SPECIFICATIONS FOR LCD MODULE

CUSTOMER	STD
MODEL	WM-F2822X-6FLWa VER. 4
CUSTOMER APPROVED	

APPROVED BY	CHECKED BY	ORGANIZED BY
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☐ **APPROVAL FOR SPECIFICATIONS ONLY**

■ **APPROVAL FOR SPECIFICATIONS AND SAMPLE (18121279)**

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History of Version

Version	Contents	Date	Note
a1	New Version	26.Dec.2008	SPEC.
a2	Change as following by Wintek: a. 1.3 Interface Pin Function b. 1.5-2. Initialization Table c. 3.1 Mechanical Diagram d. 3.2 Back-light Specification e. 3.3 Packing Method	17.Jan.2009	SPEC.
a3	Change as following by Wintek: a. 4.1 Specification of Quality Assurance: To add definition of area drawing	09.Feb.2009	SPEC.
a4	Sample delivery Change as following by Wintek: a. 1.2 Electrical Characteristics b. 1.5-2. Initialization Table	20.Feb.2009	SPEC. & SAMPLE

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(1) Electronic Units

1.1 Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
OPERATION TEMPERATURE	TOP	-20	-	+70	℃
STORAGE TEMPERATURE	TST	-30	-	+80	℃
SUPPLY VOLTAGE FOR LOGIC	VDDIO	-0.5	-	+5.0	V
SUPPLY VOLTAGE FOR ANALOG	AVDD/ PVDD	-0.5		+5.5	
SUPPLY VOLTAGE	V1~ V2	-0.3	-	AVDD+0.3	V
STATIC ELECTRICITY	Be sure that you are grounded when handing LCM.				

1.2 Electrical Characteristics

(Ta=25℃)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	VDDIO	-	1.8	3.3	3.6	V
SUPPLY VOLTAGE FOR ANALOG	PVDD	-	3.2	3.3	3.4	V
INPUT HIGH VOL.	VIH	-	0.8x VDDIO	-	VDDIO	V
INPUT LOW VOL.	VIL	-	GND	-	0.2xVDDIO	V
OUTPUT HIGH VOL.	VOH	-	VDDIO -0.4	-	-	V
OUTPUT LOW VOL.	VOL	-	GND	-	GND+0.4	V
SUPPLY CURRENT FOR LOGIC	*I_{VDDIO}	-	-	0.02	0.03	mA
SUPPLY CURRENT FOR ANALOG	I_{PVDD}	-	-	4.4	5.67	

*I_{VDDIO} Measurement condition is for all pixels on
*I_{PVDD} Measurement condition is for all pixels on

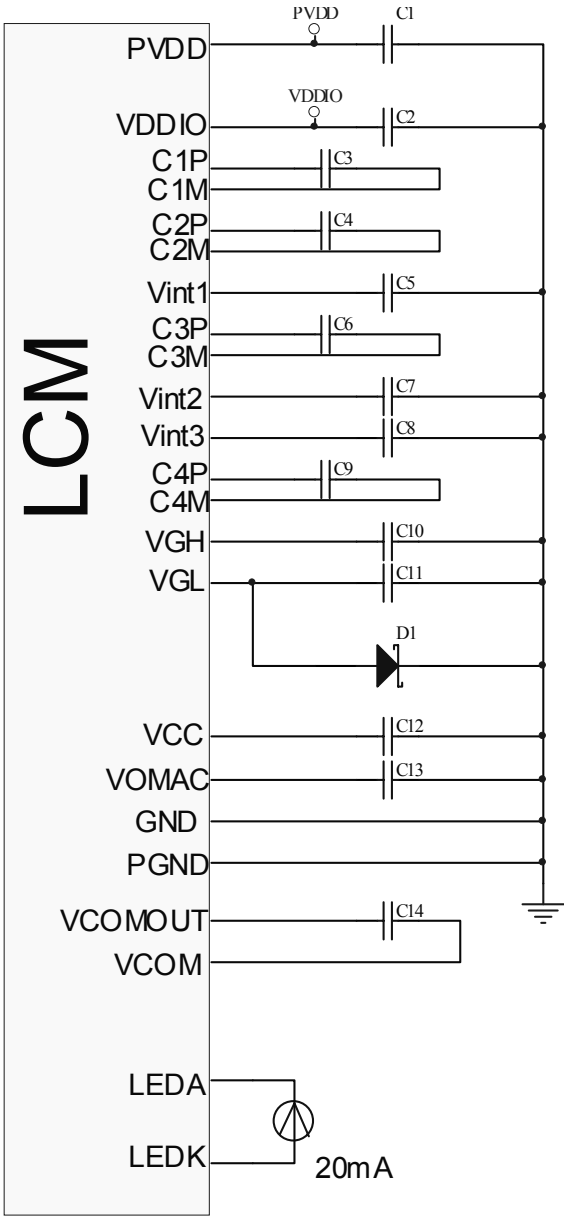
1.3 Interface Pin Function

CN1:

NO	SYMBOL	I / O	FUNCTION
1.	VCOM	I	Common electrode driving voltage
2.	VGL	C	Negative low power supply for gate output:-10V
3.	C4P	C	Power setting capacitor connect pin
4.	C4M	C	Power setting capacitor connect pin
5.	VGH	C	Positive power supply for gate output::+15V
6.	VCOMOUT	O	Frame polarity output for panel VCOM.
7.	VCOMAC	C	Define the amplitude of the VCOM swing
8.	VCC	C	Power output pins and connect capacitors.
9.	C3P	C	Power setting capacitor connect pin
10.	C3M	C	Power setting capacitor connect pin
11.	VINT3	C	Intermediate voltage for charge Pump
12.	C2P	C	Power setting capacitor connect pin
13.	C2M	C	Power setting capacitor connect pin
14.	VINT2	C	Intermediate voltage for charge Pump
15.	C1P	C	Power setting capacitor connect pin
16.	C1M	C	Power setting capacitor connect pin
17.	PGND	P	Ground pins for charge pump circuits
18.	PVDD	P	Power supply for charge pump circuits
19.	VINT1	C	Intermediate voltage for charge Pump
20.	GND	P	GND
21.	VDDIO	P	Power supply for digital circuits
22.	RSTB	I	Global reset
23.	SPENB	I	Serial communication chip select
24.	SPDA	I/O	Serial communication data input/output

25.	SPCK	I	Serial communication clock input
26.	HSD	I	Horizontal sync input
27.	VSD	I	Vertical sync input
28.	CLKIN	I	Clock input
29.	DIN7	I	Data input: MSB
30.	DIN6	I	Data input
31	DIN5	I	Data input
32.	DIN4	I	Data input
33.	DIN3	I	Data input
34.	DIN2	I	Data input
35.	DIN1	I	Data input
36.	DIN0	I	Data input: LSB
37.	VCOM	I	Common electrode driving voltage
38	NC	-	No connection
39	LEDK	P	Back Light operating power supply
40	LEDA	P	Back Light operating power supply

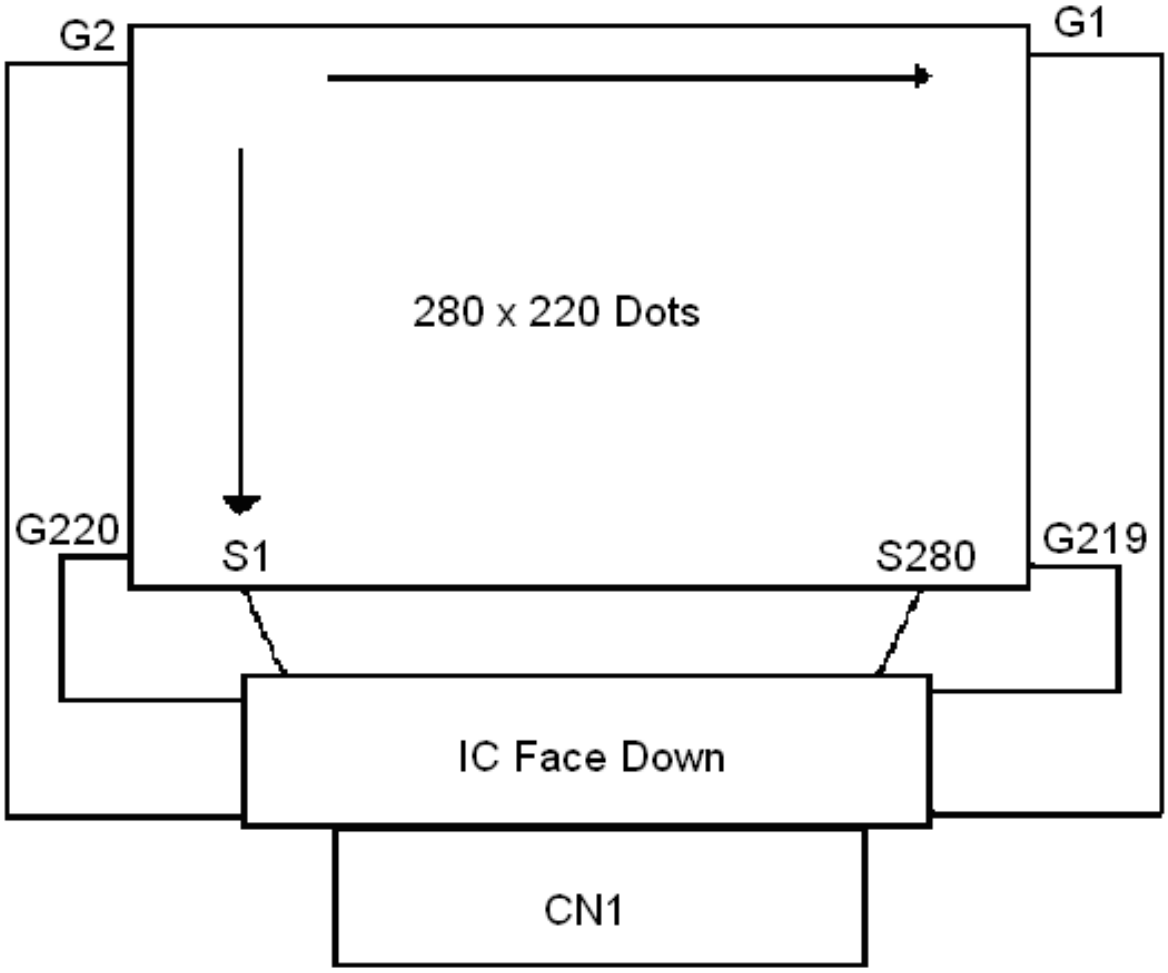
1.4 Power Supply for LCD Module



Note1: PVDD=3.3V, VDDIO=1.8~3.6V, ILED=20mA,
C1,C2,C12 =2.2uF/6.3V
C3,C4,C11,C14 =2.2uF/16V
C5,C7,C13=4.7uF/16V
C6,C9,C10=2.2uF/25V
C8=4.7uF/25V
D1= RB521S-30

1.5 Block Diagram with Display RAM Address

1.5-1. Block Diagram



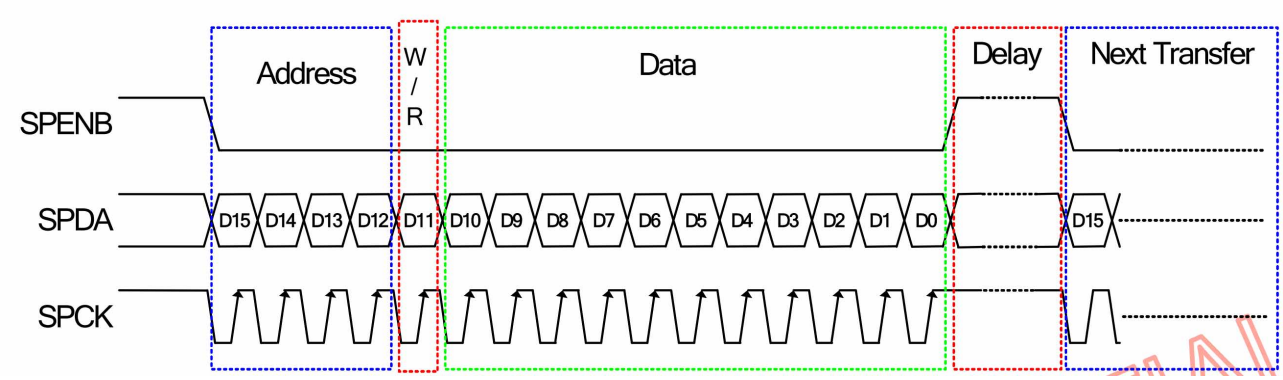
1.5-2. Initialization Table:

NO	Document Number	Attachment file
1	MF2822X-IN1-102	

Double-Click the "Attachment Icon" above for opening attachment file.

1.6 Timing Characteristic

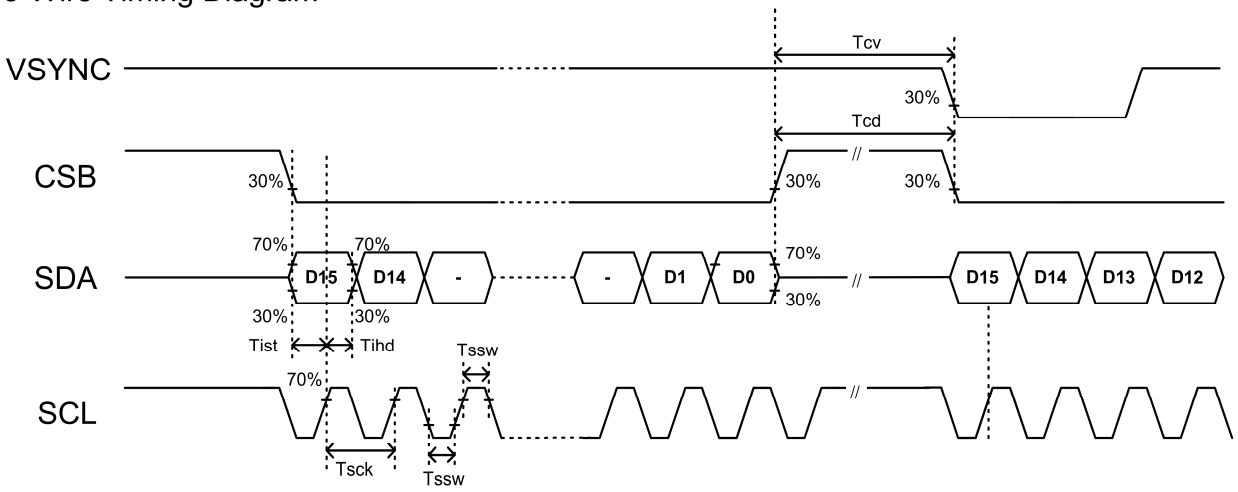
3-Wire Serial Port Interface



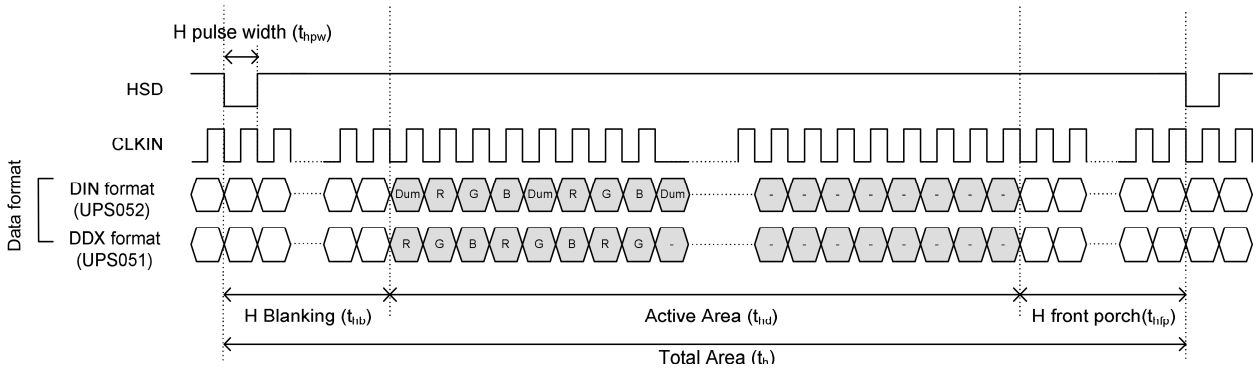
3-Wire Command Format:

Bit	Description
D15-D12	Register Address.
D11	W/R control bit. “0” for Write; “1” for Read
D10-D0	Data for the W/R operation to the address indicated by Address phase

3-Wire Timing Diagram



RGB Input Data Form

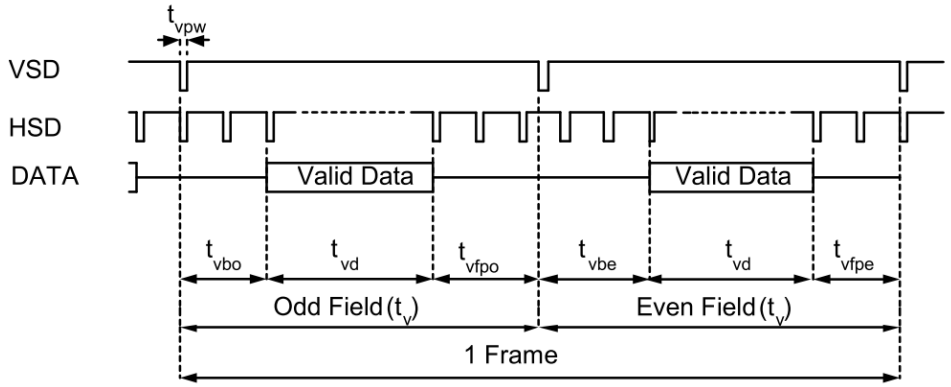


Data Active Area

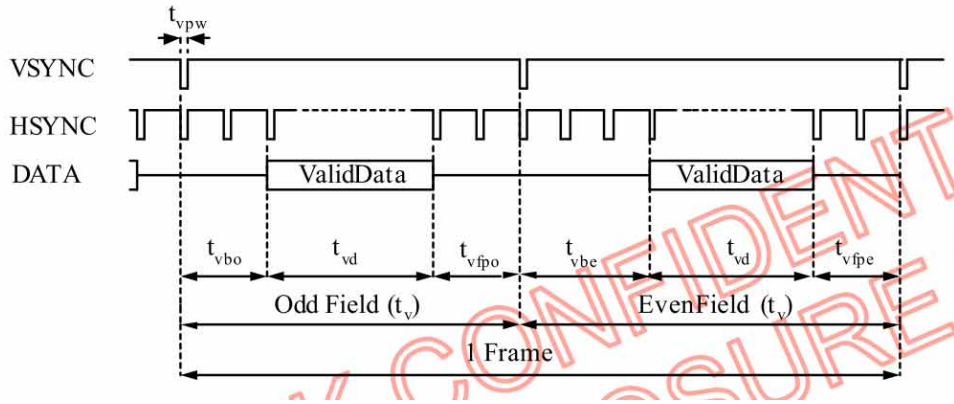
Input Format	Format Standard	CLKIN (MHz)	HSD (CLKIN)	Total Area (CLKIN)	Active Area (CLKIN)	Note
8bit RGB	8 bit RGB	5.67	1	360	288	288X222

Vertical input timing

Interlace



Non-interlace

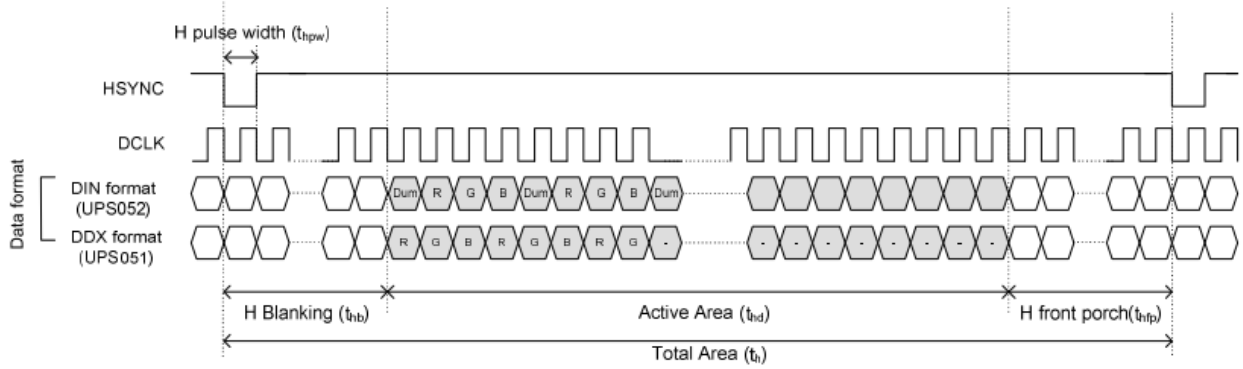


1. RGB vertical input timing

Parameter		Symbol	Interlace			(*)Non-interlace			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Vertical display area		t_{vd}		240			240		H
VSD period time		t_v	247.5	262.5	277.5	247	262	277	H
VSD pulse width		t_{vpw}	1CLKIN	1H	6H	1CLKIN	1H	6H	
*VSD Blanking (t_{vb})	Odd field	t_{vbo}	6	13	21	6	13	21	H
	Even field	t_{vbe}	6.5	13.5	21.5				
VSD Front porch (t_{vfp})	Odd field	t_{vfpo}	1.5	9.5	16.5	1	9	16	H
	Even field	t_{vfpe}	1	9	16				

Horizontal input timing

1. Serial DIN or DDX or YUV Mode Data format



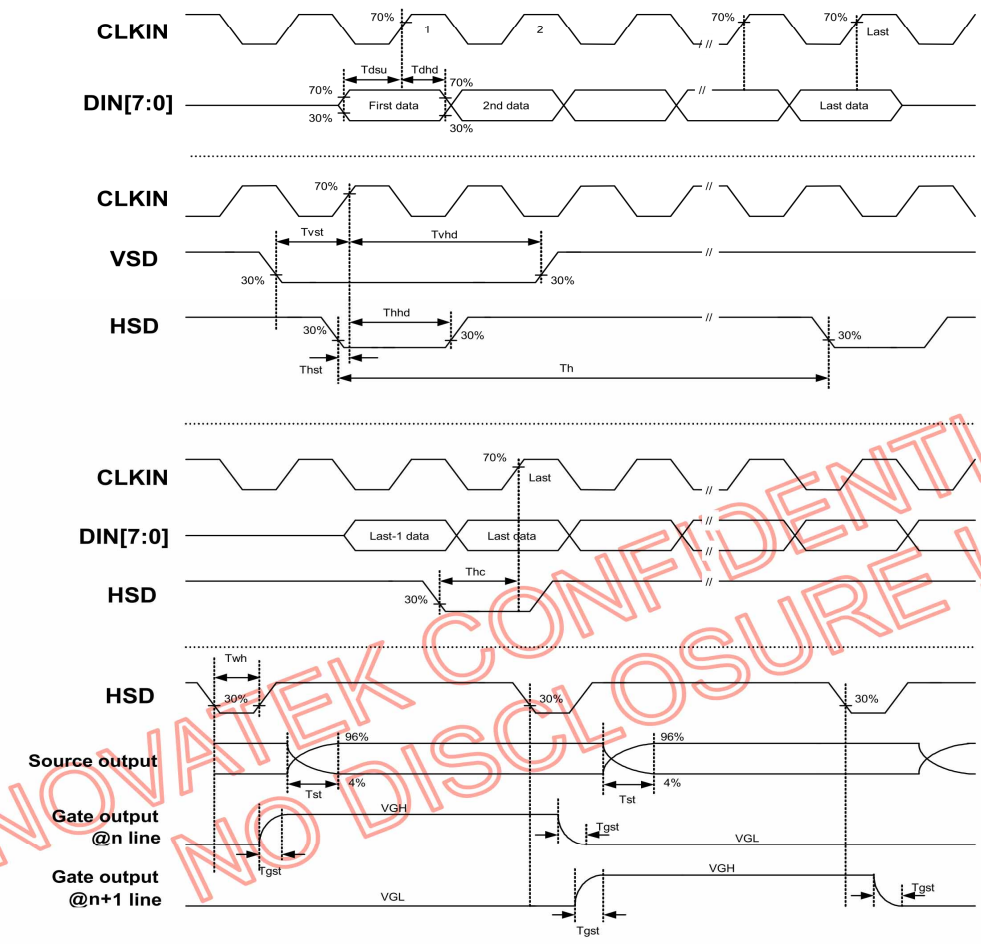
2. Serial horizontal input timing

RGB(RESL="1")

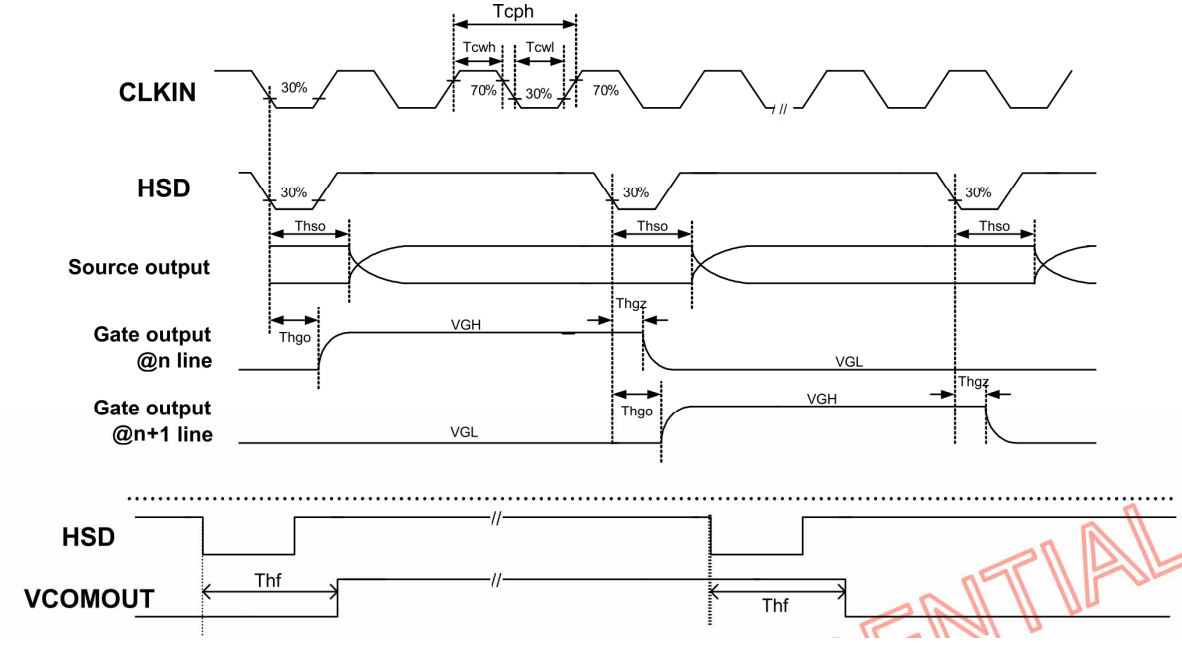
Parameter		Symbol	Value			Unit
Horizontal display area		t_{hd}	288			CLKIN
CLKIN frequency		f_{clk}	Min.	Typ.	Max.	
			5.6	5.67	5.95	MHz
1 Horizontal Line		t_h	360			CLKIN
HSD pulse width	Min.	t_{hpw}	1			
	Typ.		1			
	Max.		56			
HSD blanking		t_{hb}	42	58	70	
HSD front porch		t_{hfp}	30	14	2	

Timing Diagram

Clock and Data Input Timing Diagram



Timing Table Diagram



Test Condition: (VDDIO =1.8~3.6V , PVDD=AVDD=3.0~3.6V, AGND=GND=PGND=0V, TA= 25℃)

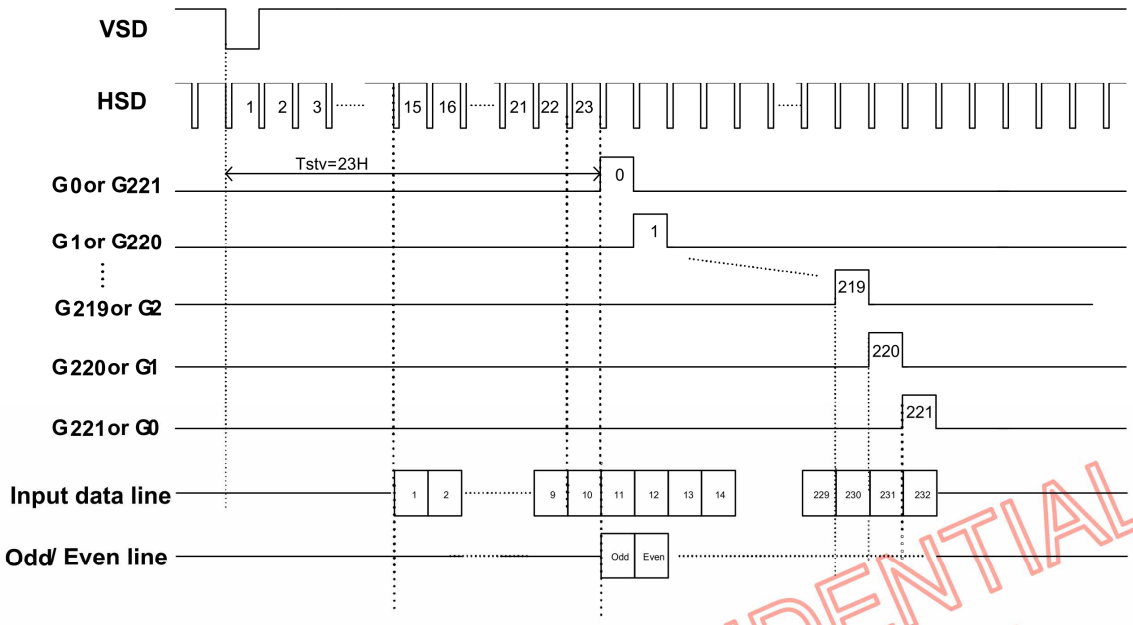
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Time that the HSD to CLKIN	Thc	-	-	1	CLKIN	
HSD period time	Th	60	63.56	67	us	
VSD setup time	Tvst	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
HSD setup time	Thst	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
Data set-up time	Tdsu	12	-	-	ns	DIN0 ~ DIN7 to CLKIN
Data hold time	Tdhd	12	-	-	ns	DIN0 ~ DIN7 to CLKIN
Time that VSD to 1st Gate output	Tstv	6	13	21	Th	Delay by HDLY setting.
Source output stable time	Tst	-	25	30	us	96% final, CL=15pF, R=2K
Gate output stable time	Tgst	-	500	1000	ns	96% final, CL=40pF
Source Output loading	CL	-	15	30	pF	
Time that HSD width	Twh	1	1	96	CLKIN	
3-wire serial communication AC timing						
Serial clock	Tsck	240	320	--	ns	
SPCK pulse duty	Tscw	40	50	60	%	Tscw = Tssw/Tsck
Serial data setup time	Tist	120	-	-	ns	
Serial data hold time	Tihd	120	-	-	ns	
Serial clock high/low	Tssw	120	-	-	ns	
Chip select distinguish	Tcd	1	-	-	us	
Time that the SPENB to VSD	Tcv	1	-	-	us	

RGB Mode(RESL="1")

AC Electrical Characteristics (VDDIO =1.8~3.6V , AVDD=3.0~3.6V, AGND=GND=0V, TA=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN frequency	Fclk	-	5.67	-	MHz	Fclk =1/Tcph, VDDIO=1.8~3.6V
CLKIN cycle time	Tcph	-	176.4	-	ns	
CLKIN pulse duty	Tcw	40	50	60	%	Tcw=Tcwh/Tcph
Time that HSD to 1'st data input	Ths	42	58	70	CLKIN	Delay amount are pin option

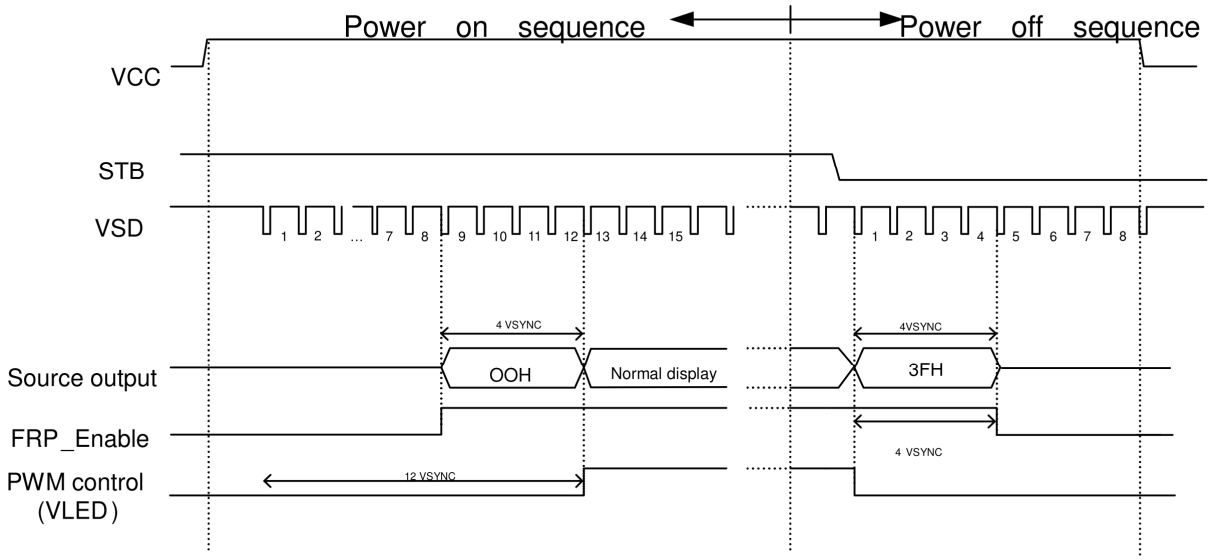
Gate Driver Output Timing Diagram(**RESL="1"**)



Notes:

1. NTSC /PAL mode: Input data line 11 is output on the G1 line.

1.7 Power ON/OFF SEQUENCE



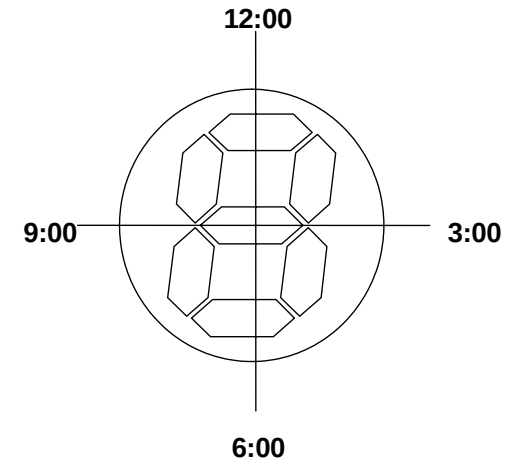
(2) Electro-optical Units

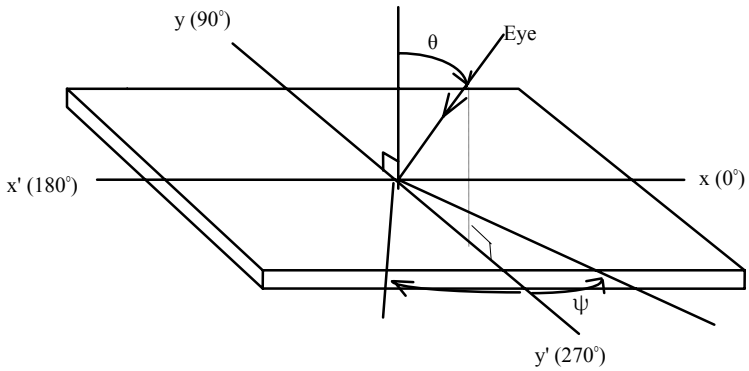
2.1 Electro-optical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Viewing Angle (C.R. ≥ 10)	θ	ψ= 0 ° 3H	45	-	-	deg.
	θ	ψ= 90 ° 12H	55	-	-	
	θ	ψ= 180 ° 9H	45	-	-	
	θ	ψ= 270 ° 6H	15	-	-	
CONTRAST RATIO	CR	Transmissive(Ta=25℃)	200	250	-	-
RESPONSE TIME	Tr+ td	Ta=25℃	-	35	-	ms
Red x-coord	Rx	Ta=25℃	0.54	0.60	0.66	-
Red y-coord	Ry		0.28	0.34	0.40	
Green x-coord	Gx		0.27	0.33	0.39	
Green x-coord	Gy		0.53	0.59	0.65	
Blue x-coord	Bx		0.09	0.15	0.21	
Blue x-coord	By		0.06	0.12	0.18	
White x-coord	Wx		0.26	0.32	0.38	
White x-coord	Wy		0.29	0.35	0.41	
LCD TYPE	TFT (Normally White / Transmissive)					
VIEWING DIRECTION	6 O'CLOCK					
Gray inversion	6 O'CLOCK					

Notes：All the optical data should be measured when the display's driven under the "Typ" condition.

2.2 Optical Definitions





View Angle

(3) Mechanical Units

3.1 Mechanical Diagram

NO	Document Number	Attachment file
1	MF2822X-AS2-101	

Double-Click the "Attachment Icon" above for opening attachment file.

3.2 Back-light Specification

LED Backlight Styles:

The LED chips are distributed over the whole light area of the illumination unit, which gives the most uniform light.

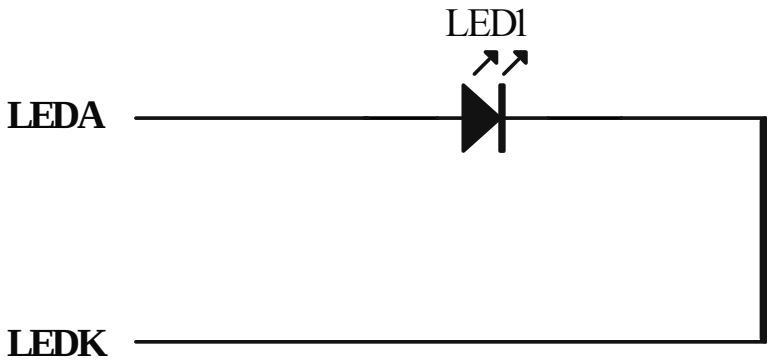
3.2-1. Data About LED Backlight

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Backlight type	LED (WHITE)						
Supply Current	I_{LED}	-	20	25	mA	V_{LED} ≤3.5V	-
Reverse Voltage (Single chip)	V_R	-	-	5.0	V	-	-
Luminous Intensity	I_V	200	250	-	cd/m^2	I_{LED}=20mA	1 (With LCD)
Luminous Intensity Ratio	-	-	-	30%	-	I_{LED}=20mA	2

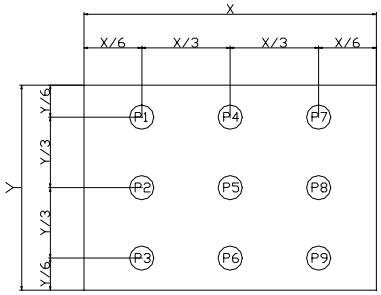
NOTE：1. Average Luminous Intensity of P1 – P9

2. Luminous Intensity Ratio = (MAX-MIN)./ MAX.

3.2-2. Internal Circuit Diagram



3.2-3. MEASURED METHOD (X*Y: Light Area)



(Effective spatial Distribution)

Hole Diameter φ3mm;1 to 9 per Position Measured Luminous Intensity Ratio

3.3 Packing Method

NO	Document Number	Attachment file
1	MF2822X-M1-02	

Double-Click the "Attachment Icon" above for opening attachment file.

(4) Quality Units

4.1 Specification of Quality Assurance

4.1-1.Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to purchaser by WINTEK CORPORATION (Supplier).

4.1-2.Standard for Quality Test

a. Inspection :

Before delivering, the supplier should take the following tests, and affirm the quality of product.

b. Electro-Optical Characteristics:

According to the individual specification to test the product.

c. Test of Appearance Characteristics:

According to the individual specification to test the product.

d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(i) Test method: According to **ANSI/ASQC Z1.4-2003.General Inspection Level Ⅱ take a single time.**

(ii) The defects classify of AQL as following:

Major defect: AQL=0.65

Minor defect: AQL=2.5

Total defects: AQL=2.5

4.1-3.Nonconforming Analysis & Deal With Manners

a. Nonconforming analysis:

(i) Purchaser should supply the detail data of non-conforming sample and the non-suitable state.

(ii) After accepting the detail data from purchaser, the analysis of nonconforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before two weeks.

b. Disposition of nonconforming:

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

4.1-4. Agreement items

Both sides should discuss together when the following problems happen.

a. There is any problem of standard of quality assurance, and both sides think that it must be modified.

b. There is any argument item which does not record in the standard of quality assurance.

c. Any other special problem.

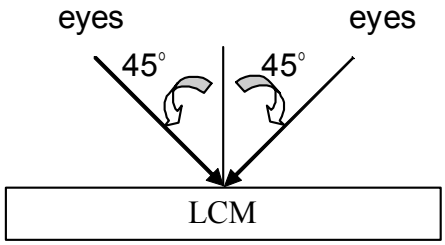
4.1-5. Standard of The Product Appearance Test

a. Manner of appearance test:

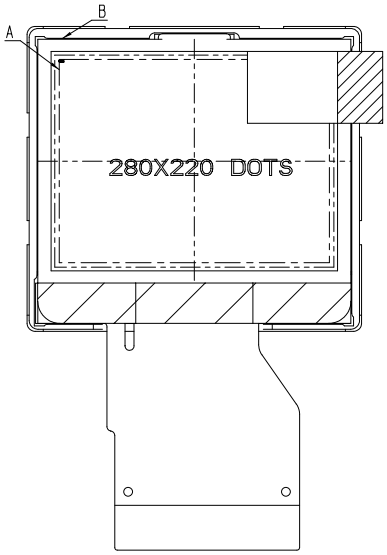
(i) The test must be under 20W ㄨ 2 or 40W fluorescent light, and the distance of view must be at 30 cm.

(ii) When display on use front-light test, while display off use back-light test.

(iii)The test direction is base on about around 45° of vertical line.



(iv) Definition of area:



A Area : Viewing area.

B Area : Out of viewing area.
(Outside viewing area)

b. Basic principle:

(i) It will accord to the AQL when the standard can not be described.

(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

(iii) Must add new item on time when it is necessary.

c. Standard of inspection:(Unit: mm)

4.1-6. Inspection specification

NO	Document Number	Attachment file
1	M1L070012	

Double-Click the "Attachment Icon" above for opening attachment file.

4.2 Standard Specification for Reliability

NO	Document Number	Attachment file
1	M3ET090005	

Double-Click the "Attachment Icon" above for opening attachment file.

4.3 Precautions in Use of LCM

4.3-1 Handling of LCM

- Don't give external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.

4.3-2 Storage

- Store in an ambient temperature of 5℃ to 45℃, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.

4.3-3 Soldering

- Use the Sn-Ag-Cu (96.5, 3.0, 0.5) solder
- Iron : Temperature 300℃ and less than 5-6 sec during soldering.
- Rewiring : no more than 3 times.

4.3-4 Assembly

- The front polarizer is covered with a protective foil which should be removed before use.

(5) Substance Management Units

5.1 Product Substances Management Documentation

NO	Document Number	Attachment file
1	Environment management standard (EMS-P-017-01)	

Double-Click the "Attachment Icon" above for opening attachment file.

Note：Details of control substance and apply threshold for “Product Substances Management Documentation” please refer to the following attachment file.