



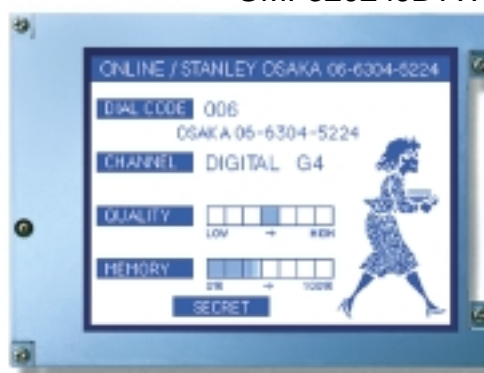
Product Guide

GMF32024JFTW/GMF32024JBTW Series
320x240 Dot Matrix LCD Module



GMF32024JFTW

GMF32024JBTW



New 320 x 240 Dot Matrix type LCD
CFL backlighting provides compact size, high brightness and long life (50,000hrs@25°C)
Electrical noise level is significantly reduced by the use of metal case
Display quality is improved due to the reduced cross talk

Features:

- Wide viewing angle STN LCD
- Thin & compact
- Maintenance free due to the use of long life CFL backlighting (CFL life : 50,000hrs@25°C)
- High brightness (200cd/m² min., twice as bright as the conventional type)
- Noise reduction by metal case
- Improved gray scale (4 or 8 levels)

Applications:

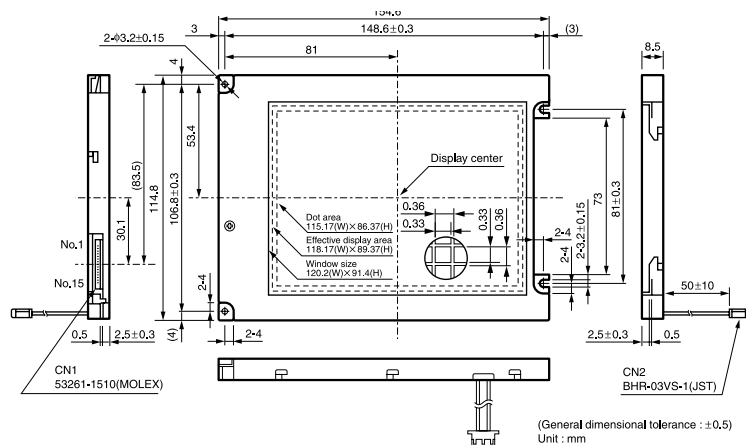
- Factory Automation equipment
- Programmable controller
- Measurement equipment
- Security equipment
- Office Automation equipment
- POS terminal

Product Specifications

Part Number	LCD Type	Viewing Direction	Module Dimensions W x H x D (mm)	Effective Viewing Size W x H (mm)	Pixel Pitch	Duty Ratio	Back Light Source	Interface
GMF32024JFTW	STN B&W	6:00	154.6 x 114.8 x 8.5	118.17 x 89.37	0.36 x 0.36	1/240	CFL	4bit parallel
GMF32124JFTW		12:00						
GMF32024JBTW	STN Blue	6:00						
GMF32124JBTW		12:00						

**
LCD module with 16 gray scale level and exclusive IC controller will be available in September 2001.
Exclusive IC controller reduces flickering and produces a high quality gray scale display.

1. External Dimensions



2. Absolute Maximum Ratings

2-1. Environmental Condition

Item		Minimum	Maximum	Remarks
Ambient Temperature	Operating	0°C	+50°C	–
	Storage	-20°C	+70°C	–
Humidity		*1		No Condensation
Vibration		Conforms to JIS-C-7021A-10		–
Mechanical Shock		Conforms to JIS-C-0041		–
Corrosive Gas		None		–

*1: Ta≤+40°C 85%RH maximum

$T_a > +40^\circ\text{C}$ Absolute humidity should not exceed 85% RH at $T_a = 40^\circ\text{C}$

2-2. LCD driving

(Ta=0~+50°C)

Item	Symbol	Min.	Max.	Unit
Power supply for logic	VDD-VSS	0	7	V
Input voltage for logic	VI	0	VDD+0.3	V
Power supply for LCD driver	VEE-VSS	0	42	V

2-3. CFL Backlighting

(Ta=0~+50°C)

Item	Symbol	Min.	Max.	Unit
Circuit Voltage	VS	–	2,000	V
Lamp Current	IL	2	8	mA
Operating Frequency	CFL-f	20	100	kHz

3. Interface Pin Function

CN1 : 53261-1510 (Molex) [LCD]

Pin No.	Symbol	Effective signal level	Function
1	FLM	H	Scan start signal
2	CL1	H→L	Display data latch signal
3	CL2	H→L	Display data receive signal
4	$\overline{\text{D-off}}$	H/L	Display off signal*1
5	VDD	–	Power supply off for logic (5V)
6	VSS	–	GND for logic
7	VEE	–	Power supply to drive LCD
8	NC	–	Not connected
9	NC	–	
10	NC	–	
11	NC	–	
12	D3	H/L	4bit parallel data
13	D2	H/L	
14	D1	H/L	
15	D0	H/L	

* Recommended connector: 51021-1500(Molex)

Terminal arrangement of interface signal should be compatible to the above figure of external dimensions.

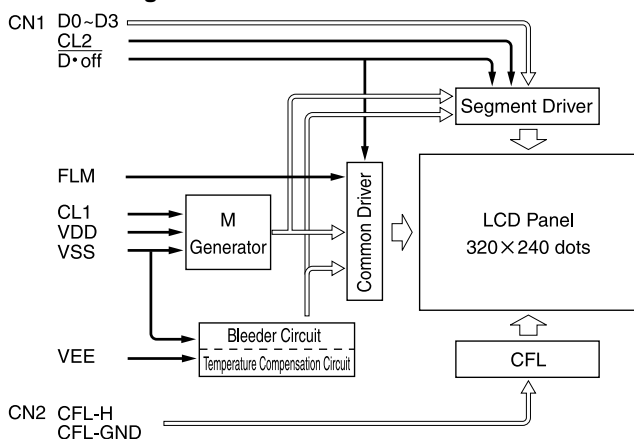
*1 $\overline{\text{D}}\cdot\text{off}$ is pulled up to VDD through 10k Ω in the module.

CN2: BHR-03VS-1(JST) [CFL]

Pin No.	Symbol	Effective signal level	Function
1	CFL-H	AC	Connected to Inverter OUT
2	NC	–	Not Connected
3	CFL-GND	–	Connected to Inverter OUT GND

* Recommended Connector SM02-(8.0)B-BHS-1(JST)

4. Block Diagram



5. Electrical Characteristics

5-1. LCD driving (Ta=+25° C, VDD=5V±5%, duty=1/240)

Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage for logic		VDD-VSS	4.75	5.0	5.25	V	–
LCD	STN-B&W	VEE-VSS	24.0	25.6 ^{*1}	28.0	V	*1,*2
Driving Voltage	STN-Blue	VEE-VSS	24.0	25.7 ^{*1}	28.0	V	
Input “High” voltage		VIH	0.8VDD	–	VDD	V	–
Input “Low” voltage		VIL	0	–	0.2VDD	V	–
Supply current for logic		IDD	–	1.0	3.0	mA	*2
Supply current for LCD drive		IEE	–	10.0	20.0	mA	
Latch pulse frequency		fCL1	16.8	18.0	36.0	kHz	*3
Frame frequency		fFLM	(70)	(75)	(150)	Hz	–

*1: Actual display contrast of the product varies depending on the LCD supply voltage(V_{EE}-V_{SS}). Please adjust your supply voltage between 24.0V and 28.0V in order to optimize the contrast at Ta=25 deg C. (the above chart is reference only)

*2: LCD supply voltage and power consumption depend on the display content.

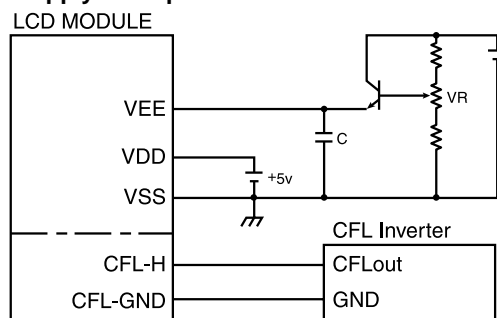
*3: It is important to adjust latch pulse frequency to have the best display quality on actual module.

5-2. CFL Backlighting

($T_a = +25^\circ\text{C}$)

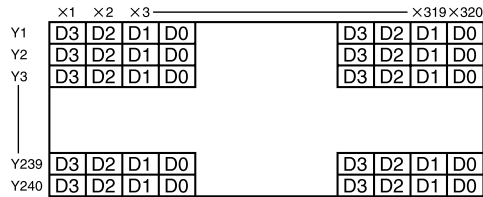
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Circuit Voltage*1	VS	–	–	1,000	–	V
Lamp Voltage	VL	–	295	330	365	V
Lamp Current	IL	–	4.5	5.0	5.5	mA
Operating Frequency	fCFL	–	25	40	65	kHz
Power Consumption	PCFL	–	–	(1.65)	–	W

6. Power Supply Example

[illegible]

Symbol

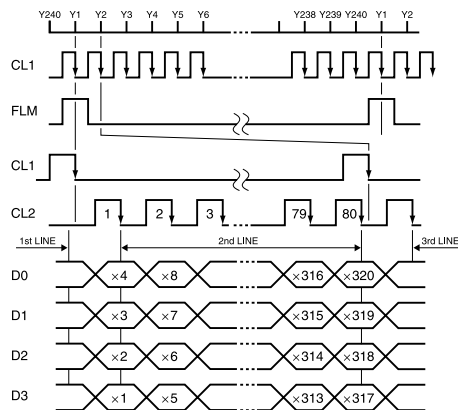
7. Correspondence of Data and Screen



8. Interface Timing Characteristics

Item	Symbol	Terminal	Min.	Typ.	Max.	Unit
Shift clock frequency	tCYC2	CL2	83	–	–	ns
Shift clock pulse width (H level)	tCWH2	CL2	20	–	–	ns
Shift clock pulse width (L level)	tCWL2	CL2	20	–	–	ns
Data set up time	tDS	D0-D3 CL2	10	–	–	ns
Data hold time	tDH	D0-D3 CL2	10	–	–	ns
Latch pulse width (H level)	tCWH1	CL1	50	–	–	ns
Latch pulse width (L level)	tCWL1	CL1	370	–	–	ns
Latch set up time	tCLS	CL1 CL2	100	–	–	ns
Latch hold time	tCLH	CL1 CL2	100	–	–	ns
Latch pulse frequency	tCYC1	CL1	27.8	55.6	59.5	μs
FLM set up time	tFLS	FLM CL1	100	–	–	ns
FLM hold time	tFLH	FLM CL1	30	–	–	ns
Input signal rise time	tr1	CL1 CL2	–	–	30	ns
Input signal fall time	tf1	CL1 CL2	–	–	30	ns
D-off signal rise time	tr2	D-off	–	–	200	ns
D-off signal fall time	tf2	D-off	–	–	200	ns

9. Interface Timing Chart for Data Transfer



10. Optical Characteristics

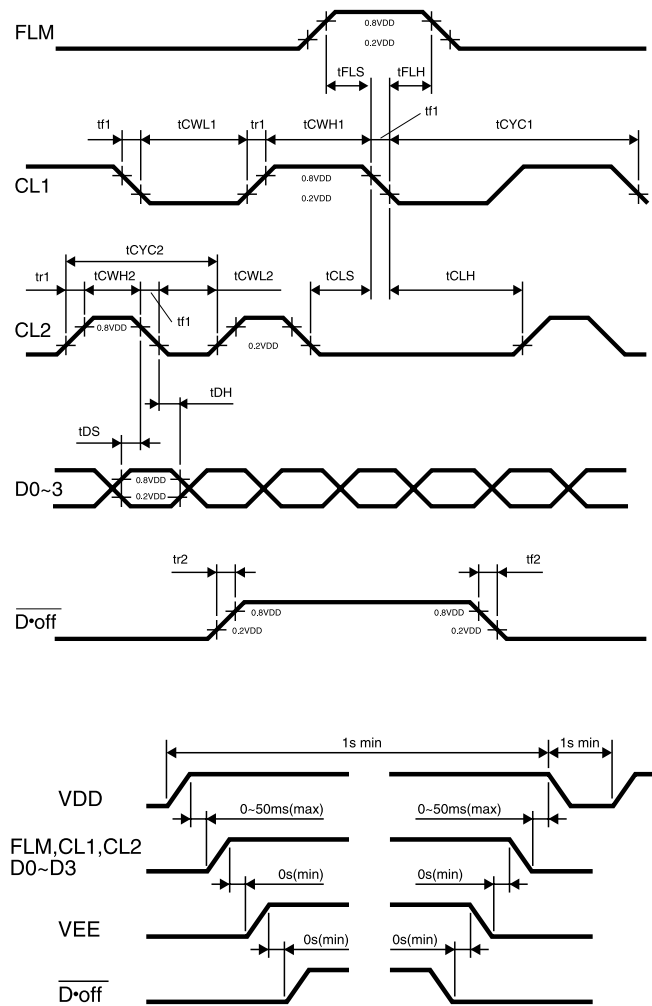
10-1. LCD panel (VDD=5V, duty=1/240)

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit
LCD Driving Voltage (recommended)	STN B&W STN Blue	VEE-VSS	+25°C	–	25.6 25.7	V
Viewing Angle	θ φ	+25°C	-30 -30	– –	+30 +30	°
Contrast Ratio	STN B&W STN Blue	K	+25°C	6 3	12 5	–
Rise	τr	+25°C	–	180	250	ms
Decay time	τd	+25°C	–	100	250	ms

10-2. CFL Backlighting (Ta=+25°C, VDD=5V, duty=1/240)

Item	Min.	Typ.	Max.	Unit
Brightness	150	200	–	cd/m²

11. Interface Timing



12. Reliability Test

No.	Item	Test Condition	Unit
1	High temperature operation	Ta=+50°C all display ON in standard operation	240hours
2	High temperature storage	Ta=+70°C (Unpowered)	240hours
3	Low temperature storage	Ta=-20°C (Unpowered)	240hours
4	High temp. and humidity	Ta=+40°C, RH=85% (Unpowered)	240hours
5	Thermal cycle test	-20°C(30min.)→+25°C(5min.)→+70°C(30min.) ↑ +25°C(5min.)← (Unpowered)	10cycles
6	Vibration test	Frequency range: 10-55Hz Amplitude: 1.5mm Sweep cycle : 10-55-10 (1 minute) JIS-C7021A-10 CONDITION A (Unpowered)	x,y and z Direction 2hours each. Total 6hrs.
7	Mechanical shock	Peak acceleration : 490m/sec² Applied time : 11ms half-sine pulse JIS-C-0041 (Unpowered)	±x,±y, and ±z (each 3 times)

13. Precaution for Usage (refer to specifications for further information)

13-1. Handling

- (1) Since the LCD panel is made of glass, avoid applying excessive shocks to the module by dropping, bending or twisting.
- (2) Do not touch, press or rub the display panel with a hard tool or object such as tweezers because the polarizers in the panel are easily scratched.
- (3) Do not use organic solvents to clean the display panel off as these solvent may be adverse to polarizers.
To clean the surface off, dried cloth, dampened absorbent cotton with petroleum benzine or adhesive tape are preferable.
- (4) Wipe off water drops immediately ; contact with water over a long period of time may cause deformation or color fading.
- (5) Avoid using or storing the module under the conditions where high temperatures and high humidity may exist.
When stored, this module should be packaged in a conductive polyethylene bag and placed under relatively low temperatures(5~30°C). Direct sunlight or light from fluorescent lamp should be avoided during the storage.
- (6) The liquid crystal inside of the panel is harmful ; if any liquid leaks out and comes in contact with skin or clothes, wash off immediately with soap and water. Never put that in the mouth.
- (7) The LCD module has a TCP (Tape Carrier Package) structure. Please do not bend or modify during the mounting process.
- (8) This module is designed for the equipment to be used in an air-conditioned room without any vibration and mechanical shock. Avoid using it under other conditions.

13-2. Operation

- (1) Never connect or disconnect the module from the main system while power is being supplied.
- (2) Please be advised that the LCD module may not function correctly if the storage temperature exceeds the range of the specification.
- (3) Optical characteristics (viewing angle and contrast ratio) vary according to the driving voltage(V_{EE}) of liquid crystal.
Adjust(V_{EE}) so that the LCD has the optimum contrast.
- (4) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit.
Therefore, it must be used under the relative condition of 40°C 85%RH.
Care should be taken for rapid temperature change because it may cause the condensation.
- (5) Do not touch any connector terminal, mounted component or PCB during operation.
If touched, injury to the operator may occur due to applied high voltage. Damage to the display is also possible.
- (6) This module is designed to operate under 1/240 duty. Using other duty ratios may cause certain problems.
- (7) Power supply sequence
Please be aware that the LSI that is used inside the LCD module may be damaged due to the "Floating phenomenon" or "Latch-up phenomenon" when the LCD supply voltage (V_{EE}) and / or other signals are input before the power supply for logic (V_{DD}) gets stable.

13-3. Installation

- (1) Do not disassemble or modify the module. In case of disassembling or modification, if the module does not work due to the result of such action, Stanley will not be responsible for the failure.
- (2) Care should be taken regarding ESD, as the circuit of the module contains CMOS LSI(s).
The assemblers body should be grounded with an earthband . Material which prevents static electricity should be selected for a clothing.
- (3) The module is mounted by using the holes on the 4 corners of it. In order to secure it on a flat surface, care should be taken not to apply excessive stress to cause "warp" or "distortion".
If applied on the LCD panel, that may cause color change or damage.
- (4) Cover with display a transparent acrylic panel to protect the polarizer and the LCD panel.
Make a space between the protective panel and the module to prevent stress.
- (5) Dusting the module may affect the display adversely; Care should be taken when used in a dusty environment.
- (6) The metal case is not included in the inspection criteria. Due to this reason, it is recommended to generate a design that the metal frame is invisible.
- (7) It will be hot around CFL. Please give an attention to the heat radiation and LCD panel should be used within environmental condition specified in 2-1.

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