SPECIFICATION
FOR
LCD MODULE

Customer　　　: _____

Product Model: _____LD035H3-54NM-A1_____

Sample code: _____

Designed by	Checked by	Approved by

Final Approval by Customer

☐ LCM Machinery OK

Checked By _____

☐ LCM Display OK

Checked By _____

☐ LCM OK

☐ NG，Problem survey:

Approved By _____

※**The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.**
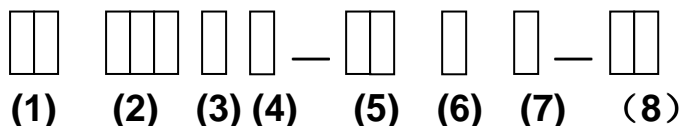
Revision History

Version	Contents	Date	Note
A	Original	2010.05.18	
B	Change BL FPC	2014.04.10	

 REV.A

Contents

 REV.A

1 Numbering System

☐☐ ☐☐☐☐ — ☐☐ ☐ ☐ — ☐☐
(1)   (2)   (3) (4)   (5)   (6)   (7)   （8）

No	Definition	Specifications
(1)	TFT LCM Productor No.	LD ---- League display technologiy Co.,Ltd
(2)	Display monitor opposite angle line size	Unit :mm or mmm (size <10 inch: takes two integers ; size >=10 inch: takes three integers)
(3)	Productor Types	D ---- Digital photo frame / DVD G ----GPS M ----MP H ----Handheld device 。。。
(4)	Productor Development Series No.	By two figures characters expression from 01 to 99
(5)	Interface PIN Number	By two figures characters expression from 01 to 99
(6)	With Touch Panel Or Not	T----With T/P ； N----Without T/P
(7)	LCD Type	A----AUO ；M----CMO ；C----CPT；P----PVI；L----LG；W----Wintek；H----HSD；T----TM；Y----Hydis；I----Hitach；S----Sharp。。。
(8)	Productor Development edition No.	By The English litters：A 1~ Z9

2 Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of Shenzhen L&D Technology   Co.,Ltd.

It is capable of using 262k colors mode 24bit parallel bi-directional interface.

3 Normative Reference

GB/T4619-1996 《 Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

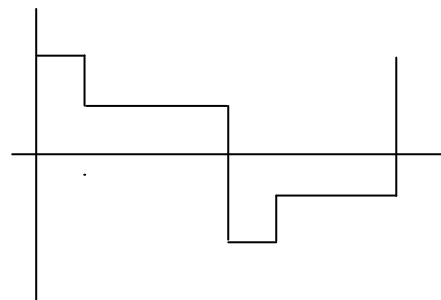IEC61747-1 《SIXTH PARTGB2828`2829-87《National Standard of PRC》

4 Definitions

4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.
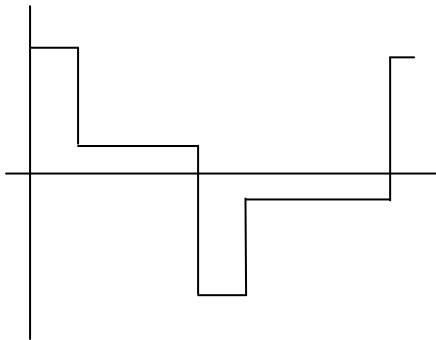
【 selected waveform 】   【 non-selected waveform 】

① Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

$(f_f=80Hz,\ \Phi=10°\ \theta=270°\ at\ 25℃)$

② Vth2: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

$(f_f=80Hz,\ \Phi=10°\ \theta=270°\ at\ 25℃)$

③ Vop: (Vth1(50%)+Vth2(50%))/2 $(f_f=80Hz,\ \Phi=10°\ \theta=270°\ at\ 25℃)$

4.2 Definition of Response Time Tr, Td

①Tr: The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. $(f_f=80Hz,\ \Phi=10°\theta=270°at\ 25\ ℃)$

②Td: The time required which the brightness of segment
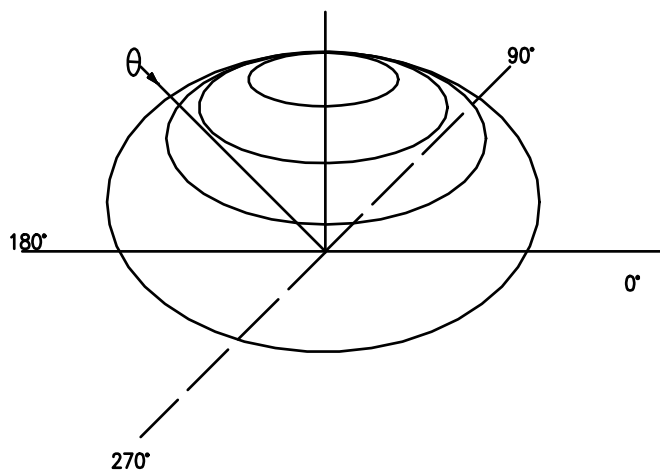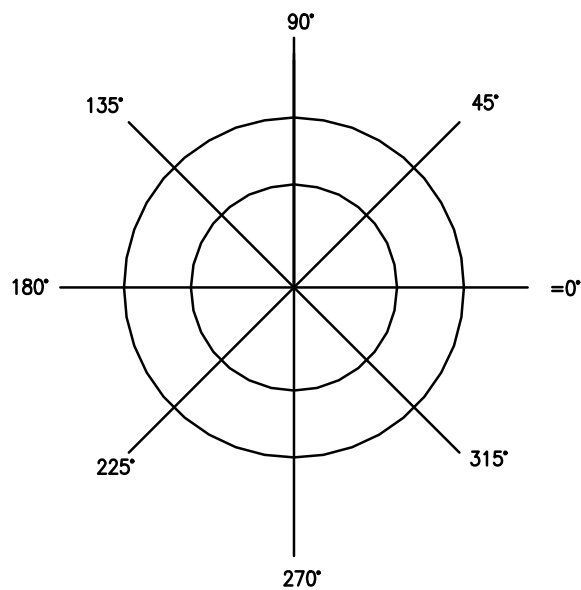
becomes 90% from 10% when waveform is switched to selected one from selected one. (f_f=80Hz, Φ=10° θ=270° at 25℃)
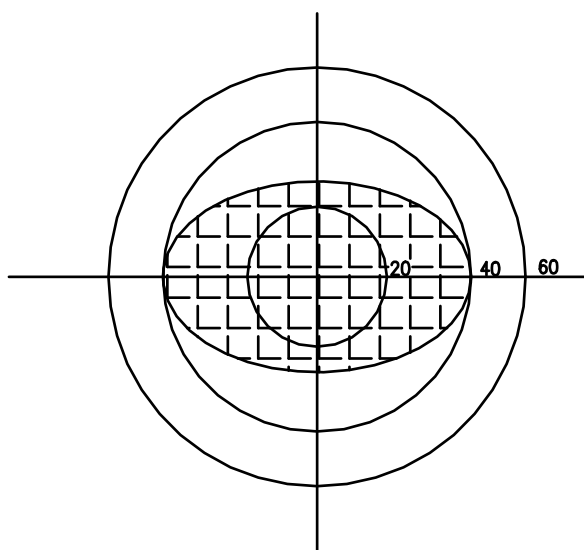
4.3 Definition of Contrast Ratio Cr

Cr=A/B

 ① A: Segments brightness in case of non-selected waveform

 ② B: Segments brightness in case of selected waveform

4.4 Definition of Angle and Viewing Range

Angular Graph: Constrast Ratio

Such as:
Viewing Angle Range:
 80(Cr>2) Horizontal
 70(Cr>2) Vertical

REV.A

5 Technology Specifications

5.1 Feature

This single-display module is suitable for use in Multidedia Player products.

The LCD adopts one backlight with High brightness 6-lamps white LED.

1) Construction: 3.5″ a-Si color TFT-LCD ,White LED backlight, FPC.

2) LCD:

    2.1 Amorphous-TFT 3.5-inch display, transmissive, normally white type.

    2.2 320(RGB)×240dots Matrix.

    2.3 Narrow-contact ledge technique.

    2.4 LCD Driver IC: HX8238D × 1.

3) Low cross talk by frame rate modulation.

4) 262K Color ,24bit RGB interface.

5) Video signal interface: Parallel RGB .

5.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional outline	76.9(W) ×63.9(H)×3.2 (T)	mm
Active area	70.08(W) ×52.56 (H)	mm
Luminance for LCM	300	cd/m^2
Pixel size	219(W) ×219(H)	um
Resolution	320(RGB) × 240	pixel

5.3 Absolute Max. Rating

5.3 Absolute Max. Rating

Item	Symbol	Value			Unit	Remark
		Min	typ	Max		
Supply voltage	VDD	-0.3	3.3	5.0	V	-
Operating temperature	T_{OPR}	-20	-	+70	℃	-
Storage temperature	T_{STG}	-30	-	+80	℃	-

5.4 Electrical Characteristics

DC Electrical Characteristics

Parameter	Symbol	Rating			Unit
		Min.	Typ.	Max.	
Low level input voltage	V_{IL}	0	-	0.3 VCC	V
Hight level input voltage	V_{IH}	0.7 VCC	-	VCC	V

5.5 Optical specifications

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Power Voltage	VCC	3.0	3.3	3.6	V	
Digital Operation Current	Icc		8.6		mA	
Gate On Power	VGH	14	15	18	V	
Gate Off Power	VGL	-11	-10	-8	V	
Vcom High Voltage	VcomH		3.7		V	Note1
Vcom low Voltage	VcomL		-1.6		V	Note1
Vcom level max	VcomA			6	V	

Note1. VcomH& VcomL : Adjust the color with gamma data. Vp-p should be higher then
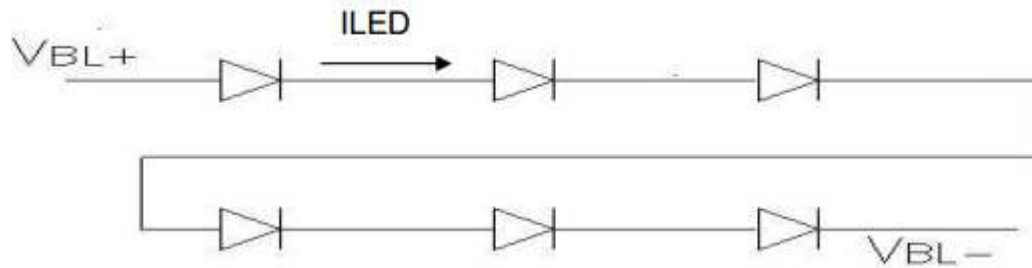4V.(Option 5V)

Note: Please power on following the sequence VCC → VDD
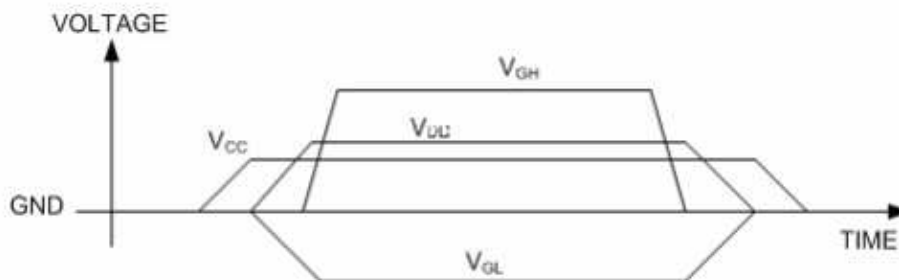
5.6 LED back light specification (6 White Chips)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	Vf	If=20mA	-	19.8	-	V
Uniformity (with L/G)	ΔB_p	If=20mA	80	-	-	%
Luminance for LCM	L_V	If=20mA	240	700		cd/m^2

LED CIRCUIT

5.7 Interface Pin Connections

PIN NO.	Symbol	Description
1-2	LED_Cathode	LED -
3-4	LED_Anode	LED +
5	NC(YU)	NC
6	NC (XR)	NC
7	NC	NC
8	/RESET	RESET
9	SPENA	Serial data enable
10	SPCLK	Serial clock
11	SPDAT	Serial data
12-19	B0-B7	Bule data 0-7
20-27	G0-G7	Green data 0-7
28-35	R0-R7	Red data 0-7
36	HSYNC	Horizontal sync
37	VSYNC	Vertical sync
38	DOTCLK	Dot(data) Colck
39-40	NC	NC
41	VCCIO(1.8V)	Power supply(1.8V) Note 1
42	VDD(3.3V)	Power supply(3.3V)
43	NC (YD)	NC
44	NC (XL)	NC
45	VGL	Voltage Test PIN. (No external supply.)
46	NC	NC
47	VGH	Voltage Test PIN. (No external supply.)
48	SEL2	Note 2
49	SEL1	
50	SEL0	
51	NC	
52	ENB(DEN)	Data enable
53	DGND	GND
54	AVSS	GND

Note 1: VCCIO= 1.8V or VCCIO= VDD

Note 2:

SEL2	SEL1	SEL0	Format	Operating Frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHz
0	0	1	Serial-RGB data format	19.5MHz
0	1	0	CCIR 656 data format (640RGB)	24.54MHz
0	1	1	CCIR 656 data format (720RGB)	27MHz
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)	24.54MHz
1	0	1	YUV mode A data format (Cr-Y-Cb-Y)	27MHz
1	1	0	YUV mode B data format (Cb-Y-Cr-Y)	27MHz
1	1	1	YUV mode B data format (Cb-Y-Cr-Y)	24.54MHz

6 Signal timing diagram and Circuit block diagram

6.1 Circuit block diagram
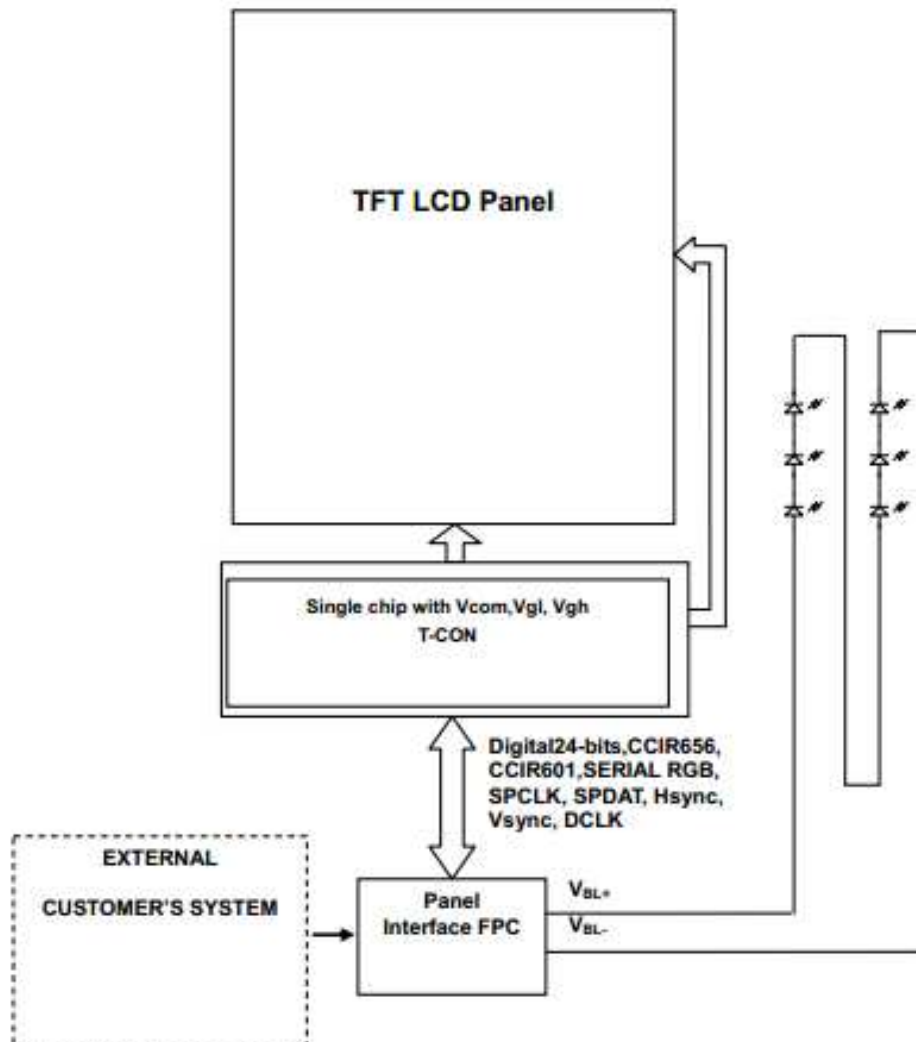
6.2 Signal Timing Diagram

6.2.1 Power ON Sequence

LQ35NC111 has a power ON/OFF sequence control function. When STB pin is pulled L,blank data is outputted for 5-frames first, form the falling edge of the following VSYNC signal. The blank data would be gray level 255 for normally white LC.
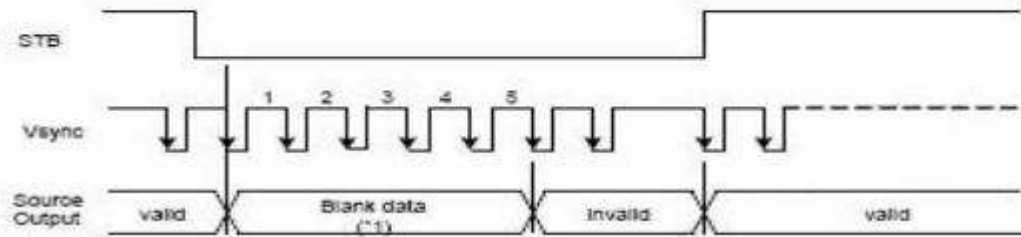
6.2.2 Digital Parallal RGB interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	156	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	408	-	Tosc
	Pulse Width	THS	5	30	-	Tosc
	Back-Porch	Thb		38		Tosc
	Display Period	TEP	-	320	-	Tosc
	Hsync-den time	THE	36	68	88	Tsoc
	Front-Porch	Thf	-	20	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: 1. Thp + Thb = 68, the user is make up by yourself.
2. Tv = Tvs + Tvb + Tvd + Tvf , the user is make up by yourself.
3.When SYNC mode is used,1st data start from 68th Dclk after Hsync falling

6.2.3 Digital Serial RGB interface

Digital Serial RGB interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	52	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	1224	-	Tosc
	Pulse Width	THS	5	90	-	Tosc
	Back-Porch	Thb		114		Tosc
	Display Period	TEP	-	960	-	Tosc
	Hsync-den time	THE	108	204	264	
	Front-Porch	Thf	-	60	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: 1. Thp + Thb = 204, the user is make up by yourself.
2. Tv = Tvs + Tvb + Tvd + Tvf , the user is make up by yourself.
3. When SYNC mode is used,1st data start from 204th Dclk after Hsync falling

6.2.4 CCIR601/656 Interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	37	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns

6.3 Waveform

● CCIR601 (HS_POL=L in Register R2)
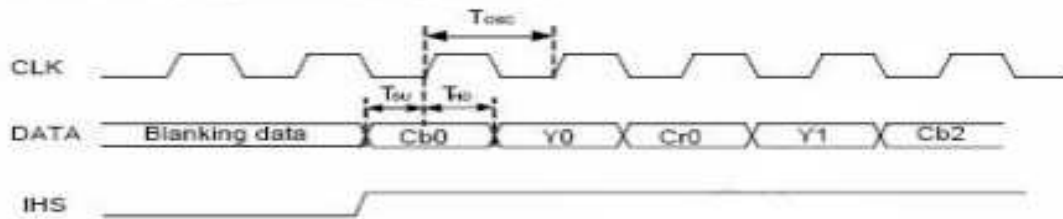
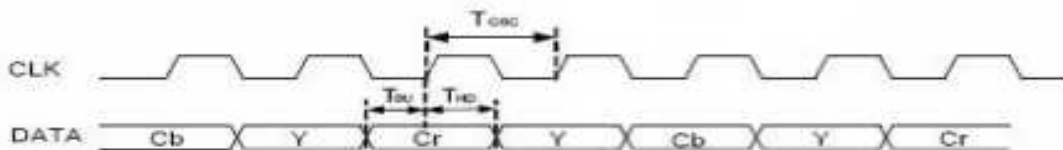Figure1 CLK,DATA and HIS waveforms in CCIR601

● CCIR656

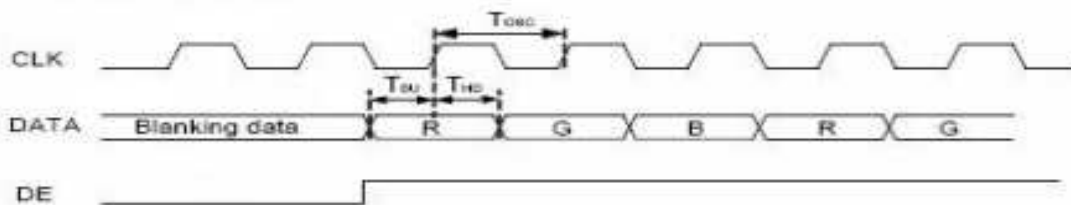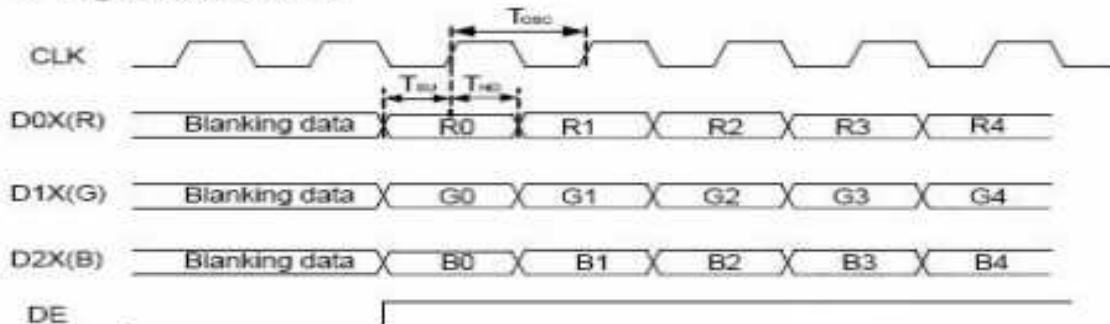Figure2 CLK and DATA waveforms in CCIR656

● Digital Serial RGB

Figure3 CLK, DATA and DE waveforms in Digital Serial RGB

● Digital Parallel RGB

6.3.1 Clock and Sync waveforms

REV.A
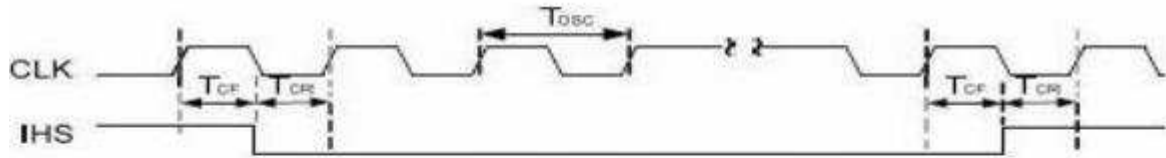
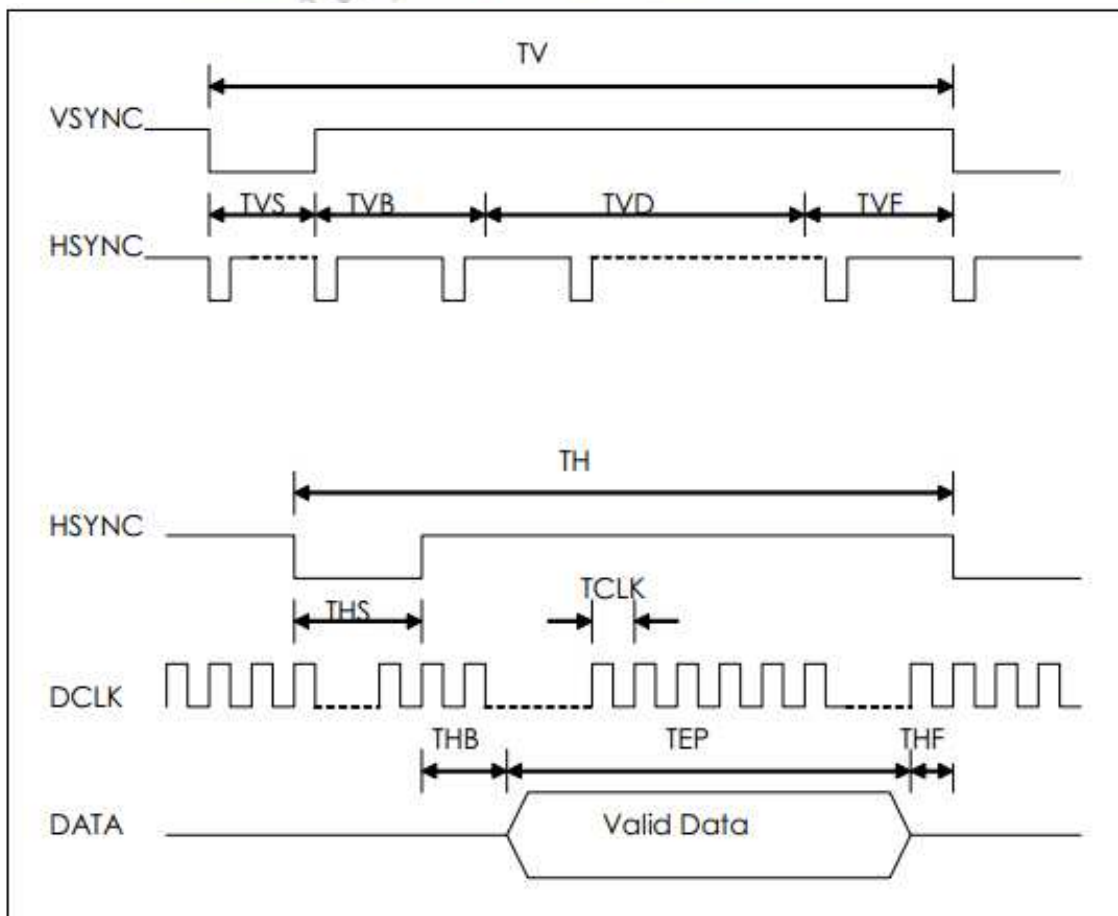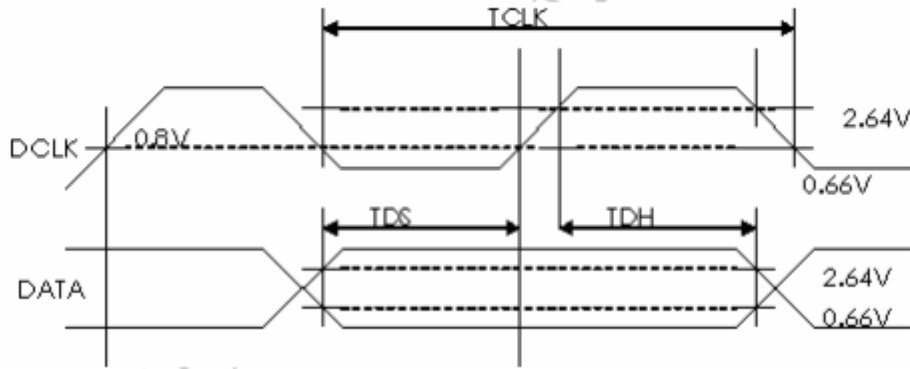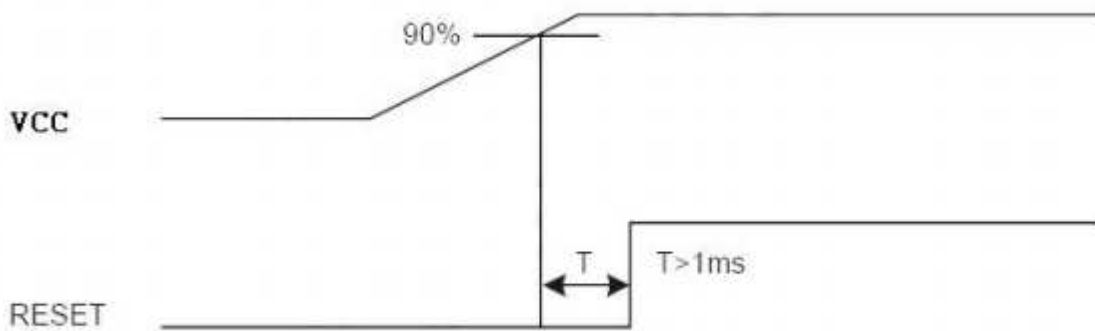**Figure6 CLK and IHS timing waveform**
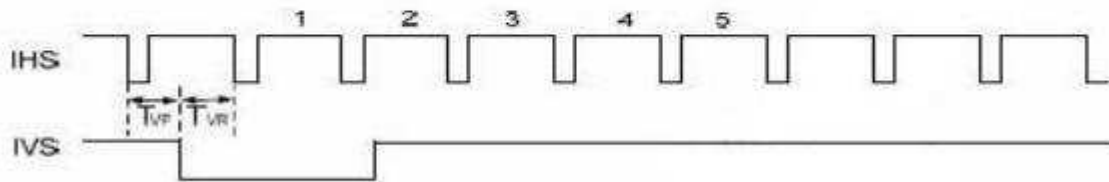
Figure7 IHS and IVS timing waveforms

6.3.2 Reset Timing Chart

The RESET input must be held at least 1ms after power is stable
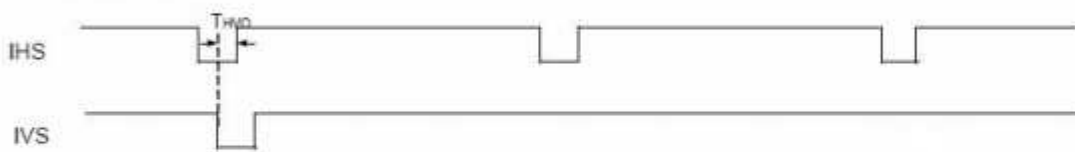

Reset timing

6.3.3 Digital RGB timing waveform

Hsync and Vsync timing

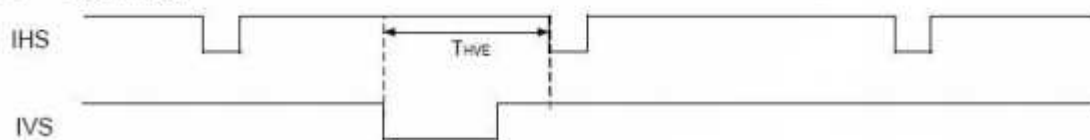CCIR601 timing waveform VS_POL=H, HS_POL=L in Register R2)

IHS and IVS timing

● Odd field
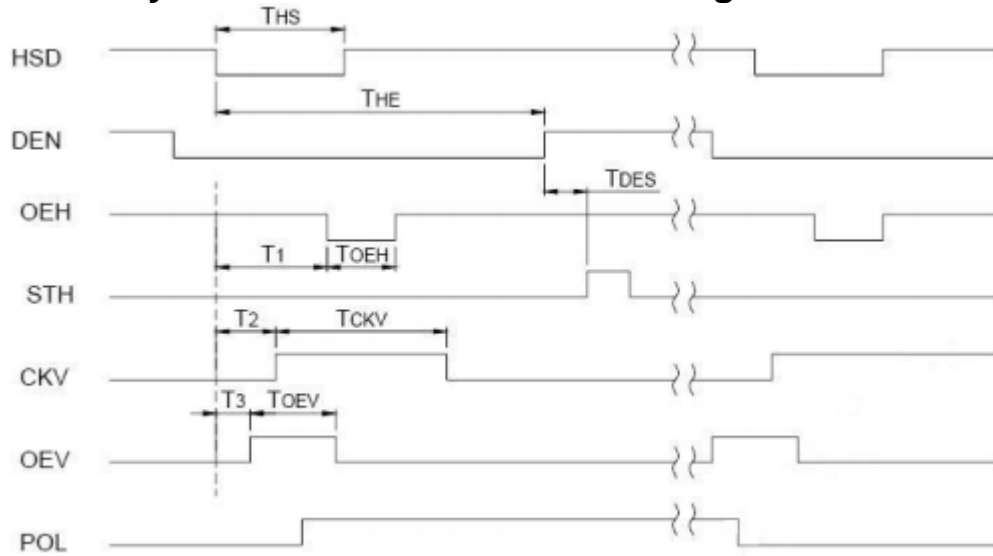

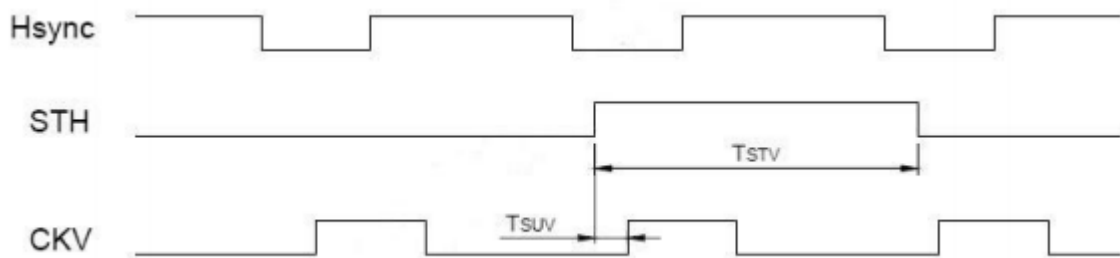IHS and IVS waveforms in odd field

● Even field

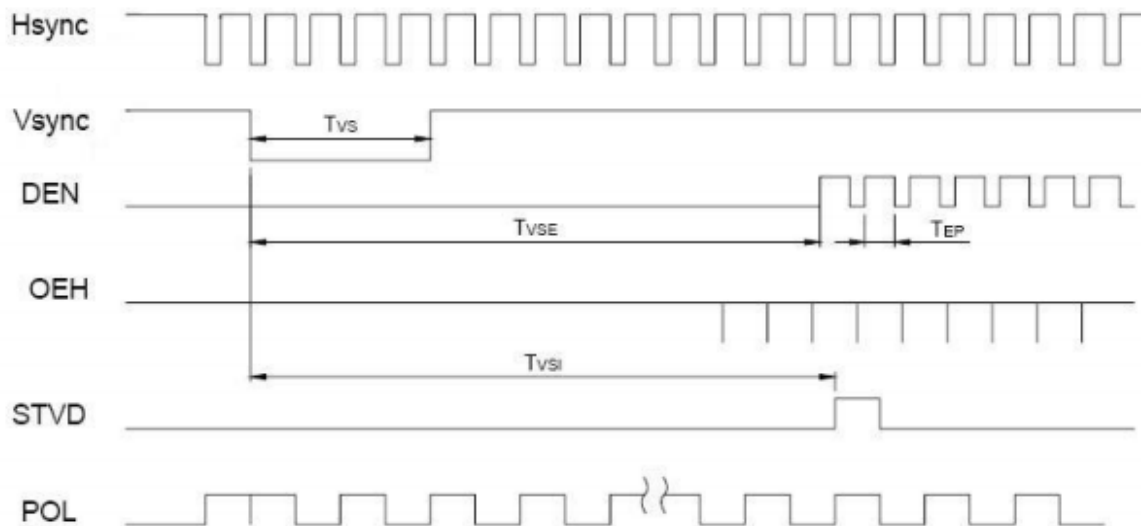IHS and IVS waveforms in even field

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6.3.4 Hsync and horizontal control timing waveform

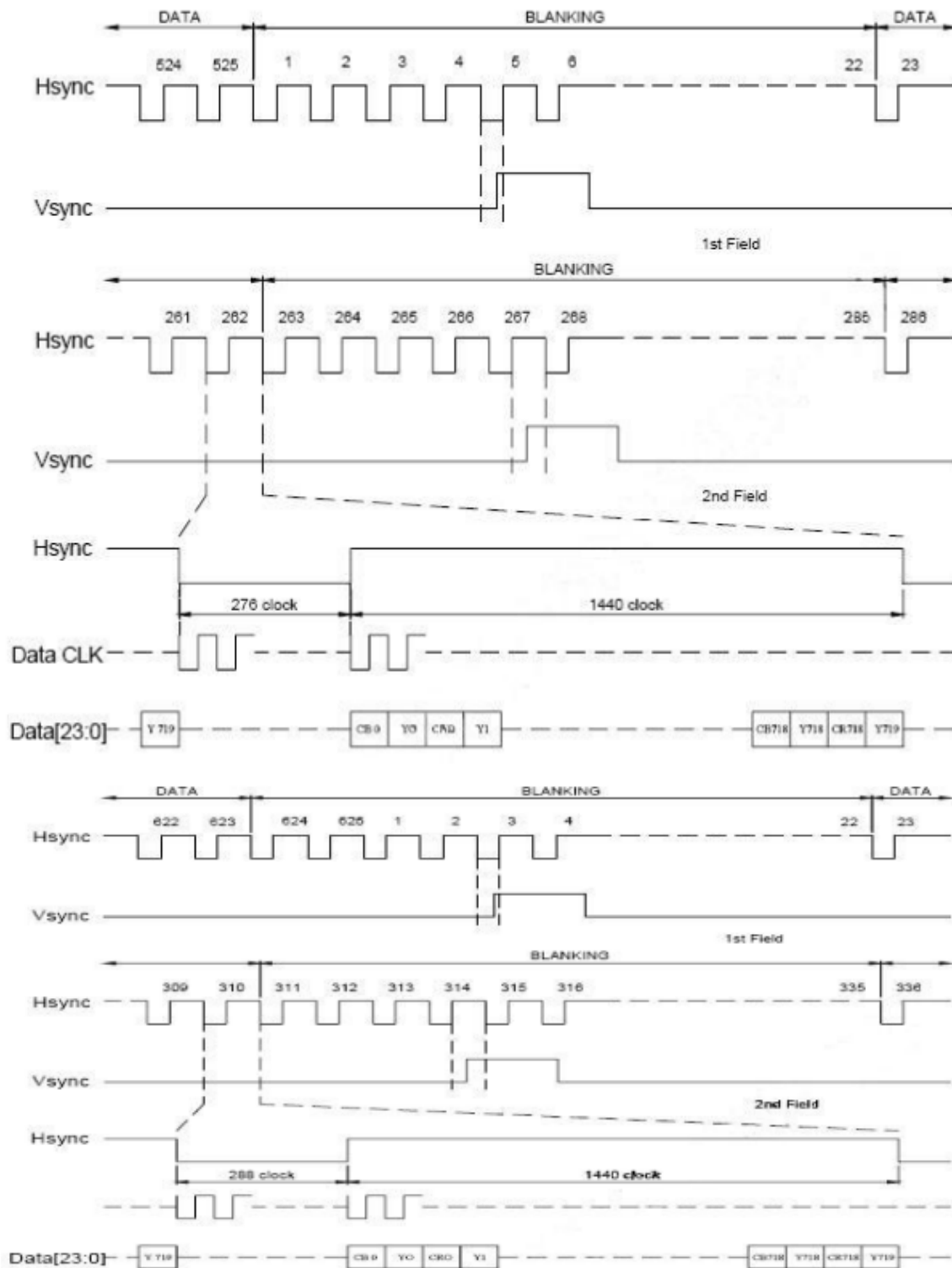### 6.3.5 Hsync and vertical shift clock timing waveform

6.3.6 Hsync and vertical control timing waveform

6.3.7 CCIR601 timing waveform

CCIR601 timing waveform (VS_POL="H" , HS_POL="L" in Register R2)

7 Initial code

No

8 SPI timing Characteristics

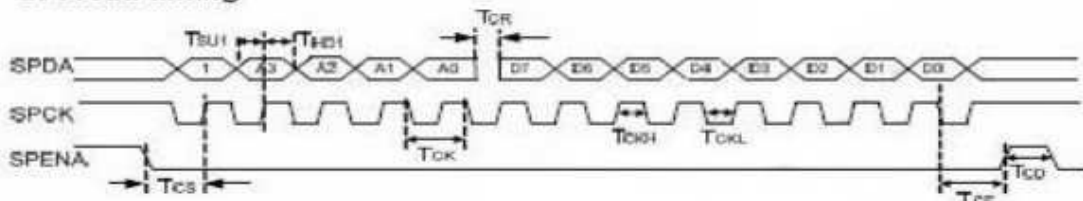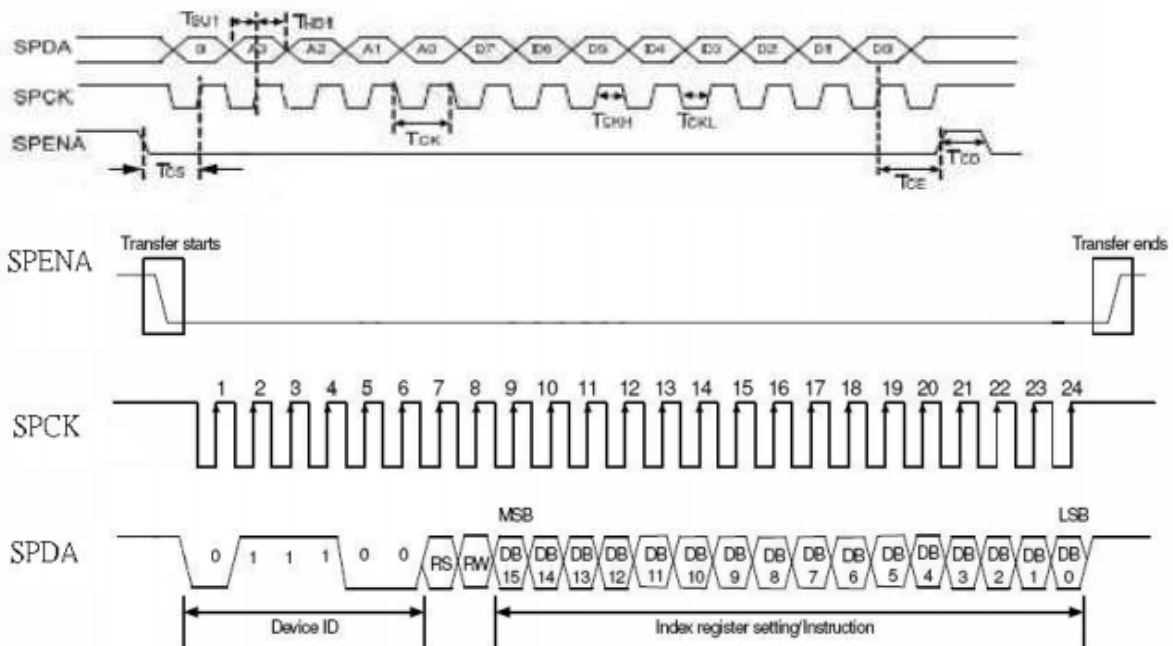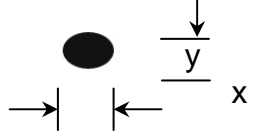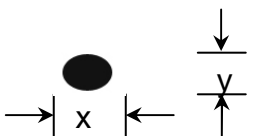| PARAMETER	Symbol	Min.	Typ.	Max.	Unit
SPCK period	T_{CK}	60	-	-	ns
SPCK high width	T_{CKH}	30	-	-	ns
SPCK low width	T_{CKL}	30	-	-	ns
Data setup time	T_{SU1}	12	-	-	ns
Data hold time	T_{HD1}	12	-	-	ns
SPENA to SPCK setup time	T_{CS}	20	-	-	ns
SPENA to SPDA hold time	T_{CE}	20	-	-	ns
SPENA high pulse width	T_{CD}	50	-	-	ns
SPDA output latency	T_{CR}	-	1/2	-	T_{CK}

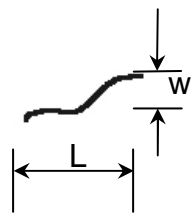● **SPI read timing**

Figure8 SPI read timing

SPI write timing
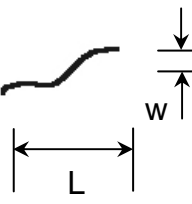
9 Reliability Test Conditions And Methods

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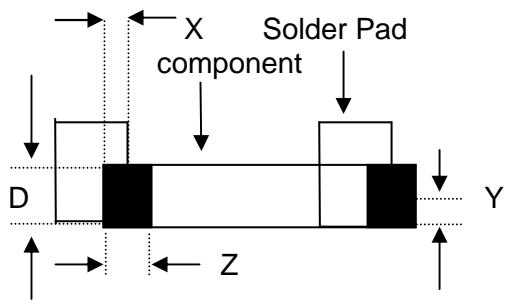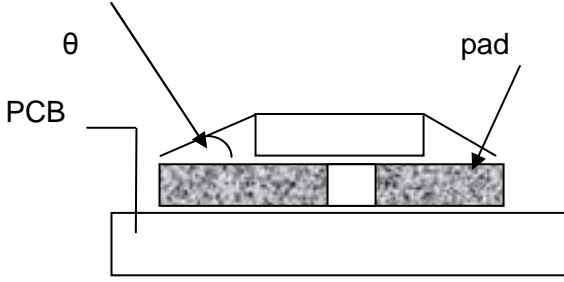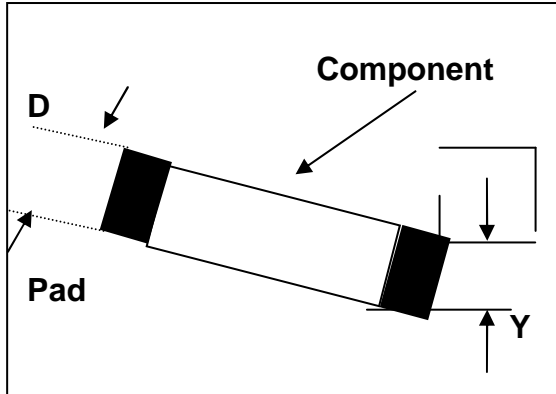
NO	Item	Condition	Method
1	High / Low Temperature Storage	80℃/-30℃ 120hrs	Check and record every 48Hrs
2	High / Low Temperature Life	70℃/-20℃ 120hrs (operating mode)	Check and record every 48Hrs
3	High Temperature、 High Humidity Operating	60℃,90% RH, 96Hrs	Check and record every 48hrs
4	Thermal Shock	-30℃(30Min) ⟶ 25℃(5Min) ⟶ 80℃(30Min) (conversion time, : 5 sec) 20 cycles	Each 10 cycles end , check
5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction(X,Y,Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Static Electricity	Gap mood: ±1KV~±8KV (10 times air discharge with positive/negative voltage voltage gap : 1kv) Touch mood: ±1KV~±4KV	Each discharge end, Check the Electrical Characteristics
7	Curve	60 Thousand times, 40 times/min 150° (according to die if exist)	Check and record every 2~4 thousand times
8	Slump	Free faller movement for each side、cording、angle (75cm High、6 sides、2 angle、2 cording)	End
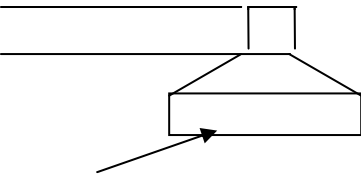
10. Inspection standard
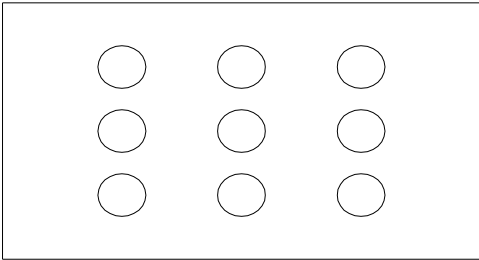
No	Item	Criterion	
01	Outline Dimension	In accord with drawing	
02	Position-finding Dimension Assemble Dimension	In accord with drawing	
03	LCD black spots, white spots (Round type)	Round type: non display 3.1 Small area LCD Unit : mm 3.2 Large area LCD	

3.1 Small area LCD (Unit : mm)

Dimension	Qualified Quantity
D≤0.1	Ignore
0.1＜D≤0.15	2
D＞0.15	0

3.2 Large area LCD

Dimension	Qualified Quantity
D≤0.1	Ignore
0.1＜D≤0.15	2
0.15＜D≤0.20	1
D＞0.20	0

C-STN : if D＞0.1 , unqualified

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04	LCD black spots, white spots (Line Style)	4.1 Small area LCD Unit : mm		

4.1   Small   area   LCD

Unit : mm

Length	Width	Qualified Quantity
-	≤0.015	Ignore
≤1.0	0.015<W≤0.025	2
≤2.0		1
≤1.0	0.025<W≤0.05	1
-	D>0.05	According to circle

4.2 Large area LCD

Length	Width	Qualified Quantity
-	≤0.015	Ignore
≤2.0	0.015<W≤0.025	2
≤1.0	0.025<W≤0.05	1
-	D>0.05	According to circle

CSTN : If W ≥ 0.015 , unqualified
Ignore beyond viewing area

05	LCD Scratch 、 Threadlike Fiber	Same to NO.3 circle sightline and surface of LCD is vertical (2)Same to NO.3 line style	

06	POL	It is not admissible that POL is beyond the edge of glass, else, unqualified. It is essential that POL is over the 50 percent of width of frame , else ,unqualified. According to the drawing in case of special definition.	

07	IC/FPC Bonding	Scratch	Reject

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07		Intensity Of Adhesion	If lower than specification, reject	
		Gold Fold Twist	Reject	
07	IC/FPC Bonding	Silicon	According to outline, no gold outside, seal can not be higher than LCD	
		FPC Gold Sever	Reject	
08	SMT	Lack of Component、Polarity Inverse	If exist, reject	
		Leak Solder、Virtual Solder	If exist, reject	
		Short Circuit In Solder Point	If exist, reject	
		Tin Ball	If exist, reject	
		Tin Acumination	If visual, reject	
		Height Solder Point	If higher 0.5mm than component. reject	
		Height of component	Either side higher 0.5mm than component, reject	

08	SMT	Component Shift	X<3/4Z reject y>1/3D reject	
		Few Tin	If θ≤20° reject	
		Component Deflection	If Y >1/3D reject	
		Component Carcass Sideways	Reject	

		Component Carcass Sideways	If exist with visual inspection , reject	
		Lot Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: Tin accrete the solder side completely , full circle arc , ok C: Jointing include whole solder side, height of tin>50 percent of height of component, reject	
		Few Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: height of tin > 1/3 of solder side of component , ok C: height of tin $\leqslant$ 1/3 of solder side of component, reject	
08	SMT		Normal Jointing side	
09	Light	Short circuit 、 Open circuit	Forbid	
		Quality of CSTN Display	1、Rolling strake with visual inspection, forbid 2、Differentness of color in viewing area with visual inspection (full white、red、green、blue), forbid 3 、 Display change with visual inspection , forbid	

10	Color Of CIE Coordinate		x	y	Drive LCD under normal condition, 25℃ Φ=0 Θ=0 Test white、red、green blue with DMS Record	
		white	±0.05	±0.05		
		Red	±0.05	±0.05		
		Green	±0.05	±0.05		
		Blue	±0.05	±0.05		
		According to the specification or sample customer have approved				
11	Brightness	In accord with product specification			Drive condition is according to specification Measure location is in Follow Picture 3、Adjust brightness instrument tozero , burrow against the surface of LCD , press "measure" , record when the display is steady. (YOKOGAWA-3298) Measure location	
12	CR (Max)	According to specification			According to product specification Measure instrument (DMS-501)	
13	Response time	According to specification			According to product specification Measure instrument (DMS-501)	
14	Viewing angle	According to specification			According to product specification Measure instrument (DMS-501)	
15	Vibration、Ring	Compare with the sample customer supply			Compare with the sample customer supply when assemble	
16	Frequency Of FPC Bend	According to the use of product (main FPC of foldaway cell phone ≥6 thousand)			Measure instrument Bend angle : 150° Fix FPC in the casement when customer supply	

11 Handling Precautions

11.1 Mounting method

The LCD panel of Daxian LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

11.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly
- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:
- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:
- Soldering flux
- Chlorine (Cl) , Salfur (S)

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Salfur (S) from customer, Responsibility is on customer.

11.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

11.4 packing

- Module employ LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

11.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature

LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
  Usage under the maximum operating temperature, 50%Rh or less is required.

11.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.
- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

11.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

12 Precaution for use

12.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

12.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.
- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to Daxian , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

13 Dimensional Outline

Specification:
1). Luminance: 250cd/m2(TYP)
2). Display mode: α_Si TFT/Transmissive/Normal White
3). Operating temp.: −20℃~+70℃
   Storage temp.: −30℃~+80℃
4). IC: HX8238−D
5). All the row material are Rohs complicant

*55.77±0.50
*63.90±0.20(OUTLINE)
*55.50(V.A)
52.56(LCD A.A)
2.02
3.27
16.0±0.5
4.00
39.94±0.50
27.50±0.20
8.69
高温胶
单层弯折区
单层弯折区

320(RGB)×240 DOTS
TFT 3.5″

70.08(LCD A.A)
*73.55(V.A)
*76.0±0.20(OUTLINE)
3.46
1.72

*0.30±0.05
1.20MAX
3.20±0.15

背光电路图 (CIRCUIT DIAGRAM)
A
K

−0.33±0.08
0.35
0.15
3.00
P0.5*(54−1)=26.50±0.05

REV 版本	DESCRIPTION 描述	DATE 日期
A00	First issue	2012-07-25

1	LED_Cathode	31	R3		
2	LED_Cathode	32	R4		
3	LED_Anode	33	R5		
4	LED_Anode	34	R6		
5	NC(YU)	35	R7		
6	NC(XR)	36	HSYNC		
7	NC	37	VSYNC		
8	/RESET	38	DOTCLK		
9	SPENA	39	NC		
10	SPCLK	40	NC		
11	SPDAT	41	VCC0(1.8V)		
12	B0	42	VDD(3.3V)		
13	B1	43	NC(YD)		
14	B2	44	NC(XL)		
15	B3	45	VGL(NC)		
16	B4	46	NC		
17	B5	47	VGH(NC)		
18	B6	48	SEL2		
19	B7	49	SEL1		
20	G0	50	SEL0		
21	G1	51	NC		
22	G2	52	ENB(DEN)		
23	G3	53	DGND		
24	G4	54	AVSS		
25	G5				
26	G6				
27	G7				
28	R0				
29	R1				
30	R2				

SCALE: FIT
SHEET: 1 OF 1
GENERAL TOL: ±0.2MM

APP: DATE:
CHK: DATE:
DWN: DATE:

MODEL NO: LD035H3−54NM−A1
PART NO:
TITLE: LCM OUTLINE