48.0" 3840*720

High brightness color TFT-LCD

Model: VM48Q1 V0

Date: Mar. 20th, 2020

Note: This specification is subject to change
without notice

Customer：_____

Date：_____

Approved	Prepared
Date:	**Date:**

Contents

RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2020/03/20	All	First Edition for customer		

1. Handling Precautions

1) Since front polarizer is easily damaged, pay attention not to scratch it.

2) Be sure to turn off power supply when inserting or disconnecting from input connector.

3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.

6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.

7) Do not open or modify the Module Assembly.

8) Do not press the reflector sheet at the back of the module to any directions.

9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.

10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

2. General Description

2.1 Overview

VM48Q1 V0 module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor).It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a White-LED Backlight unit. Graphics and texts can be displayed on a 3840×RGB×720 dots panel with about 1.07B colors (RGB 8-bits + FRC). All input signals are MIPI interface compatible. The BLU driving current source for backlight LED driving by external LED driver.

2.2 Features

- High brightness display, 1000nits by LED backlight.
- Long operation lifetime BLU design
- RoHS Compliance

2.3 Application

Industrial applications.

2.4 Display specifications

| Items	Unit	Specification
Screen Diagonal	mm	48.0 inch
Active Area	mm	1194.048(H) X 223.884(V)
Pixels H x V	pixels	3840 x3(RGB) x 720
Pixels Pitch	um	103.65 (per one triad) x 310.95
Pixel Arrangement		RGB Vertical stripe
Display mode		Normally Black
White luminance (center)	Cd/m^2	1000 (Typ)
Contrast ratio		1000:1 (Typ.)
Optical Response Time	msec	16 ms (Typ. On/off)
Normal Input Voltage VDD	Volt	12V
Power Consumption (Vcc Line + LED backlight)	Watt	103.2W (VDD line= 7.2W; LED lines= 96 W)
Weight	Grams	TBD
Physical size	mm	1217.9(W)×248.2(H)×9.6(D)
Electrical Interface		V-by-One
Surface Treatment		Anti-glare and hard-coating 3H
Temperature range Operating Storage	^0C ^0C	-20 ~ 60 -30 ~ 80
RoHS Compliance		RoHS Compliance

2.5 Optical characteristics

The following optical characteristics are measured under stable condition at 25 ^{0}C

Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)		89		2
		CR=10 (Left)		89		
		Vertical (Up)		89		
		CR=10 (Down)		89		
Contrast Ratio		Normal Direction		1000		3
Response Time	msec	Raising + Falling		25	35	4
Color / Chromaticity Coordinates (CIE)		Red x	-0.05	0.590	+0.05	5
		Red y		0.370		
		Green x		0.350		
		Green y		0.555		
		Blue x		0.155		
		Blue y		0.110		
Color coordinates (CIE) White		White x		0.313		
		White y		0.329		
Center Luminance	Cd/m^2		800	1000		6
Luminance Uniformity	%		70	75		7
Crosstalk (in 60 Hz)	%				4	

Note 1: Measurement method

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.
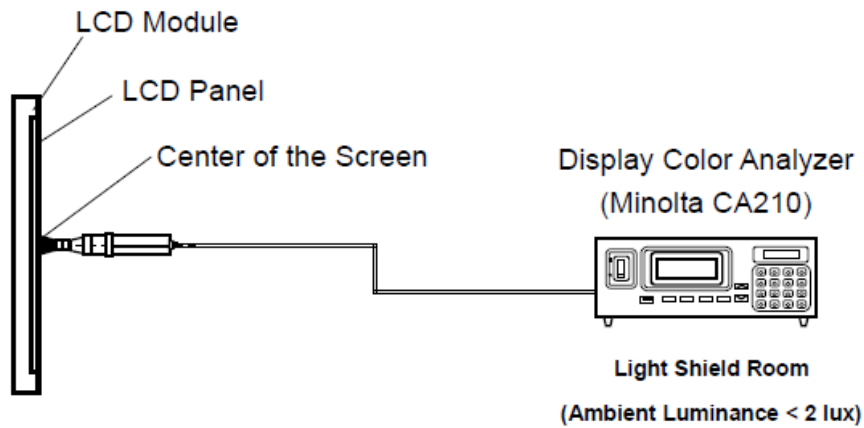
Note 2: Definition of viewing angle
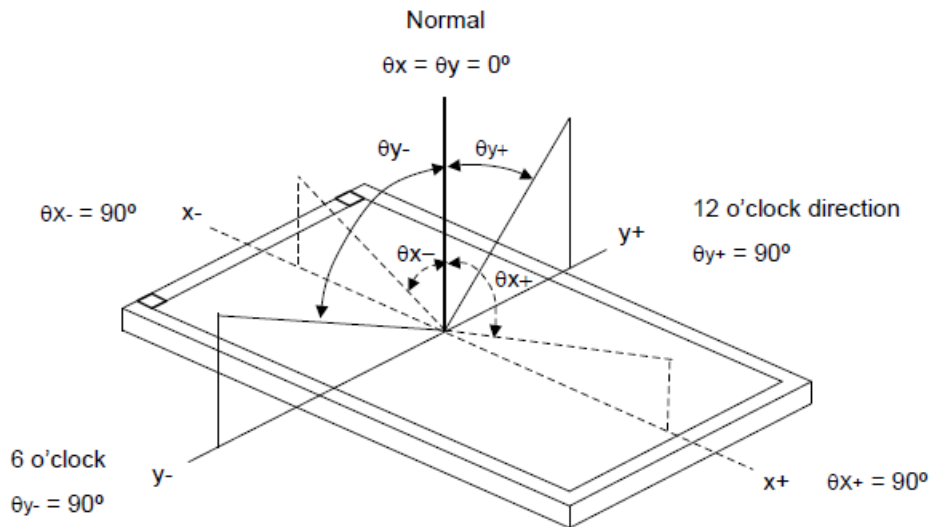
Note 3: Contrast ratio is measured by Minolta CA210

Note 4: Definition of Response time

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to "Full Black" (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.
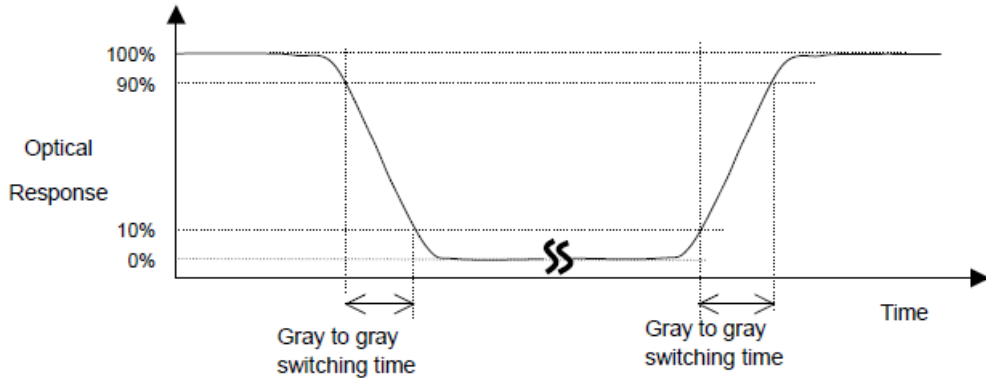
Note 5: Color chromaticity and coordinates (CIE) is measured by Minolta CA210

Note 6: Center luminance is measured by Minolta CA210

Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minolta CA210
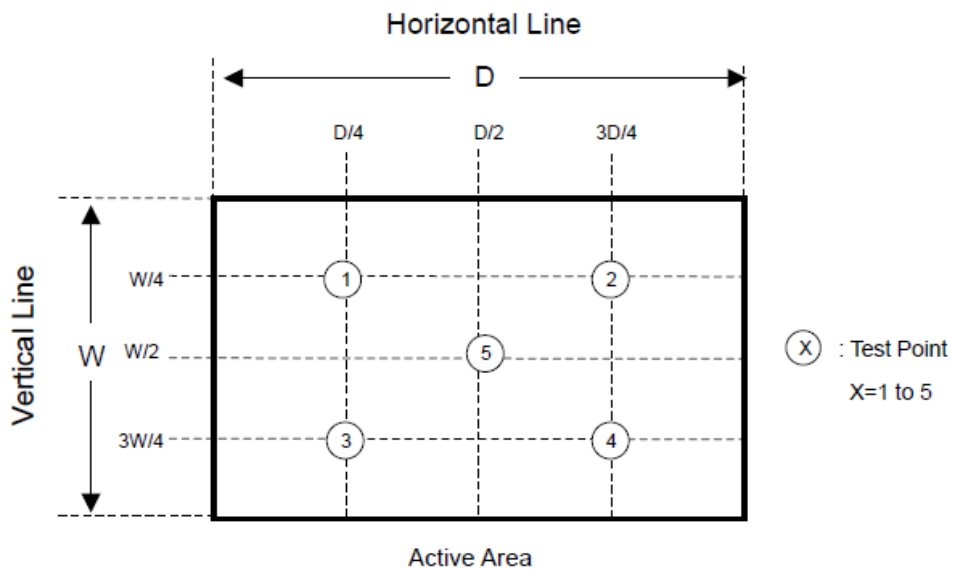
Uniformity = (Min. Luminance of 5 points) / (Max. Luminance of 5 points)

3. Absolute Maximum Ratings

3.1 TFT LCD module

Items	Symbol	Min	Max	Unit	Conditions
Power supply voltage	V_{DD}	Vss-0.3	13.2	Volt	

3.2 Backlight unit

Rating	Symbol	Min	Max	Unit
BLU input voltage	V_{BLU}	-	26.4	V

3.3 Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T_{OP}	-20	-	60	^{0}C	
Operation Humidity	H_{OP}	5		90	%	Note 3
Storage temperature	T_{ST}	-30		80	^{0}C	
Storage Humidity	H_{ST}	5		90	%	

Note 1: With in Ta= 25℃

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).

4. Electrical Characteristics

    4.1 LCD electrical characteristics.

Electrical specifications >   [Ta =25±2 ℃]

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	VDD	VSS-0.3	12	13.2	V	
Power Supply Current		-	600	1000	mA	Note1
Power Consumption		-	7.2	13.2	Watt	
Rush current		-	-	5	A	
Ptotal		-	-	-	W	

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.
        The current draw and power consumption specified is for VDD=12.0V,

4.2 BLU electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Power Supply Input Voltage	VBL	21.6	24	26.4	Vdc	
Power Supply Ripple Voltage	VRP	-	-	400	mV	
Power Supply Current	IDD	-	4	-	A	
Power Consumption	PDD	-	96	-	Watt	Note 1

Note 1: The specified current and power consumption are under the typical supply Input voltage, 24V.
It is total power consumption.

5. Interface connection

5.1 Electrical interface connection

5.1.1　TFT interface(CN1)

● Connector : 51pin(Manufactured by 德润) or Equivalent

Pin No	Symbol	Description	Pin No	Symbol	Description
1	VDD	Power Supply +12.0V	27	GND	Ground
2	VDD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VDD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VDD	Power Supply +12.0V	30	GND	Ground
5	VDD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VDD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VDD	Power Supply +12.0V	33	GND	Ground
8	VDD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	No Connection	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	PWM TIN	External VBR(From System)	40	Rx4n	V-by-One HS Data Lane 4
15	PWM TOUT	External VBR(For System)	41	Rx4p	V-by-One HS Data Lane 4
16	NC	No Connection	42	GND	Ground
17	NC	No Connection	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	SDA(For I2C)	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL(For I2C)	45	GND	Ground
20	NC	No Connection	46	Rx6n	V-by-One HS Data Lane 6
21	Local_ON	'L' = Local dimming Disable	47	Rx6p	V-by-One HS Data Lane 6
22	SEL_SEC	分区选择信号,L/NC:2section,H:1section	48	GND	Ground
23	PQ-MODE	No Connection	49	Rx7n	V-by-One HS Data Lane 7
24	GND	Ground	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot plug detect	51	GND	Ground
26	LOCKN	Lock detect			

5.1.2 BLU interface(CN2)

LED driver board connector: Cvilux CI0114M1HR0-NH

Pin NO	Symbol	Description
1	VIN	DC +24V
2	VIN	DC +24V
3	VIN	DC +24V
4	VIN	DC +24V
5	VIN	DC +24V
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	GND	Ground
11	NC	No connected
12	ON / OFF	OFF=0V; ON=+3V
13	DIMM	10~100%
14	NC	No connected

5.2 VBYONE interface

Vx1 Byte length and Color mapping>

Byte	Packer input	Color data mapping
		30 bpp RGB
0	Bit-0	R2
	Bit-1	R3
	Bit-2	R4
	Bit-3	R5
	Bit-4	R6
	Bit-5	R7
	Bit-6	R8
	Bit-7	R9
1	Bit-8	G2
	Bit-9	G3
	Bit-10	G4
	Bit-11	G5
	Bit-12	G6
	Bit-13	G7
	Bit-14	G8
	Bit-15	G9
2	Bit-16	B2
	Bit-17	B3
	Bit-18	B4
	Bit-19	B5
	Bit-20	B6
	Bit-21	B7
	Bit-22	B8
	Bit-23	B9
3	Bit-24	-
	Bit-25	-
	Bit-26	B0
	Bit-27	B1
	Bit-28	G0
	Bit-29	G1
	Bit-30	R0
	Bit-31	R1

6. Signal timing specification

Input data specification V-By-One Connector

- Timing characteristics of input signals

Timing characteristics of input signals >

| Item		Symbols	Min	Typ	Max	Unit
Frequency		$1/Tc$				MHz
Vertical	Frame Rate	F	47	60	61	Hz
	Total	T_V	740	810	1010	T_H
	Display	T_{VD}		720		T_H
	Blank	T_{VB}	20	90	290	T_H
Horizontal	Total	T_H	530	550	570	T_{CLK}
	Display	T_{HD}		480		T_{CLK}
	Blank	T_{HB}	50	70	90	T_{CLK}

7. Electrical inspection specification

- V by one Input Signal Timing

SSCG Receive Information of TCON: When modulation frequency is 30KHz, spread spectrum modulation range is inner ±0.5% .

V by one Input Signal Timing

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Voltage
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	392	tTCIP/30	-	PS	-
		4-byte	294	tTCIP/40	-	PS	-
Eye Width at Package Pin	tREYE	-	-	0.5	-	UI	-
Eye Width Position A at Package Pin	tA	-	-	0.25	-	UI	0 mV
Eye Width Position B at Package Pin	tB	-	-	0.3	-	UI	50 mV
Eye Width Position C at Package Pin	tC	-	-	0.7	-	UI	50 mV
Eye Width Position D at Package Pin	tD	-	-	0.75	-	UI	0 mV
Eye Width Position E at Package Pin	tE	-	-	0.7	-	UI	-50 mV
Eye Width Position F at Package Pin	tF	-	-	0.3	-	UI	-50 mV
Intra – pair Skew	TTOSK_intra	-	-0.3	-	0.3	UI	-
Intra – pair Skew	TTOSK_inter	-	-500	-	500	UI	-
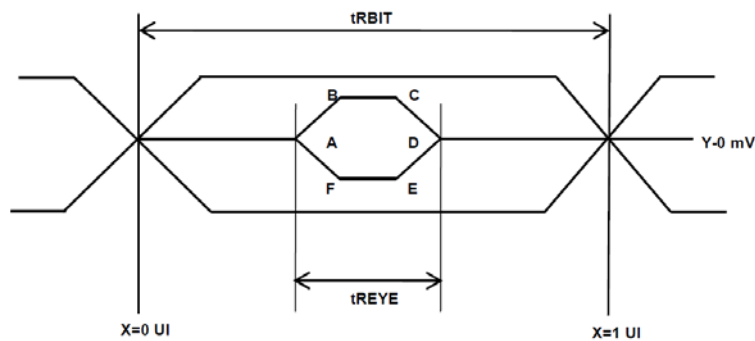
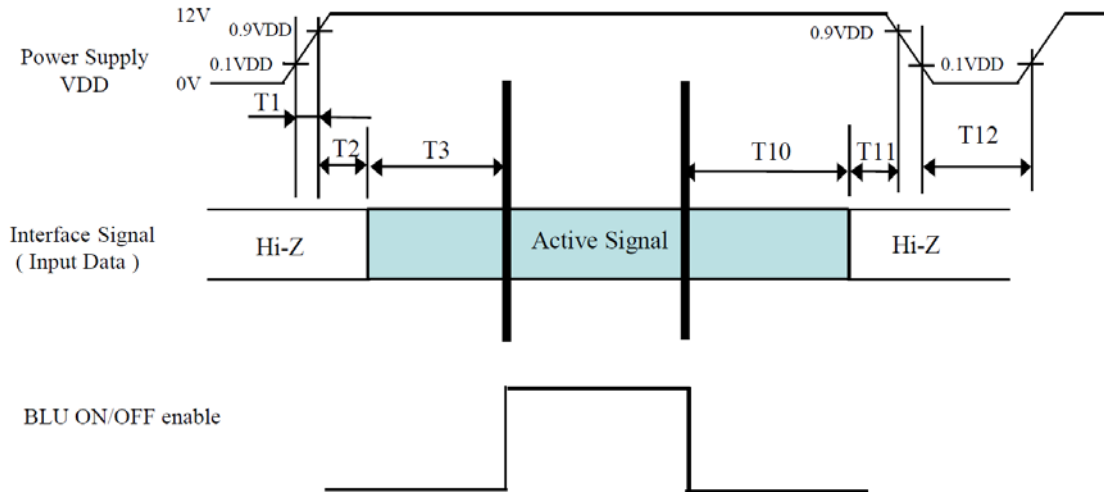## 8. Signal timing waveforms of interface signal

Input data specification

- Timing characteristics of input signals
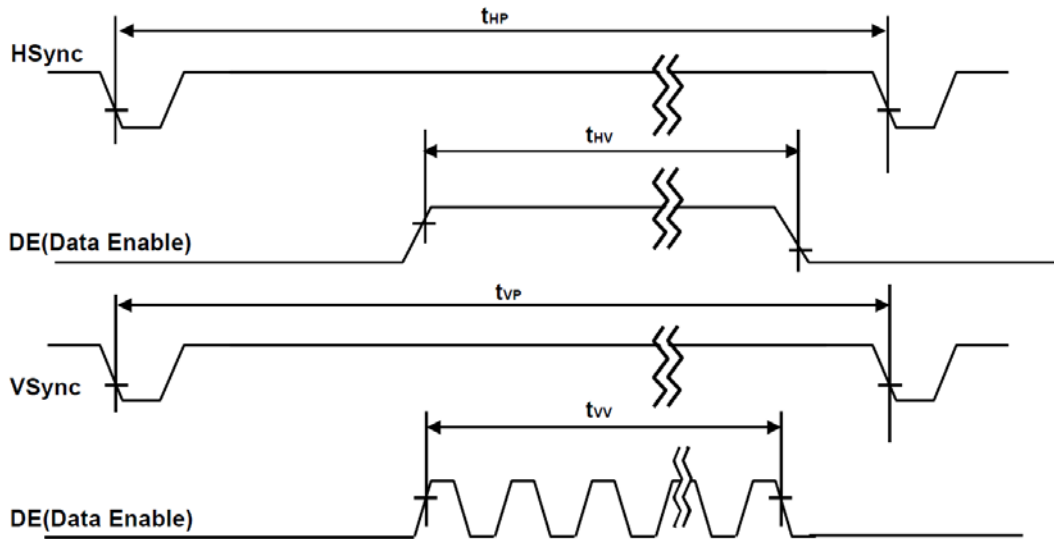
-V by one Data format as follows this table

Mode 1: Non-Division			
Lane	1st Data	2nd Data	Data#
Lane0	1	9	3833
Lane1	2	10	3834
Lane2	3	11	3835
Lane3	4	12	3836
Lane4	5	13	3837
Lane5	6	14	3838
Lane6	7	15	3839
Lane7	8	16	3840

9. Power sequence

Sequence Table

Parameter	Values			Units
	Min	**Typ**	**Max**	
T1	0.5	-	-	ms
T2	0	-	-	ms
T3	600	-	-	ms
T10	200	-	-	ms
T11	0	-	-	ms
T12	1	-	-	s

10. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta=40℃, 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 60℃, 50%RH, 240hours	3
Low Temperature Operation (LTO)	Ta= -20℃, 240hours	
High Temperature Storage (HTS)	Ta= 80℃, 240hours	
Low Temperature Storage (LTS)	Ta= -30℃, 240hours	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 100 cycles	
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -10℃ to 50℃, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

Note 3: The test items are tested by open frame type chassis.

11. Shipping package
(TBD)

12. Mechanical Characteristics