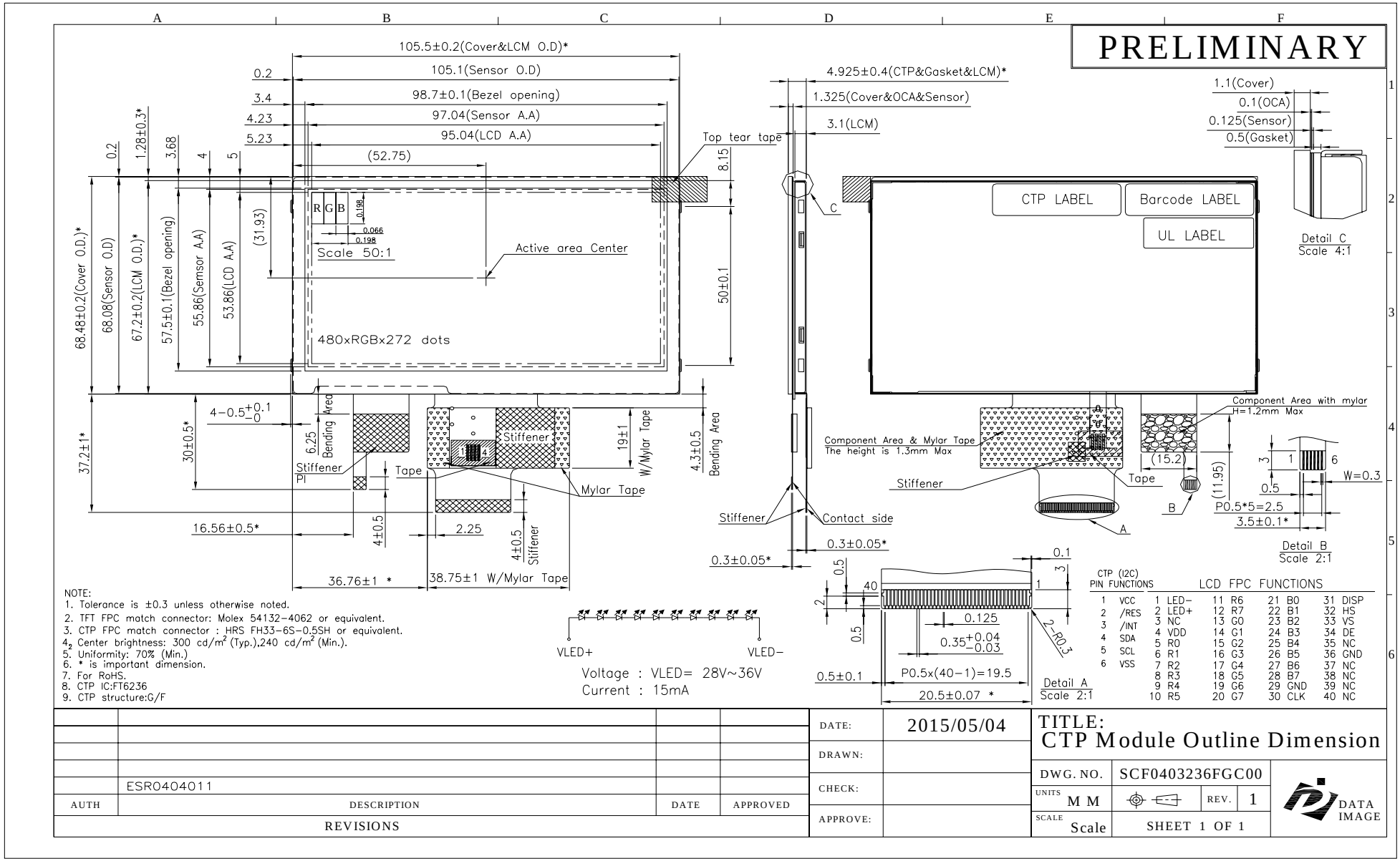


12. PRECAUTION FOR USING LCM

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 Land 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.

13. OUTLINE DRAWING



NOTE:
1. Tolerance is ±0.3 unless otherwise noted.
2. TFT FPC match connector: Molex 54132-4062 or equivalent.
3. CTP FPC match connector : HRS FH33-6S-0.5SH or equivalent.
4. Center brightness: 300 cd/m² (Typ.),240 cd/m² (Min.).
5. Uniformity: 70% (Min.)
6. * is important dimension.
7. For RoHS.
8. CTP IC:FT6236
9. CTP structure:G/F

CTP (I2C) PIN FUNCTIONS

1	VCC	1	LED-	11	R6	21	B0	31	DISP
2	/RES	2	LED+	12	R7	22	B1	32	HS
3	/INT	3	NC	13	G0	23	B2	33	VS
4	SDA	4	VDD	14	G1	24	B3	34	DE
5	SCL	5	R0	15	G2	25	B4	35	NC
6	VSS	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

AUTH	DESCRIPTION	DATE	APPROVED
	ESR0404011		

REVISIONS

DATE:	2015/05/04
DRAWN:	
CHECK:	
APPROVE:	

TITLE: CTP Module Outline Dimension

DWG. NO.	SCF0403236FGC00		
UNITS M M		REV.	1
SCALE Scale	SHEET 1 OF 1		

DATA IMAGE

14. PACKAGE INFORMATION

TBD