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SPECIFICATIONS FOR LCD MODULE

CUSTOMER	STD
MODEL	WM-FL040V-NFLWa VER.2
CUSTOMER APPROVED	

APPROVED BY	CHECKED BY	ORGANIZED BY
LCM 2012/1/13	LCM 2012/1/13	LCM 2012/1/12

☒ APPROVAL FOR SPECIFICATIONS ONLY

☐ APPROVAL FOR SPECIFICATIONS AND SAMPLE

History of Version

Version	Contents	Date	Note
1	NEW VERSION	29.Dec.2011	SPEC
a2	Modify: a 4.1 Mechanical Diagram b. 4.2-1. Data About LED Backlight	12.Jan.2012	SPEC

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(1) Electronic Units

1.1 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Operating Temperature	TOP	-20	-	+70	
Storage Temperature	TST	-30	-	+80	
Supply Voltage for Analog	VCI-VSS	-0.3	-	-4.6	V
Supply Voltage for Digital	VDD-VSS	-0.3	-	-4.6	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 Analog	VCI	-	2.5	2.8	3.3	V
Supply Voltage for Digital	VDD	-	2.5	2.8	3.3	V
Supply Voltage for I/O	VDDIO	-	1.65	1.8	3.3	V
Input Signal High Voltage	VIH	IOVCC=1.65~3.3V	0.7*IOVCC	-	IOVCC	V
Input Signal Low Voltage	VIL	IOVCC=1.65~3.3V	-0.3	-	0.3*IOVCC	V
Output Signal High Voltage	VOH	IOVCC=1.65~3.3V	0.8*IOVCC	-	-	V
Output Signal Low Voltage	VOL	IOVCC=1.65~3.3V	-	-	0.2*IOVCC	V
Supply Current for Analog	*ICI	-	-	-	22	mA
INTERFACE	MIPI					

*ICI Measurement condition is for all pixels on
*IDD Measurement condition is for all pixels on

1.3 Interface Pin Function

CN1:

NO	SYMBOL	I / O	FUNCTION
1	GND	P	Ground
2	PWM	O	Back light control pin
3	GND	P	Ground
4	RES	I	Reset pin
5	GND	P	Ground
6	GND	P	Ground
7	D0N	I/O	MIPI DSI differential data 2-pair
8	D0P	I/O	MIPI DSI differential data 2-pair
9	GND	P	Ground
10	GND	P	Ground
11	IOVCC	P	Supply voltage to the digital circuit
12	LED+	P	LED positive pin
13	LED1-	P	LED negative pin
14	LED2-	P	LED negative pin
15	VCI	P	Supply voltage to the analog circuit
16	GND	P	Ground
17	GND	P	Ground
18	CP	I	MIPI DSI differential clock pair
19	CN	I	MIPI DSI differential clock pair
20	GND	P	Ground
21	GND	P	Ground
22	D1P	I/O	MIPI DSI differential data 2-pair
23	D1N	I/O	MIPI DSI differential data 2-pair
24	GND	P	Ground
25	NC	-	No connection
26	NC	-	No connection
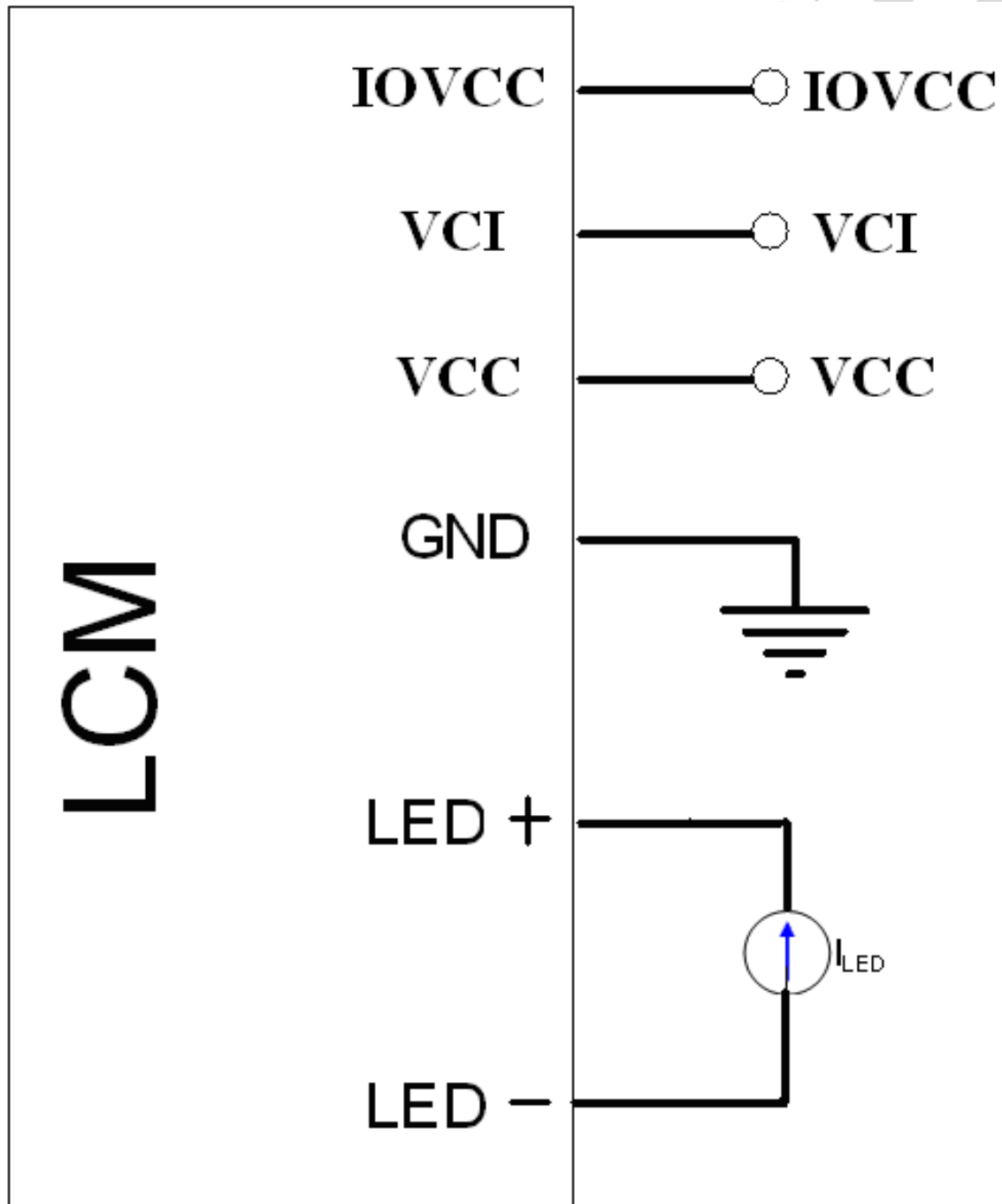
Note: VCC=2.8V, VCI=2.8V ,IOVCC=1.8

1.5 Block Diagram with Display RAM Address

1.5-1. Block Diagram

畫素原點

480*RGB*800

G2   S1440   S1   G1

ILI9803面版正視圖

G800   G1024   G1023   G799

FPC Pin1
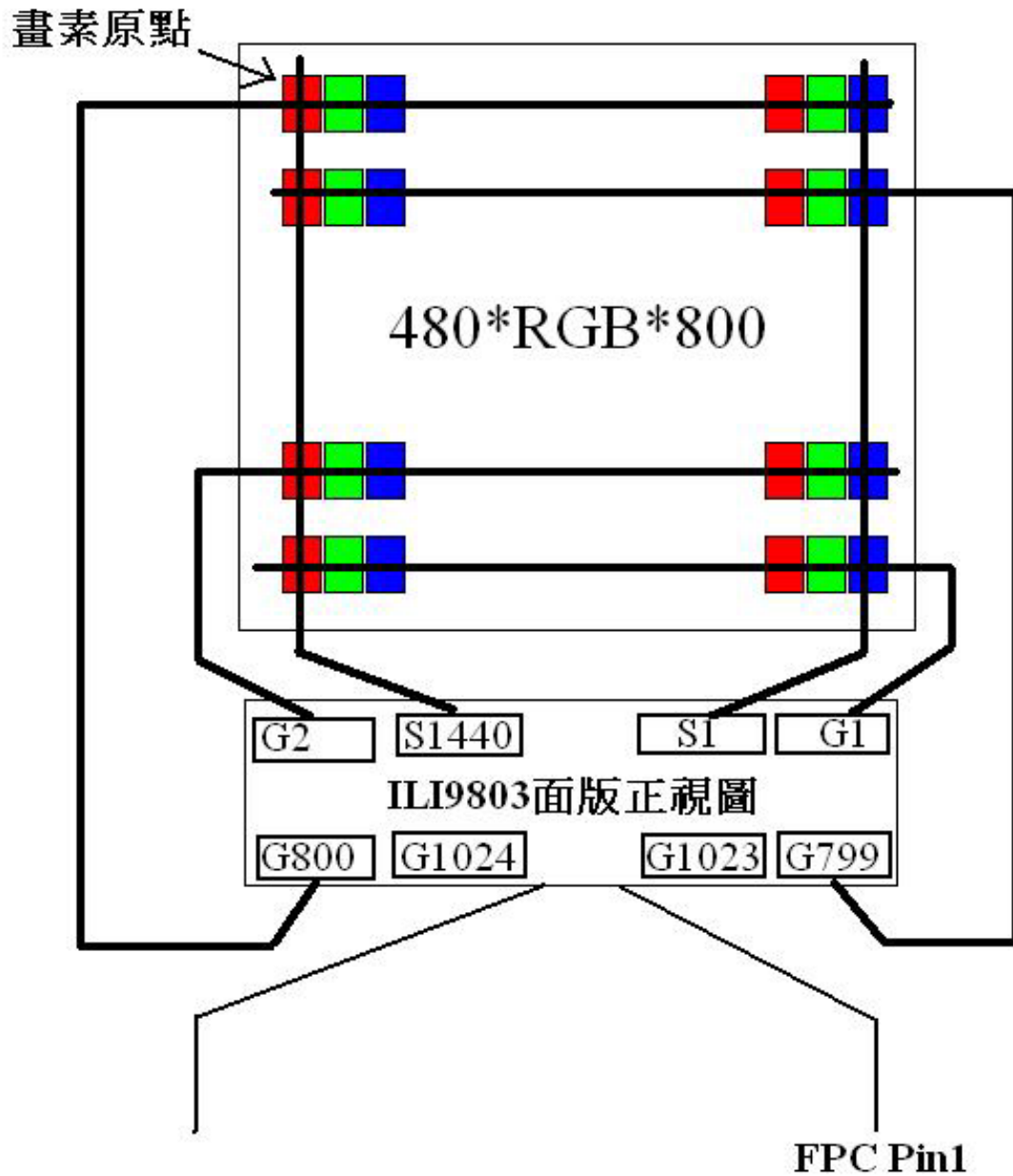
1.5-2. Display Data RAM:

1.5-3. Initialization Table:

| NO	Document Number	Attachment file
1	DFL040V-IN1-101	📎

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

1.6 Timing Characteristic

ILI9803 supports MIPI DSI which can be enabled or disabled by external IM [3:0] pin. ILI9803 can be accessed through one PHY lane module which communicates via two lines to a complementary part at the other side of the lane interconnects. The communication can be separated two different levels between the MCU and ILI9803:

- Low level communication what is done on the interface level.
- High level communication what is done on the packet level.

ILI9803 uses data and clock lane differential pairs for DSI, The data lane (DATAP and DATAN) is used for data communication and clock lane (CLKP and CLKN) is used to transmit the clock signal. The Mobile Industry Processor Interface (MIPI) can be used for communication between the processor and DSI-compliant LCD driver chip. The selection of this interface is done when IM [3:0] pins are high state (IOVCC level).
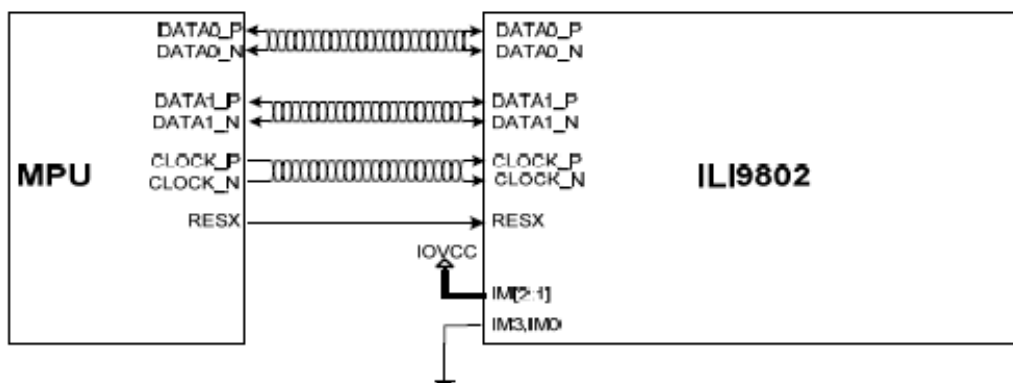
Low Power mode means that each line of the differential pair is used in single end mode and a differential receiver is disable (A termination resistor of the receiver is disable) and it can be driven into a low power mode. High Speed mode means that differential pairs (The termination resistor of the receiver is enable) are not used in the single end mode.

There are used different modes and protocols in each mode when there are wanted to transfer information from the MCU to ILI9803 and vice versa.

The State Codes of the High Speed (HS) and Low Power (LP) lane pair are defined below.

Lane Pair State Code	Line DC Voltage Levels		High Speed (HS)	Low Power	
	DATA_P	DATA_N	Burst Mode	CLOCK_P	CLOCK_N
HS-0	Low (HS)	High (HS)	Differential – 0	Note 1	Note1
HS-1	High (HS)	Low (HS)	Differential – 1	Note 1	Note 1
LP-00	Low (LP)	Low (LP)	Not Defined	Bridge	Space
LP-01	Low (LP)	High (LP)	Not Defined	HS – Request	Mark - 0
LP-10	High (LP)	Low (LP)	Not Defined	LP - Request	Mark - 1
LP-11	High (LP)	High (LP)	Not Defined	Stop	Note 2

Notes: (1) Low-Power Receivers (LP-Rx) of the lane pair are checking the LP-00 state code, when the Lane Pair is in the High Speed (HS) mode.

(2). If Low-Power Receivers (LP-Rx) of the lane pair recognizes LP-11 state code, the lane pair returns to LP-11 of the Control Mode.

1.7 Power ON/OFF SEQUENCE

Power On Sequence
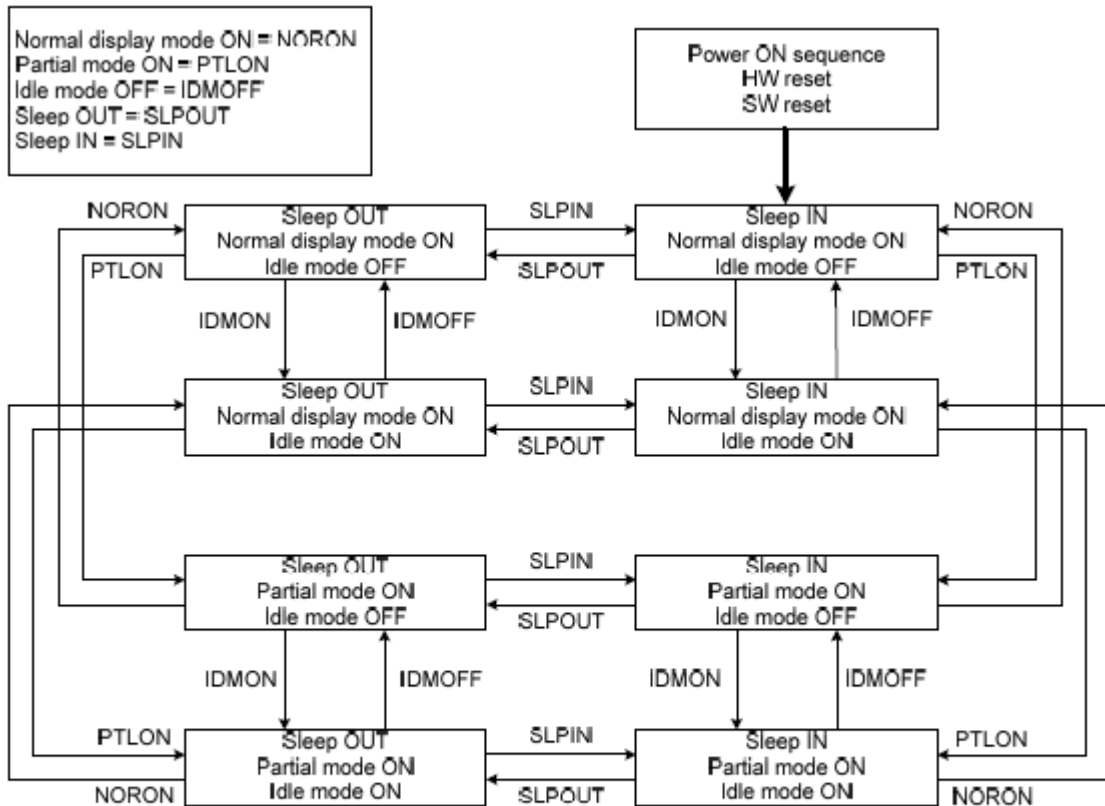
Note 1: There is not any abnormal visual effect when there is changing from one power mode to another power mode.

Note 2: There is not any limitation, which is not specified by User, when there is changing from one power mode to another power mode.

Power Off Sequence

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for ILI9803 or ILI9803 will not cause any damages for the host or lines of the interface. At an uncontrolled power off event, ILI9803 will force the display to blank and will not be any abnormal visible effects with in 1 second on the display and remains blank until "Power On Sequence" powers it up.

(2) ATT(Advanced Touch Technology)

2.1 ATT Electrical Characteristics

(Ta=25)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remark
Input Power Digital Voltage		V_{DDTP}	-	1.8	1.8	3.6	V	
Input Power Analog Voltage		V_{DDATP}	-	2.4	3.3	3.6	V	-
Input Signal Voltage	H Level	V_{IH}	-	-	1.9	-	V	-
	L Level	V_{IL}	-	-	1.3	-	V	
Report Rate		-	-	-	100	-	Hz	-
Interface		-	-	I2C				-
Touch Panel Resolution		-	-	480*800				-
Supply Current		*IDD	-	-	-	15	mA	-
Input		Four finger						-

2.2 ATT Interface Pin Function

NO	SYMBOL	I/O	FUNCTION
1	GND	P	Ground
2	INT	I	I2C interrupt
3	SDA	I/O	I2C databus
4	SCL	I	I2C Clock
5	RESET	I	Reset
6	GND	P	Ground
7	V_{DDATP}	P	Main Power
8	V_{DDTP}	P	Main Power
9	NC	-	No connection
10	NC	-	No connection
11	NC	-	No connection
12	NC	-	No connection

2.3 I2C communication
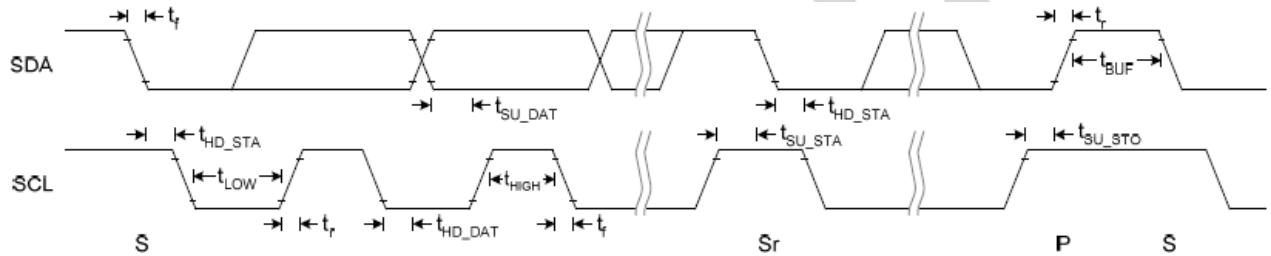
2.3.1 Timing Characteristic

Figure 5-1 I2C Fast Mode Timing

Table 5-2 I2C Fast Mode Timing Characteristic

Conditions: VDD = IOVDD = 3.3V, GND = 0V, T_A = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ.	Max.	
f_{SCL}	SCL clock frequency	0	-	400	kHz
t_{LOW}	Low period of the SCL clock	1.3	-	-	us
t_{HIGH}	High period of the SCL clock	0.6	-	-	us
t_f	Signal falling time	-	-	300	ns
t_r	Signal rising time	-	-	300	ns
t_{SU_STA}	Set up time for a repeated START condition	0.6	-	-	us
t_{HD_STA}	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us

t_{SU_DAT}	Data set up time	100	-	-	ns
t_{HD_DAT}	Data hold time	0	-	0.9	us
t_{SU_STO}	Set up time for STOP condition	0.6	-	-	us
t_{BUF}	Bus free time between a STOP and START condition	1.3	-	-	us
C_b	Capacitive load for each bus line	-	-	400	pF

2.3.2 I2C Protocol

ST1432 equipped with I2C provide two wires, serial data (SDA) and serial clock (SCL), to carry information transfers at up to 400 kbit/s(Fast mode). ST1432 plays a slave role in I2C transfer. Both SDA and SCL are bidirectional lines, connected to IOVDD via pull-up resistors. All transactions begin with a START (S) and can be terminated by a STOP (P). 7-Bit address follows START to recognize device. Each bye is 8-bit length and followed by an acknowledge bit. A HIGH to LOW transition on the SDA line while SCL is HIGH defines a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition. 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.
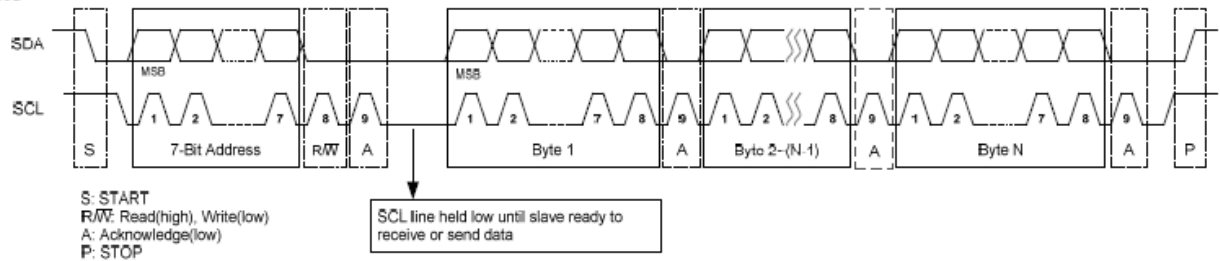
Read
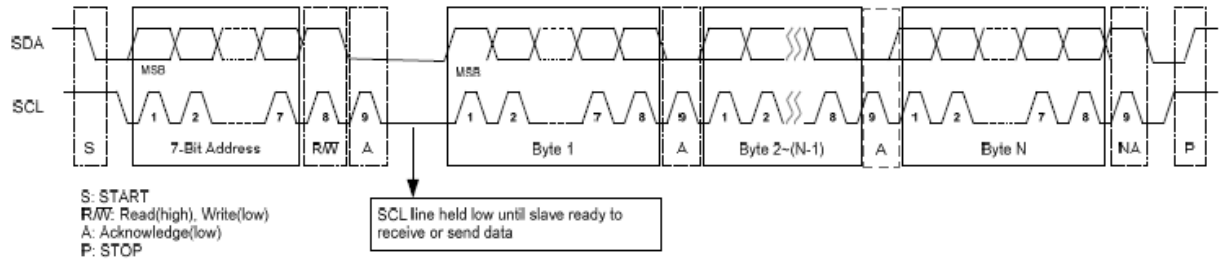
Write

Figure 4-2   I2C Waveform

(3) Electro-optical Units

3.1 Electro-optical Characteristics

ITEM	SYMBOL		CONDITION	MIN.	TYP.	MAX.	UNIT
View Angle (Transmissive)	ψ= 90° (12H)		CR>=10		80	-	deg.
	ψ= 270° (6H)				80	-	deg.
	ψ= 180° (9H)				80	-	deg.
	ψ= 0° (3H)				80	-	deg.
Contrast Ratio (Transmissive)	CR		Ta=25	500	900	-	-
Response Time	Tr+Td		Ta=25	-	30	-	ms
Color Coordinate	Red	Rx	Ta=25	0.6	0.65	0.7	-
		Ry		0.284	0.334	0.384	
	Green	Gx		0.268	0.318	0.368	
		Gy		0.525	0.575	0.625	
	Blue	Bx		0.087	0.137	0.187	
		By		0.09	0.140	0.19	
	White	Wx		0.263	0.313	0.363	
		Wy		0.279	0.329	0.379	
	NTSC			65	70		%

Note 1.Ambient condition 25±2   60±10%RH   under 10 Lunx in the darkroom
Lighting the LCM and measuring after 10 minutes.

Note 2.Measure device   BM-5A (TOPCON)   viewing cone=1°   ILed=20 mA
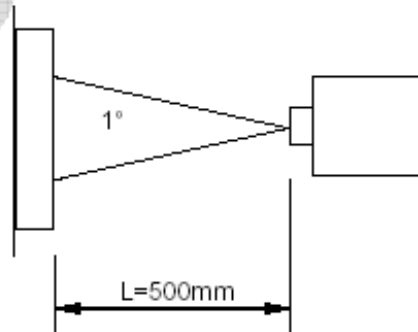

Fig.8-1 viewing cone=1°

Note 3. Definition of Contrast Ratio
CR = White Luminance (ON) / Black Luminance (OFF)

Note 4. Definition of response time   The response time is defined as the time interval
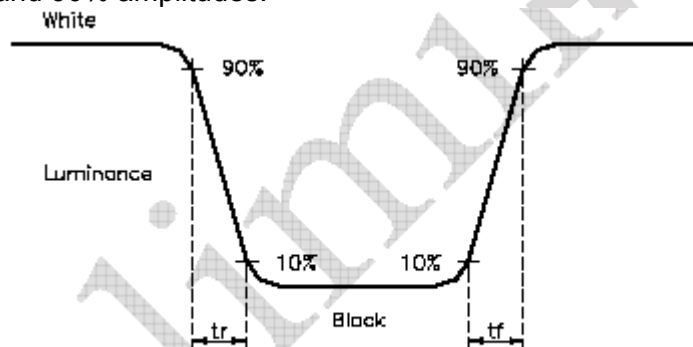between the 10% and 90% amplitudes.

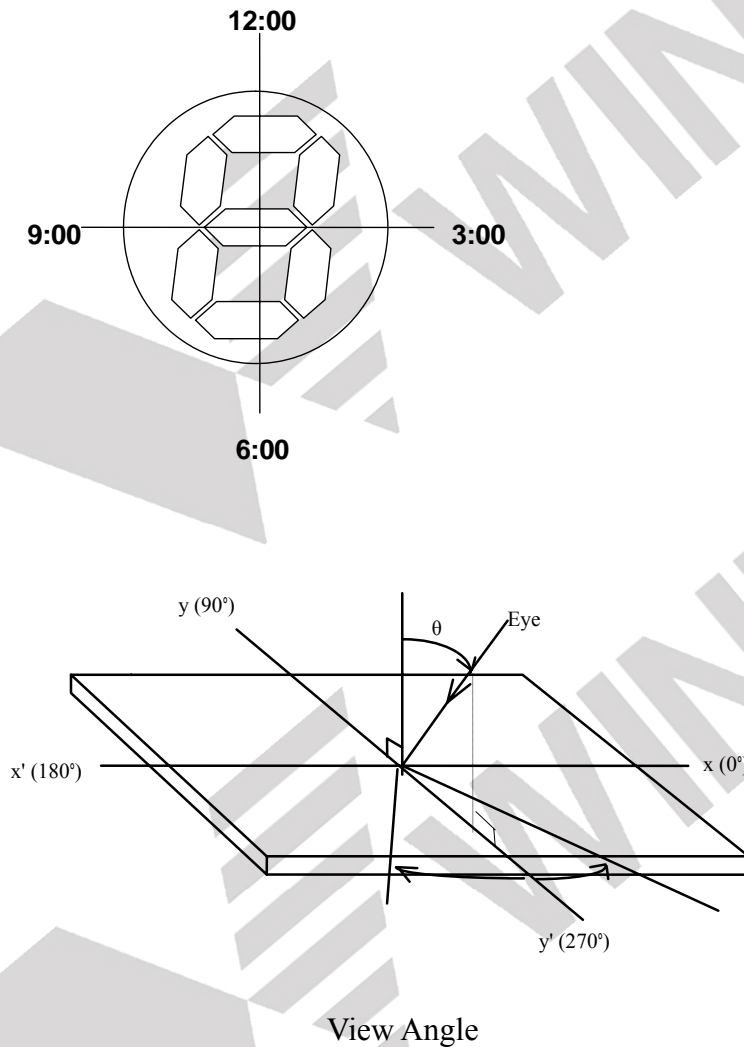Fig.8-3 Definition of Response Time (White - Black)

3.2 Optical Definitions

View Angle

(4) Mechanical Units

4.1 Mechanical Diagram

NO	Document Number	Attachment file
1	MFL040V-AS1-103	📎

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

4.2 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.

4.2-1. Data About LED Backlight

| PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Backlight Type		LED / WHITE					-
Supply Current	ILED	-	40	-	mA	VLED<=14V	-
LED Forward Voltage(Single chip)	VF	3.2	3.3	3.5	V	IF= mA	-
Reverse Voltage (Single chip)	VR	-	-	-	V	-	-
Luminous Intensity	IV	320	350	-	cd/m2	-	-
Luminous Intensity Ratio	-			25	%	-	-

NOTE　1. Average Luminous Intensity of P1 – P9

2. Luminous Intensity Ratio = ((MAX. - MIN.)/ MAX.)*100%

4.2-2. Internal Circuit Diagram
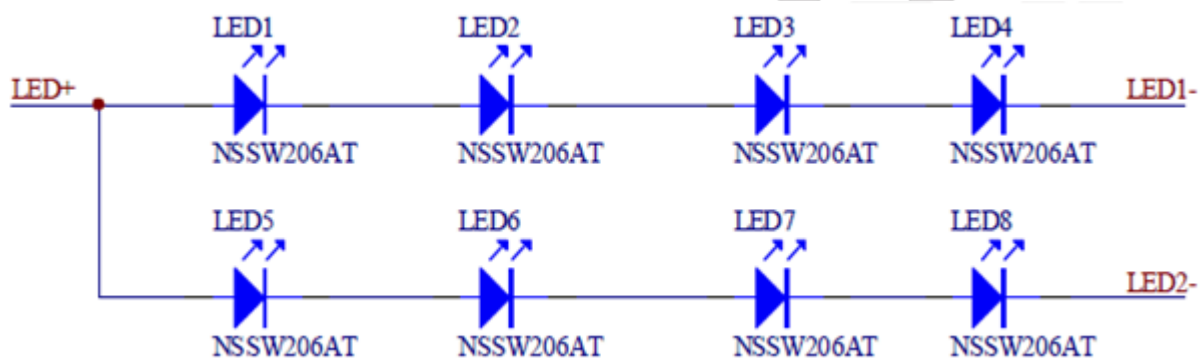
4.2-3. MEASURED METHOD (X*Y: Light Area)
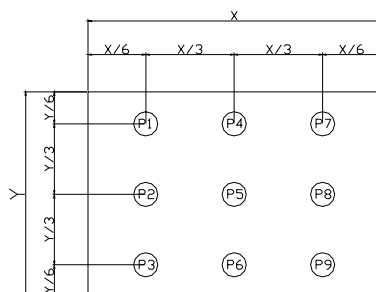
(Effective spatial Distribution)

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

3.3 Packing Method

NO	Document Number	Attachment file
1	DFL040V-M1-04	📎

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   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.
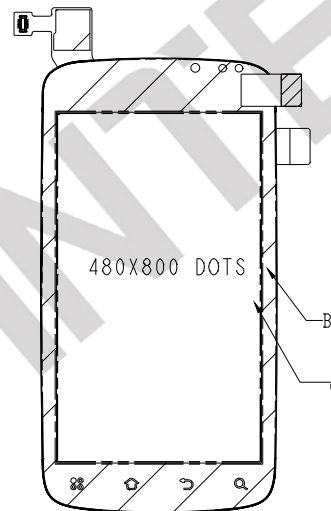
c. Any other special problem.

4.1-5. Standard of The Product Appearance Test

a. Manner of appearance test:

(i) The test must be under 20W × 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.
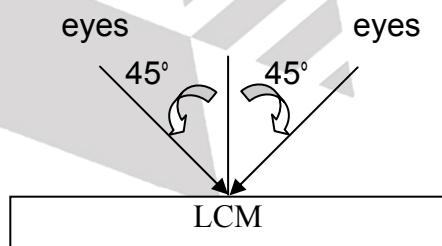
(iv) Definition of area:

A Area : Viewing area.

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

Any defect at area B could be ignored. If customer has particular requirement, this requirement should be clearly defined in inspection specification. If inspection specification has defined other criteria, the final judgement should follow the inspection specification .

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	M3ET090001	📎

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 25 ± 5 , 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.