Panasonic

Att :

No. 1M1M-0067

Date : FEB-20-2001

REFERENCE SPECIFICATION

Description : Liquid Crystal Display

Customer's Parts Number :

Model Number : EDMMRB8KJF

Notice: This specification is "Preliminary".
The contents described in this specification may be changed without notice. Please ask us to send final version and reconfirm before you start design.

Liquid Crystal Display Division		ISSUE
Product Designing Dept.		
Approval	Check	
Check	Design	

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Liquid Crystal Display Division

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Rev No	Change of date	Contents of R/V	Note	APPROVAL	CHECK	DESIGN
01A			Effective from MP			

1 Scope

This specification defines quality requirements for the passive matrix type liquid crystal display of following Part No. manufactured by the Liuid Crystal Display Division. Matsushita Electric Industrial Co., Ltd.

2 Part No. and driving method

2.1 Part No.

MEI's Part No. : EDMGRB8KJF

2.2 Driving method

- The screen of this LCD module consists of 640×3(RGB) ×480dots.
- Circuit constant of this LCD module is designed to operate under 1/484duty-70Hz of passive matrix driving methed.
  (In case different driving conditions than the above will be applied, make sure to contact the Engineering Dept, LCD DIV, MEI. in advance.
  In particular, be careful that driving conditions may change if LCD and CRT are driven simultaneously.)

3 Mechanical specifications

3.1 Outer Dimensions

See attached drawing : 1M1M-0067 (19-19)

3.2 Display pattern

・Dot format : 640×3(RGB)×480 Dots	・Dot Pitch : 0.082 × 0.246 mm
・Dot Gap : 0.020 × 0.020 mm	・Dot Size : 0.062 × 0.226 mm
・Effective Area : 118.06 ×157.42 mm	・viewing Area : 120.07×159.8 mm
	・viewing direction 6 O'clock
・Color, transmissive type, Cold Cathode Fluorescent Tube Backlight. ・Transparent Touch panel on the LCD.	
・Surface TTP : Non-glare, surface hardness : 2H	

3.3 MASS (WEIGHT) 310g Typ.

4.1 Absolute maximum ratings

$V_{DD} \geqq V_{CON} \geqq V_{SS} = 0V$

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
1 Power Supply for Logic	$V_{DD} - V_{SS}$	0		6.0	V	
2 Power Supply for LCD Drive	$V_{CON} - V_{SS}$	0		V_{DD}	V	
3 Input Logic Level	Vin	-0.3		$V_{DD}+0.3$	V	
4 Maximum Operating Temperature	Tmax	0		45	℃	Humidity 5 to 90%RH (*NOTE1)
5 Storage Temperature	Tstg	-20		60	℃	

4.2 Operating range

$V_{DD} > V_{CON} > V_{SS} = 0V$

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
1 Power Supply for Logic	$V_{DD} - V_{SS}$	4.75	5.00	5.25	V	V_{SS} = 0V
		3.15	3.30	3.45		
2 Power Supply for LCD Drive	$V_{CON} - V_{SS}$	0.80	1.95	2.80	V	
3 Operating Temperature	Topr	0	—	45	℃	Humidity 5to 90%RH (NOTE1)
4 Frame frequency	f_{FRM}	60	70	120	Hz	

(NOTE1) 1) When the display is moved from storage temperature to operating temperature, it shall recover normal display characteristics within 4 hours.

2) $T \leqq 40℃$ 90%RH max
$T > 40℃$ Absolute temperature shall be less than 40℃ and 90%RH

3) There shall be no dew condensation.

4) Display quality may not be satisfactory at over 40℃

5) The LCD Module does not expose to SUNSHINE.

5 Electrical characteristics

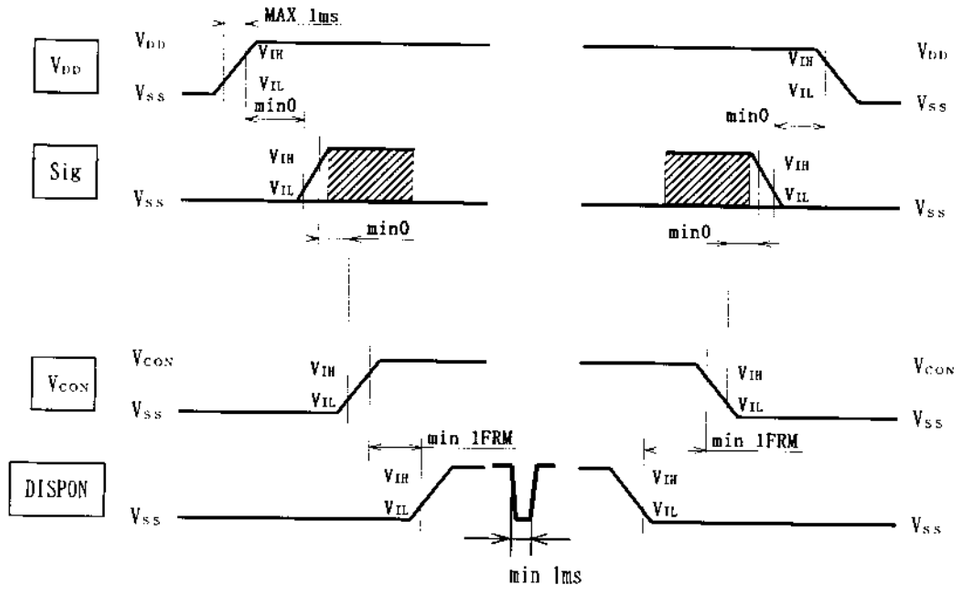
5.1 Electrical Circuits see attached drawing 1M1M-0067 (11-19)

5.2 Electrical Characteristics Ta = 0~40℃, V_{DD}= 5.0V±0.25V or V_{DD}= 3.3V±0.15V, V_{SS}= 0V (GND)

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
1 Input Voltage	V_{IH}	0.8V_{DD}	—	V_{DD}	V	
	V_{IL}	0	—	0.2V_{DD}	V	
2 Current consumption (Ta = 25℃) V_{CON} = V_{OPR} f_{FRM} = 70Hz Display pattern: Checker pattern	I_{DD}		100	150	mA	V_{DD}-V_{SS}=5.0V
			150	220		V_{DD}-V_{SS}=3.3V
	$I_{DD\ RUSH}$	1.5A (PEAK) ×10ms				Power ON
3 Shift Clock Frequency	fcpx	—	—	20.0	MHz	
4. Operating voltage	V_{OPR} = V_{CON}-V_{SS}	0.80	—	—	V	Ta = 0℃
		—	1.95	—	V	Ta = 25℃
		—	—	2.80	V	Ta = 40℃

Definition of V_{OPR} : V_{CON}-V_{SS} at the time of setting V_{CON} to get optimum contrast under V_{SS} = GND condition.

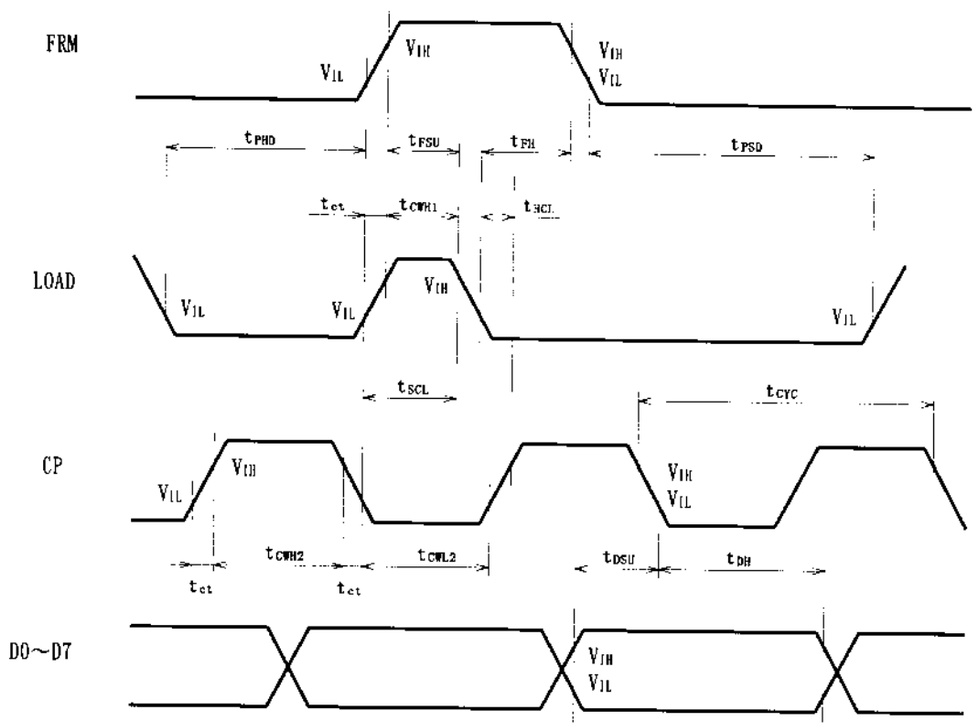
Make sure to comply with the following sequence for power supply.



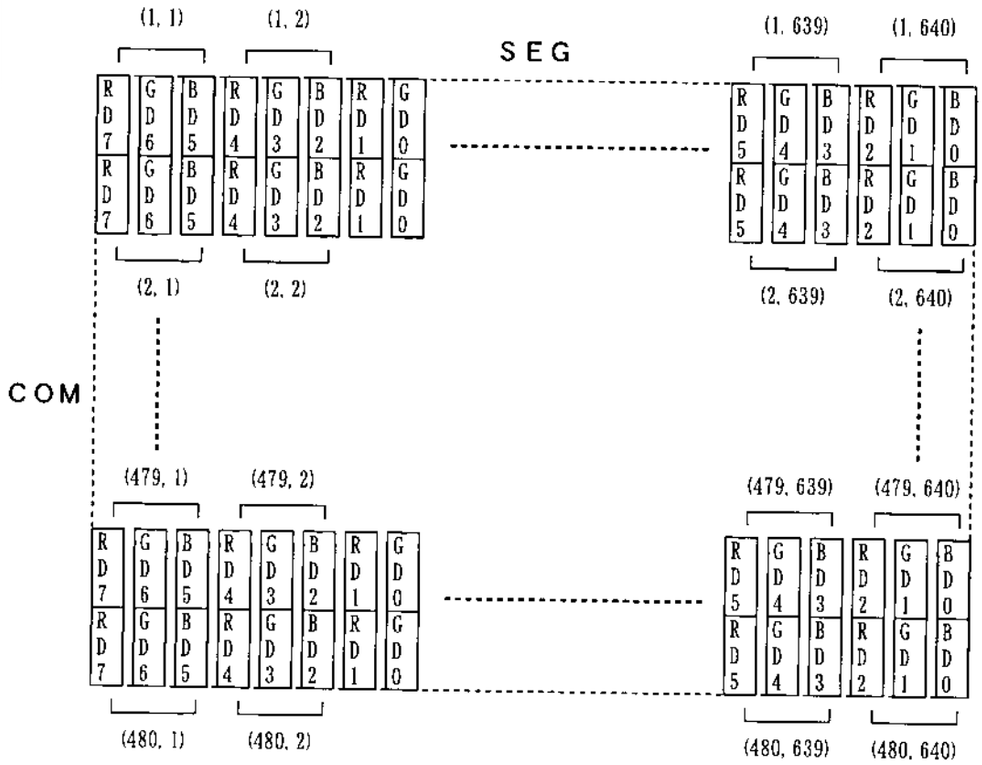
5.3 Switching Characteristics (V_{DD}= 5.0V±0.25V or V_{DD}= 3.3V±0.15V, V_{SS}= 0 V, Ta=0~40℃)

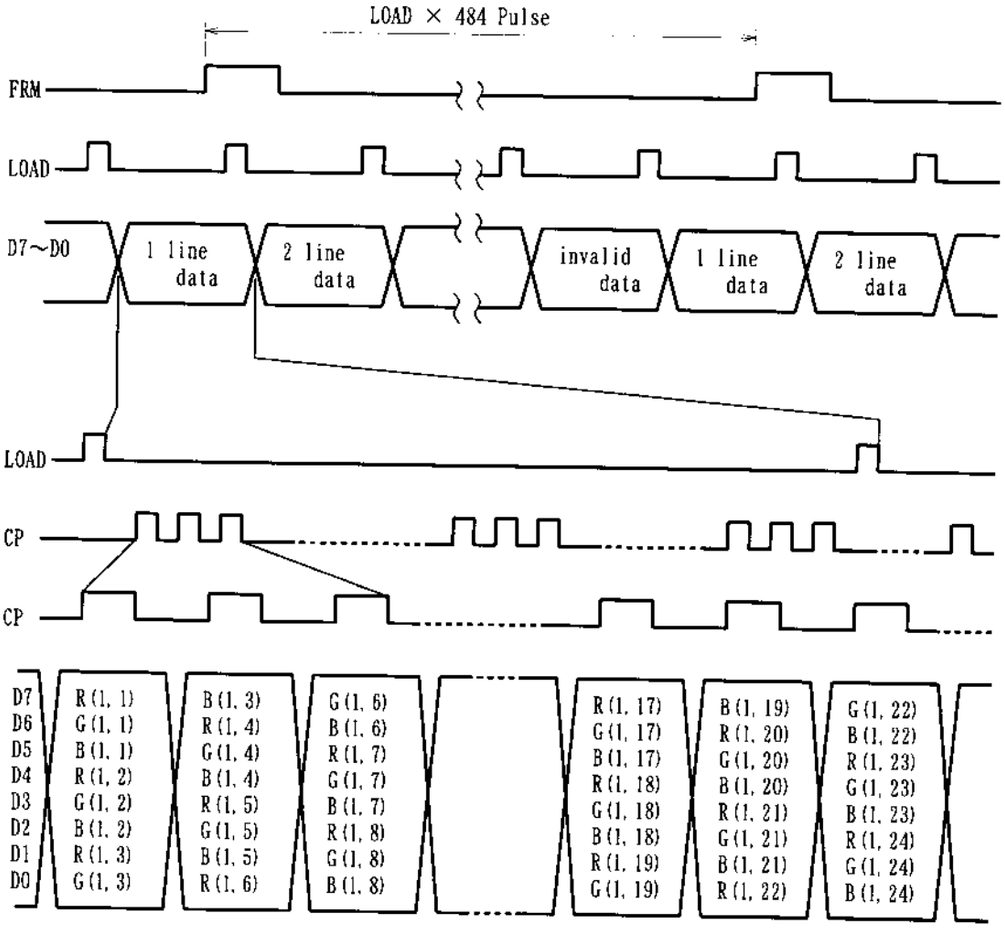
item	symb.	min.	typ.	max.	unit
Clock cycle time	t_{CYC}	50	—	—	ns
Clock pulse width (High level)	t_{CWH2}	16	—	—	ns
Clock pulse width (Low level)	t_{CWL2}	16	—	—	ns
Clock hold time	t_{HCL}	110	—	—	ns
Clock set up time	t_{SCL}	110	—	—	ns
Rise / fall time	t_{et}	—	—	25 *	ns
Load pulse width (High level)	t_{CWH1}	150	—	—	ns
Data set up time	t_{DSU}	15	—	—	ns
Data hold time	t_{DH}	15	—	—	ns
Frame set up time	t_{FSU}	120	—	—	ns
Frame hold time	t_{FH}	200	—	—	ns
Load set up time	t_{PSD}	10	—	—	ns
Load hold time	t_{PHD}	120	—	—	ns

V_{IH} = 0.8V_{DD} , V_{IL} = 0.2V_{DD} *Remarks $t_{et} < 1/2 \{ t_{CYC} - (t_{CWH2} + t_{CWL2}) \}$



5.4 Relationship between data and liquid crystal display





<Note> 1) Frame frequency of this module is set to 70 Hz. Make sure to determine driving frequency of the CCFT backlight which avoids flickering.

2) Regarding LOAD, make sure to keep constant intervals between rise and fall, and input without any intermission.

5.5 Driving method of LCD module (Refer to 5.8 : Circuit diagram)

1) Connection of power supply and signal line.
This module requires V_{DD} and power supply for LCD drive (V_{CON})
V_{CON} must be adjustable. Select proper variable resistance to avoid big change of V_{CON} by a little change of voltage.
To avoid problems such as latch-up of circuit, minimize ripple of power supply and keep ratings below maximum including overshoot.
For signal line, release signals in a way described in 5.4. However, AC converting signal is not necessary for this module.

2) ON/OFF of power supply and signal

・Driving liquid crystal molecular by DC current may cause serious damages to LCD including disorder of alignment and electrical decomposition. This module converts signals to AC using LOAD and FRM signals in driver signals. Therefore, regarding the timing of power ON/OFF and signal release, make sure to strictly comply with precautions in sequence for power supply described in 5.2.

3) Structure of LCD screen

・This module consists of 1 screen of 640 × 3(RGB) × 480dots.
The 640 × 3(RGB) side is called SEG, and there are 8 LSIs in the positioning of lower screens. The 480 side is called COM, and there are 4 LSIs.

4) Signals and driving principles (Refer to 5.4)

・Data is transferred using 8-bit parallel.
Each LSI for SEG has an internal 240 ÷ 8 = 30 clock counter. When the LSI becomes disabled after 30 clocks, it functions to output the enabled signal to next LSI.
When the counter circuit is cleared by fall of LOAD signal, the first LSI (X1) becomes enable.

・FRM signal is the scanning signal which selects COM line. The signal shifts to the next line at fall of LOAD signal. This module is designed for 1/484duty.
Therefore, FRM signal is released every 1-frame time (1/70 Hz : 14.3 ms), and LOAD signal is required of the time (1H = 14.3 / 484 ms) per each 484 divided equal time of 1 frame time.
If the time division is unbalanced, 1 / 484 duty cannot be carried out.
This may degrade current consumption and display quality.

・The 8-bit data is taken into X1 LSI shift register at fall of CP signal. Then, the next CP signal shifts the data and takes in the next 8-bit data simultaneously.
In this manner, after the total of 240 bits data are processed, which is equal to 30 clocks, X1 bacomes disabled and enabled signal is output to X2. In the same way, data of 640×3(RGB) dots is taken into the shift register. If this data is for the 1st line, FRM signal turns to H, and LOAD signal is input.
By the fall of LOAD signal, the 1st line is selected and simultaneously the data of 640 × 3(RGB) dots is latched by latch circuit of X1 to X8 LSI. Through the level shift circuit and analog switch circuit inside LSI, proper waveform of each data is output to LCD panel. At this time, lines other than 1st line has scanning signal of L.
Therefore, non-selective waveform is applied to LCD panel although these lines have latch data in X1 to X8.
Then, when FRM signal turns to L, the above display data of the 2nd line is transferred to X1 to X8 LSI as mentioned above. When LOAD signal is input, H data of FRM signal shifts to the 2nd line and selected. At the same time, display data is latched and displayed on LCD panel. The same mechanism repeats until 484th line to complete 1 frame. (Data of 481st line to 484th lines are not displayed.)

5.6 CCFT electrical characteristics

Item	Symbol	MIN	TYP	MAX	Unit	Remarks	
1. Starting voltage	Vs	—	—	880	Vrms	Ta = 25℃, IL = 6mA	*1
		—	—	1155	Vrms	Ta = 0℃, IL = 6mA	*1
2. Operating voltage	Es	—	430	—	Vrms	Ta = 25℃, IL = 6mA	
3. Lamp current	IL	—	—	6.0	mA	Dimmer : Maximum	*2
		2.0	—	—	mA	Dimmer : Minimum	*2
4. Power consumption	WL	—	2.58	—	Wrms	Ta = 25℃, IL = 6mA	
5. Discharge stabilization time	Ts	—	—	3	min	Ta = 25℃, IL = 6mA	
6. Current life	LT	10,000	—	—	hour	Ta = 25℃, IL = 6mA 50% of initial Chromaticty There shall be no remarkable color temperature change.	
7. Operating frequency range	———	50	—	80	kHz		

Measurement shall be conducted 10 minutes after CCFT is turned on at windless environment.

*1: Inverter should be designed to be matched with lamp characteristic.
(Inverter's output voltage without load should be kept higher than the maximum value of CCFT's starting voltage.)
*2: Panel surface temperature should be kept less than 60℃ when lamp current is maximum.
(Maximum lamp current should be less than 6 mA.)

【Caution】
Output voltage of inverter should have sufficient margin, because starting voltage is influenced by length of lamp cable, method of wiring and adjacent conductor to lamp. Please check and test your inverter by using actual backlight unit for our LCD.

5.7 Interface specifications

CN1 LCD interface : 52746-2090 (MOLEX)

Pin No	Symbol	Contents
1	D7	Display Data
2	D6	Display Data
3	D5	Display Data
4	D4	Display Data
5	V_{SS}	GND (0V)
6	D3	Display Data
7	D2	Display Data
8	D1	Display Data
9	D0	Display Data
10	V_{DD}	Power Supply for Logic
11	V_{DD}	Power Supply for Logic
12	CP	Data Shift Clock
13	V_{DD}	Power Supply for Logic
14	LOAD	Data Latch Signal
15	GND	GND (0V)
16	DISP	Display Control Signal (H:ON/L:OFF)
17	V_{SS}	GND (0V)
18	V_{CON}	Power Supply for LCD Driving(Whiter at Lower Voltage)
19	V_{SS}	GND (0V)
20	FRM	Frame Initialize Signal

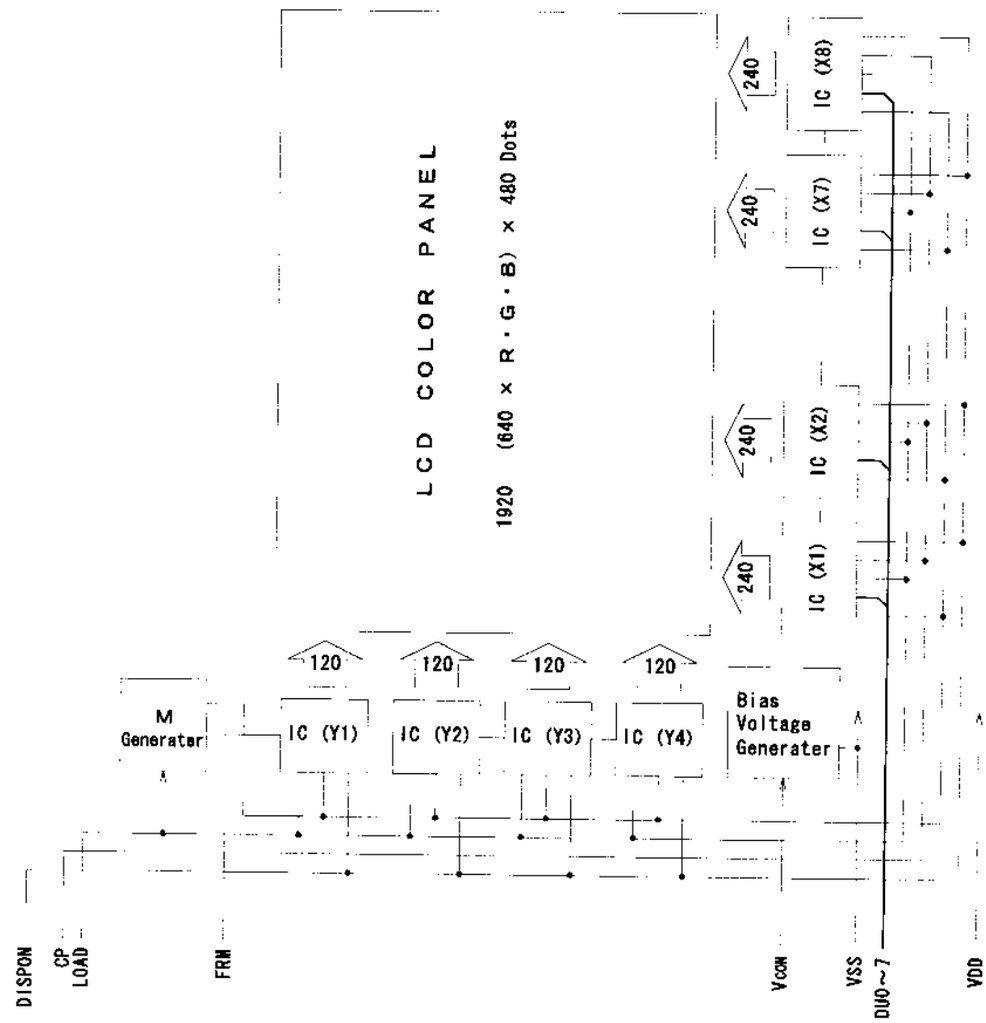
CN2 CCFT interface : BHR-03VS-1 (JST)

Pin No	Symbol	Logic	Contents
1	HIGH	———	Power supply for cold cathode tube (High voltage)
2	N.C.	———	No connect
3	GND	———	Power supply for cold cathode tube (GND)

TTP interface : Flexible pattern

Pin No	Symbol	Logic	Contents
1	X2		
2	Y1		
3	X1		
4	Y2		

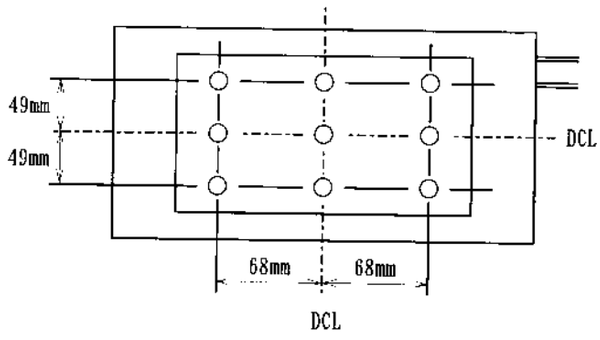
5.8 Circuit diagram



6. Optical Characteristics (Ta=25℃, Frame Frequency=70Hz)
Refer to Item 11 for characteristics measuring method.

No.	Characteristic	Symb.	Condition		MIN	TYP	MAX	Unit	Measuring method
6.1	Response Time	t_{ON}	$\theta=0°$ $\phi=0°$ ※1		—	200	300	ms	Ta=25℃ Measure at the center of display
		t_{OFF}	$V_{CON}-V_{SS}=V_{MAX}$		—	150	200		
6.2	Vertical Viewing Angle	θ $-\theta$	CR≧1.5 $V_{CON}-V_{SS}$ $=V_{MAX}$ ※1	$\phi=0°$	(-30)	—	(+20)	degree	
6.3	Horizontal Viewing Angle	ϕ $-\phi$		$\theta=0°$	(-45)	—	(+45)	degree	
6.4	Contrast Ratio	CR	$\theta=0°$ $\phi=0°$ $V_{CON}-V_{SS}=V_{MAX}$ ※1		(20)	(30)	—	—	
6.5	Brightness	B	$\theta=0°$ $\phi=0°$ $V_{CON}-V_{SS}=V_{MAX}$ ※1		(35)	(60)	—	cd/m²	IL = 4mA Measuring distance : 40 cm
6.6	Brightness uniformity	ΔB			70	—	—	%	
6.7	Color tone	White		X	—	0.330	—	—	Measure at the center of display
				Y	—	0.330	—		

※1 Definition of V_{MAX} : $V_{CON}-V_{SS}$ at the time of setting V_{CON} to get Maximum contrast under V_{SS} = GND condition.
NOTE1 : Measure after turning on the module for 20 minutes.
NOTE2 : Brightness measuring points.



Brightness B : Average of Brightness at 9 points

MIN/MAX ≧ 70 %

7 Quality and Reliability (Ta=25℃, Frame frequency=70Hz)

Refer to Item 11 for characteristics measuring method.

No.	Item	Test conditions	Judgment
7.1	Load Life	In the thermal chamber at 40±2 ℃, display the black/white checkered pattern under V_{DD}= 5 ±0.25V, V=V_{OPR} for 500±24Hr	Shall operate normally, after test.
7.2	High Temperature Exposure	In the thermal chamber at 60 $^{+0}_{-4}$ ℃, expose the module without applying any load for 240 $^{+24}_{-0}$ Hr.	
7.3	Low Temperature Exposure	In the thermal chamber at -20 $^{+4}_{-0}$ ℃, expose the module without applying any load for 240 $^{+24}_{-0}$ Hr.	
7.4	Humidity Exposure	In the thermal chamber at 40 $^{+0}_{-4}$ ℃, 85 to 90%RH, expose the module without applying any load for 240 $^{+24}_{-0}$ Hr.	
7.5	Heat Shock	In the thermal chamber, expose the module without applying any load for 1 hr each at -20±2 ℃ and 60±2 ℃ (1 cycle). Conduct 50 cycles.	
7.6	Vibration	10 to 100 Hz, 0.4 G peak Conduct the vibration test 1 h/cycle once each 3 different axes.	
7.7	Shock	50 G, 6 ms half-sin pulse Conduct the shock test 3 times to each 3 different axes. (Make sure to conduct the test on the complete set.)	
7.8	CCFT Lighting life at normal temperature	Continuous lighting for 10000 hr or longer at normal temperature under 6mA tube current	Shall be 1/2 or above compared to luminance of initial screen.
7.9	CCFT Lighting life at low temperature	Continuous lighting for 350 hr or longer at 0 ℃ temperature under 6mA tube current	

*NOTE1 : Secure the module on the test stage for No. 7.6 and 7.7 .
*NOTE2 : Never exceed absolute humidity of 40℃, 95%RH .
*NOTE3 : V_{OPR} is the best voltage at high contrast in every temperature.

8 Appearance

Refer to 1B1M-0190 for Appearance.

9 Safety

Make sure to use printed circuit board of class 94V-0.

10 Marking

10.1 Marking

The following marking shall be stamped or labeled on this module.

No	Item	Marking	Remarks
1	Product name	LCD UNIT	
2	User model No.		
3	MEI's model No.	EDMGRB8KJF	
4	Manufacturing date code	□□□□□ 5-digit alphabet/number	□ □ □□ □ □ Last digit of the year / Month: Oct. −O, Nov. −N, Dec. −D / Date / Manufacturing Department
5	Revision	□□□	3-digit alphabet/number
6	Country of origin	MADE IN JAPAN	
7	Manufacturer	Matsushita Electric Industrial Co.,Ltd.	
8	Serial No.	B8KJ□□□□□□	6-digit alphabet/number
9	Caution	Danger of high voltage	Color : Black

Marking position : Rear metal plate

10.2 Package

1) In each external box, 20 modules are packaged.

2) Place the following labels or printing on the outside of external box.

Customer	
Cust Part No.	
Part No.	EDMGRB8KJF
Quantity	
Lot No.	

11. Measuring method for electrical and optical characteristics

11.1 Measurement condition

Before measuring characteristics, specimen shall be kept under the following conditions for 4 hours Before and after each test.

Temperature : 25±1℃, Humidity : 40~70%RH, Atmosphere : 85~110kPa (650~850mmHg)

11.2 Measuring method for optical characteristics

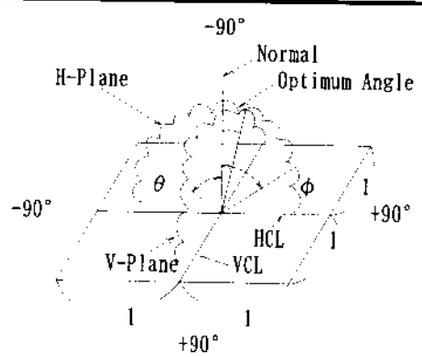
11.2.1 Measuring equipment

1) Response time : LCD-7000 by OTUKA DENSI. Measuring points (aperture) = 8mmϕ
Signal generator and memory scope

2) Contrast ratio, Viewing angle characteristics
Signal generator and color-difference meter (by Minolta CS-100)

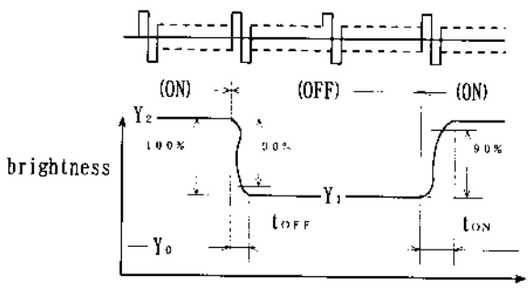
11.2.2 Definition of terms

Normal	The line which is perpendicular to the surface of front glass at cross point of VCL and HCL. This is the reference line for all angles.
V C L	The vertical center line which connects the center of top and bottom margins. This vertical line equally divides effective area.
H C L	The horizontal center line which connects center of left and right margins. This horizontal line equally divides effective area.
Optimum Angle	The angle which deflects θ degrees from Normal.
V-plane	The plane which includes Normal and VCL.
H-plane	The plane which includes Optimum and HCL. The angle toward Normal plane is shown by ϕ.



11.2.3 Measuring points of characteristics
- Measure at the following points, turning ON/OFF only the area of 15 to 20 mm from the center of effective area.

11.2.4 Response time (t_{ON} , t_{OFF})
- Set the measuring equipment (LCD-7000) to 25℃, and place the LCD module to the Normal ($\theta = 0°$, $\phi = 0°$).
- Apply the voltage at V_{MAX} of 11.2.5 and repeat display data = 1 (selective signal) and display data = 0 (Non-selective signal) continuously as shown below. Read the t_{ON} and t_{OFF} from changes in brightness shown on the memory-scope.



OFF:Display data = 0 (non-selective signal)

ON :Display data = 1 (selective signal)

Y_0 :Brightness from ambient lighting

11.2.5 Measurement of driving voltage (V_{MAX}) and contrast ratio (CR)
- Set the measuring equipment to 25℃, and place the LCD module at Normal position ($\theta = 0°$, $\phi = 0°$) against color-difference meter (CS-100).
- Display selective data (Screen : White) and non-selective data (Screen : Black) of specified duty ratio alternatively, and measure brightness at each data. Increase voltage gradually and measure brightness Y_2 at selective state and Y_1 at non-selective state.
- Calculate contrast ratio ($CR=(Y_2-Y_0)/(Y_1-Y_0)$) at each voltage and determine voltage which gives the maximum CR as V_{MAX} (= V_{CON} - V_{SS})

11.2.6 Measurement of vertical viewing angle ($\phi = 0°$)
- Set the measuring equipment (LCD-7000) to 25℃, and apply the above V_{MAX} to the LCD module.

Then change the θ angle ($\phi = 0°$) against the color-difference meter (CS-100), measure brightness at selective state Y_2 and non-selective state Y_1 and calculate $CR=(Y_2-Y_0)/(Y_1-Y_0)$. Angles above $CR \geqq 1.5$ is defined as vertical viewing angle.

11.2.7 Measurement of horizontal viewing angle ($\theta = 0°$)
- Set the measuring equipment (LCD-7000) to 25℃, and apply the above V_{MAX} to the LCD module.

Then change the ϕ angle ($\theta = 0°$) against the color-difference meter (CS-100), measure brightness at selective state Y_2 and non-selective state Y_1 and calculate $CR=(Y_2-Y_0)/(Y_1-Y_0)$. Angles above $CR \geqq 1.5$ is defined as horizontal viewing angle.

11.2.8 Measurement of color tone
- Set the measuring equipment to 25℃, and place the LCD module at Normal ($\theta = 0°$) against color-difference meter (CS-100).

Turn on the backlight applying specified current. Measure color tone with color-difference meter (CS-100) applying V_{MAX}, 60 minutes after turning on the backlight.

12. Precautions in use

(1) Exposing the liquid crystal display module to the direct sunlight or ultra violet rays for a long period of time may shorten life of the module due to deterioration of polarizer. TTP and increase in current consumption of LCD.
(2) The LCD panel is made of glass. Make sure to mount the panel with consideration to vibration and impact.
(3) Thickness of LCD panel is only 10μm, which is very thin. In addition, glass surface is specially treated (aligning treatment) to assure display performance. Ther fore pay attention to the following.
 1) Never press the LCD panel hard. In case LCD panel is pressed during the assembly process leave the panel for 1 hour before applying power.
 2) Avoid extreme temperature change while power is applied.
 3) At mounting the LCD module, avoid any stress on the panel.
(4) If the LCD module is kept at high temperature and high humidity place for long time, it may increase current consumption of the panel. Make sure to keep the module at indoor place between 5 ℃ and 30 ℃, 65 %RH or below.
(5) Handling of C-MOS
 This LCD module employs C-MOS. Pay attention to the following points.
 1) Never input any signal before turning on power.
 2) Make sure to connect all unused input terminals to V_{DD} or V_{SS}.
  a) Clean bare hands wearing antistatic uniform are required in handling.
  b) Discharge static electricity at work place by grounding floor, door, and work table.
  c) Make sure to ground tools such as soldering iron, long-nose pliers, and tweezers.
(6) Never apply unreasonable impact to the main body, or damage screws for mounting by too strong torque. Tightening torque must be within 5 kg · cm.
(7) Never use products dropped on hard floor such as concrete. These must be regarded as defectives.
(8) Never put extraordinary pressure to PCB and frame when interface connector to be installed. Never turn on power at the incomplete insertion of interface connector. Turn off power and signal when interface connector to be inserted and taken off.
(9) Put the cooling hole or slit at the body for LCD SET, to prevent from temperature increase of LCD module caused by CCFL heatup. this is because heat up of 2 pieces of CCFL will make upper edge and lower edge area of LCD screen to be observed a little bit white. In addition to this, pay attention to design that heat of inverter and customer's designed circuit will not heat up LCD module. (Observe white area on the screen where heat to be affected, LCD screen becomes worse on uniformity)
(10) When LCD module to be operated by direct current, due to the elect-chemical reaction inside LCD panel, picture quality becomes worse remarkably. To prevent from input of direct current, input signal to LCD module to be kept at the subject to Item 5 'Power ON/OFF sequence'.
(11) Observe still burning image when the same pattern to be screened at the very long time. Subject to the degree of still burning image, it will be recovered around a day. The use of screen saver is recommended to keep the same pattern display. In addition to this, write this caution in operation manual for user for customer's attention.
(12) Cautions for TTP (Refer to attached TTP Specification EMU601A2MA17.)
 ·Cleaning: Wipe off the stain on the TTP by using soft cloth moisttened with ethanol. Take care not to allow ethanol to soak into the joint of upper Film and bottom glass. It may otherwise cause peeling or defective operation.
 ·Do not use any organic solvent or detergent other than ethanol.
 ·Do not handle LCD by holding the flexible pattern portation of TTP.
 ·Do not put one product on the other. And do not put a heavy or sharp object on TTP.
 ·The input position may be fluctuated through long-time use. A zero-adjustment function using a circuit and software is recommended.
 ·Operate it with a polyacetal pen (tip R0.8mm or over) or a finger without applying excessive load.

(13) ○ to be applied on Item No.

CAUTION	① Please do not work during operating of CCFT by connecting inverter to avoid electric shock , because there is very high voltage on wiring between CCFT or EL and inverter output terminal. Please do not harm cable and connectors action with care. ② Inverter output must be stopped automatically and simultaneously when open-circuit or short-circuit happened between the inverter output and CCFT. Continuos voltage output from the inverter under the open or short circuit may cause excessive leak current and overheat. ③ Please take care burrs to be injured at the edges of LCD metal frame and sharp edges to injured at the glass edges of TTP. We would like you to design carefully to de-touch cable with frame edge section. 4 Please be careful with work to avoid injury by the edges of LCD panel. We would like you to pay attention to design for avoiding damage of LCD glass by wiring and surrounding components. 5 To make sure safety, please install fuse or shutdown circuit as safety function at power supply section inside of customer products, because there is no protect circuit inside LCD module to coop with short circuit issue of power supply (and so on) in LCD module.

(14) The appliance shall be designed as follows.
Ininstalling the LCD in the appliance, the warpage between LCD and the installation positions (4 positions : the mounting screw positions) shall be within 0.2mm.

(15) We can't assure any damages or any influences on LCD caused by environmental conditions of corrosive vapors such as chlorine(CL) and sulfur(S) and things like that.
LCD has to be handled on unexposure to corrosive vapors such as chlorine(CL) and sulfur(S) etc., so please do not work with LCD in such as environmental conditions in your side.

13 Revision of specification

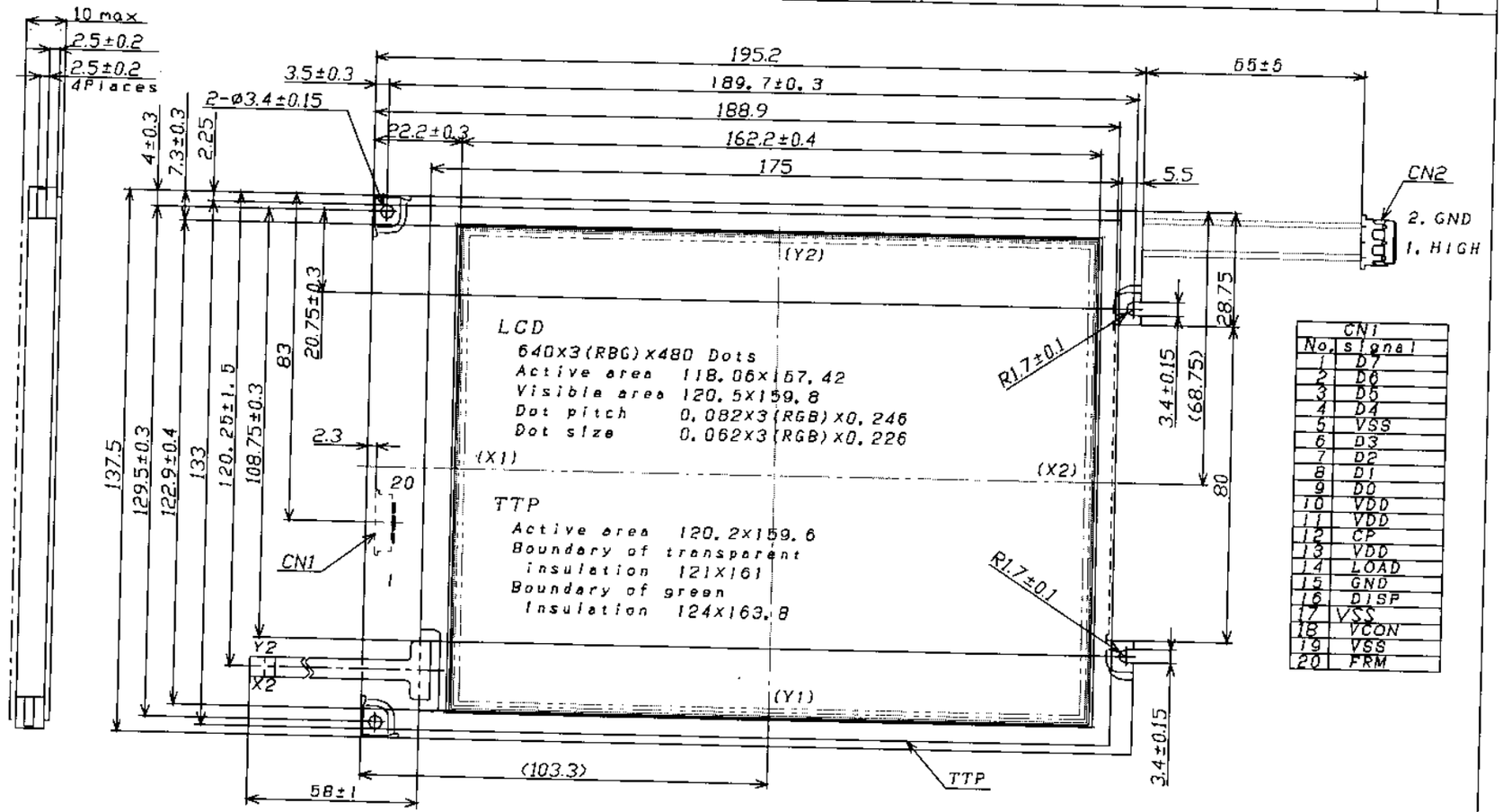
After formally signing the specification, changes in parts and materials used will be informed by prior written notice. Changes are implemented after confirmation of receipt. If there will be question on this spec of new question at the point where spec does not specify, dealing with there should be mutually discussed and find the solution.

14 Warranty period

Warranty period of this LCD module is 12 months after delivery.

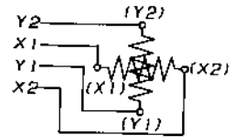
NOTE1. Unspecified Dimensional Tolerance Are ±0.5

Sym.	Date	Revision	Signed	Checked



CN1	
No.	signal
1	D7
2	D6
3	D5
4	D4
5	VSS
6	D3
7	D2
8	D1
9	D0
10	VDD
11	VDD
12	CP
13	VDD
14	LOAD
15	GND
16	DISP
17	VSS
18	VCON
19	VSS
20	FRM

TTP-Circuit diagram



connector's specification
CN1. 52746-2090 (MOLEX)
CN2. BHR-03VS-1 (JST)

	LCD module	1		
Sym	Item or Code No.	Qt	Material & Size	
7.8" VGA C-STN with TTP			Model	
Scale	Designed	Drawn	Checked	Approved	Name	EDMGRB8KJF
1:1					Drawing No.	DM-010416-02

3rd Angle