

## Preliminary

### Overview

The DG24320C5PC is a thin, lightweight STN color LCD module that incorporates slim TAB drivers. It consists of an LCD panel, various ICs and other components, and can display color graphics in a 320 × 3 (RGB) × 240 dot resolution. The data interface connects the module to its controller via 4- or 8-bit parallel connections divided into two systems for the upper and lower sections.

### Applications

- Miniature data-processing equipment
- Test and measurement equipment, multi-function telephones, fish-finding equipment

### Features

- Vivid color images using an STN color panel
- Thin form-factor and light weight
- Built-in high-intensity backlight

### General Specifications

- Display size: 5.7 inch diagonal
- LCD drive method: 1/240 duty, 1/16 bias
- LCD specifications: STN color LCD display, transmission type, negative mode
- Color array: RGB stripe
- Display capacity: 320 × 3 (RGB) × 240 dots
- Data input method: 4-bits × 2 or 8-bits × 2, alternating drive
- Circuit structure: See the block diagram
- Backlight: Two CFL edgelights

### Dimensions

- Module dimensions: 161.5 (W) × 128.5 (H) × 12.0 (T) mm
- Effective viewing area: 119.2 (W) × 90.4 (H) mm
- Dot pitch: 0.12 (W) × 0.36 (H) mm
- Dot size: 0.11 (W) × 0.35 (H) mm
- Weight: 280 (approximately) g

**SANYO Electric Co., Ltd. Semiconductor Business Headquarters**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

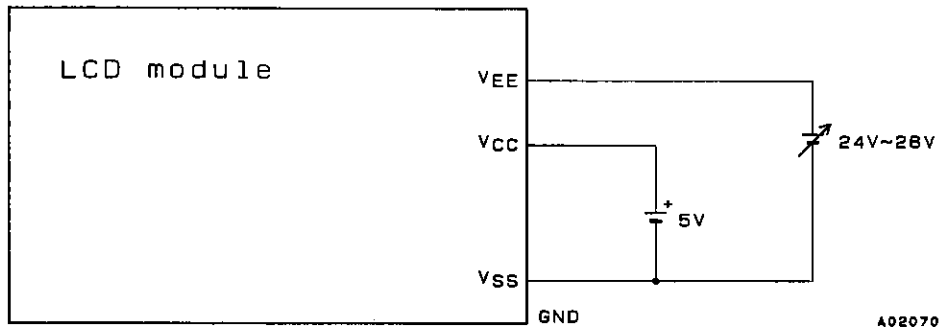
Parameter	Symbol	Condition	Rating	Unit
Logic supply voltage	$V_{CC} - V_{SS}$		-0.3 to +7.0	V
LCD drive supply voltage	$V_{EE} - V_{SS}$		-0.3 to +45.0	V
Input voltage	$V_I$		-0.3 to $V_{CC} + 0.3$	V
Operating temperature	$T_{opr}$		0 to +40	°C
Storage temperature	$T_{stg}$		-20 to +60	°C

### Electrical and Optical Characteristics at Ta = 25°C

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Input high level voltage	$V_{IH}$		$0.8 V_{CC}$		$V_{CC}$	V
Input low level voltage	$V_{IL}$		$V_{SS}$		$0.2 V_{CC}$	V
Current drain	$I_{CC}$	$V_{CC} - V_{SS} \quad 5.0 \text{ V}$		10		mA
	$I_{EE}$	$V_{EE} - V_{SS} \quad 26.0 \text{ V}$		15		mA
Response times	Rise time	$t_r \quad \theta = 0^\circ$		200	400	ms
	Fall time	$t_f \quad \theta = 0^\circ$		200	400	ms
Contrast ratio	k	$\theta = 0^\circ$	4	5		
Viewing angle	$\theta_2 - \theta_1$	$K > 1$	60	70		deg
LCD drive voltage (recommended voltage)*		$\theta = 0^\circ$		26.0		V

Note: \* LCD display contrast varies greatly with the viewing angle. The value indicated here is for reference purposes only. The acceptability of the contrast should be determined by mounting a sample in an actual product.

### Supply Voltage Circuit Example

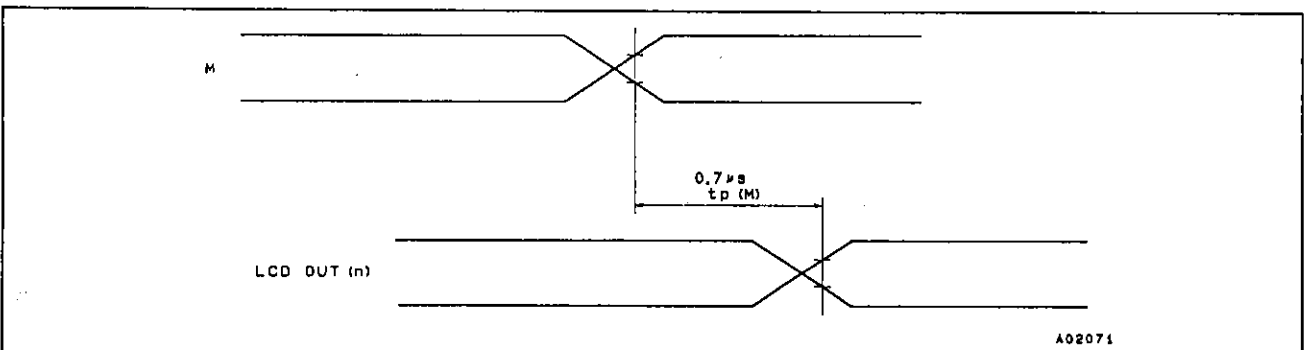


Note: When applying power, apply signals in the following order: first control inputs, then  $V_{CC}$ , and finally  $V_{EE}$ . When turning off the module, remove signals in the reverse order. Module internal ICs can be damaged if signals are not applied and removed in this order.

### LCD AC Signal (M)

Although the DG24320C5PC module includes an LCD AC signal generation circuit, it is also possible to alternate the drive waveforms using an external LCD AC signal.

Note that the external drive waveforms without alternation should damage the LCD and cause the deterioration on display. The current must be switched within a single frame and for every frame.



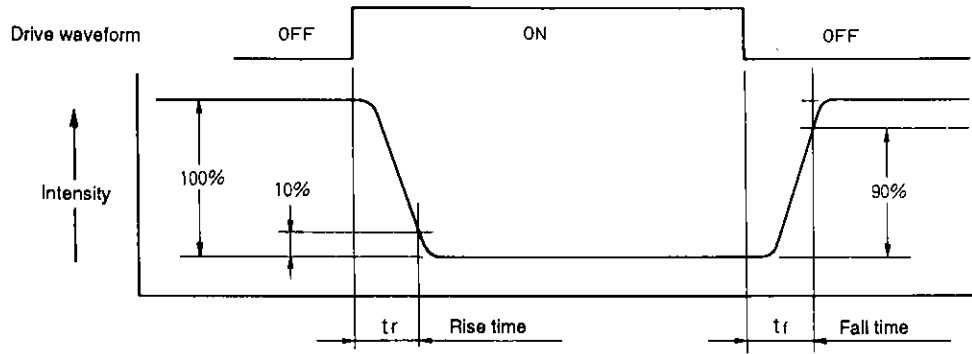


Figure 1 Response Time Definition

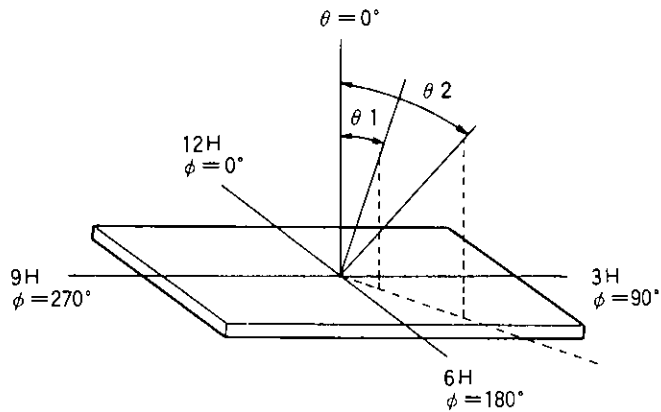


Figure 2 Definitions of the Angles  $\theta$  and  $\phi$

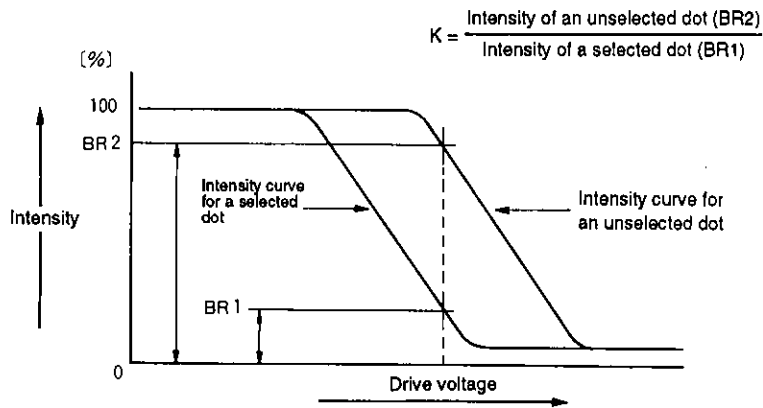
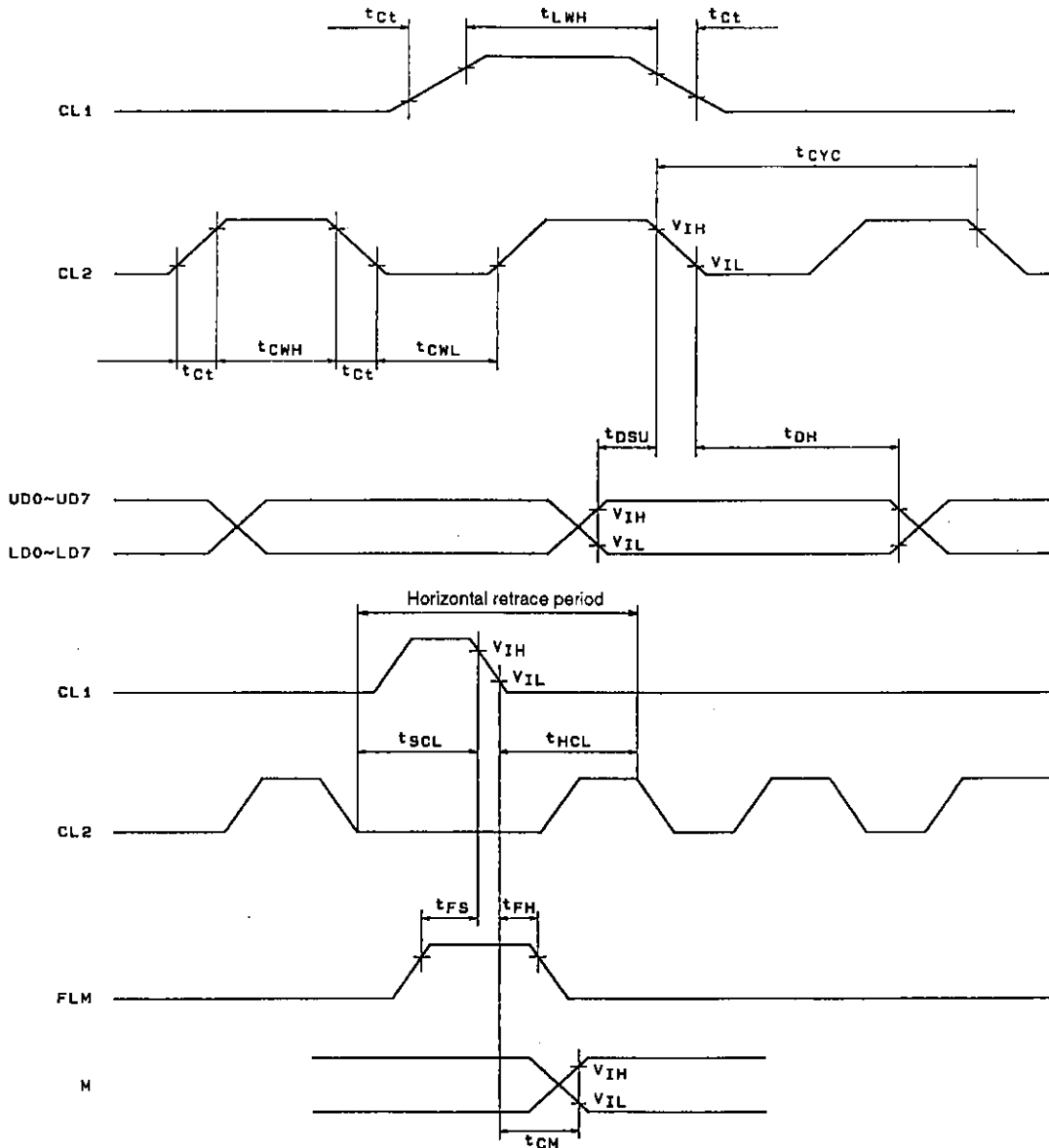


Figure 3 Contrast Definition

Timing Characteristics at Ta = 25°C

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Maximum CL2 frequency	$t_{CYC}$		82			ns
CL2 pulse width (high level)	$t_{CWH}$		28			ns
CL2 pulse width (low level)	$t_{CWL}$		28			ns
CL1 pulse width (high level)	$t_{LWH}$		30			ns
CL2 setup time	$t_{SCL}$		30			ns
CL2 hold time	$t_{HCL}$		200			ns
Clock rise/fall time	$t_{ct}$				13	ns
Data setup time	$t_{DSU}$		28			ns
Data hold time	$t_{DH}$		20			ns
FLM setup time	$t_{FS}$		100			ns
FLM hold time	$t_{FH}$		30			ns
M delay time	$t_{CM}$		-300		300	ns
Frame frequency	$f_{FLM}$			73		Hz

Timing Charts



A02072

**Interface Connections (CN-1)**

Pin No.	Symbol	Function
1	FLM	Scan line drive synchronization signal
2	M	LCD alternation signal
3	CL1	Display data latch and scan line shift clock
4	CL2	Display data shift lock
5	UD0	Upper driver display data
6	UD1	Upper driver display data
7	UD2	Upper driver display data
8	UD3	Upper driver display data
9	UD4	Upper driver display data
10	UD5	Upper driver display data
11	UD6	Upper driver display data
12	UD7	Upper driver display data
13	LD0	Lower driver display data
14	LD1	Lower driver display data
15	LD2	Lower driver display data
16	LD3	Lower driver display data
17	LD4	Lower driver display data
18	LD5	Lower driver display data
19	LD6	Lower driver display data
20	LD7	Lower driver display data
21	V <sub>CC</sub>	Logic drive power supply (+5 V)
22	V <sub>SS</sub>	GND
23	V <sub>EE</sub>	LCD drive power supply
24	DISP - OFF	High: display on, low: display off
25	NC	
26	NC	

Note: Recommended interface cables and connectors

Recommended cables : Flexible flat cable

: Manufacturer — Sumitomo Electric Industries, Ltd.

: Specifications — Sumicard (pitch: 0.8, pin count: 26)

Recommended connector: FFC connector

: Manufacturer — Burndy Japan Ltd.

: Model No. — SFR26-ISTEI

**Backlight Pin Connections (CN-2)**

Pin No.	Symbol	Function	Note
1	CFL1	High voltage input GND2	Recommended inverter Manufacturer — Todai Musen, Ltd. Model No. — MIU-201  Recommended inverter connector Manufacturer — Hirose Electric Co., Ltd. Model No. — DF3-6P-2H
2	CFL3	High voltage input GND1	
3	NC		
4	NC		
5	CFL2	High voltage input 2	
6	CFL4	High voltage input 1	

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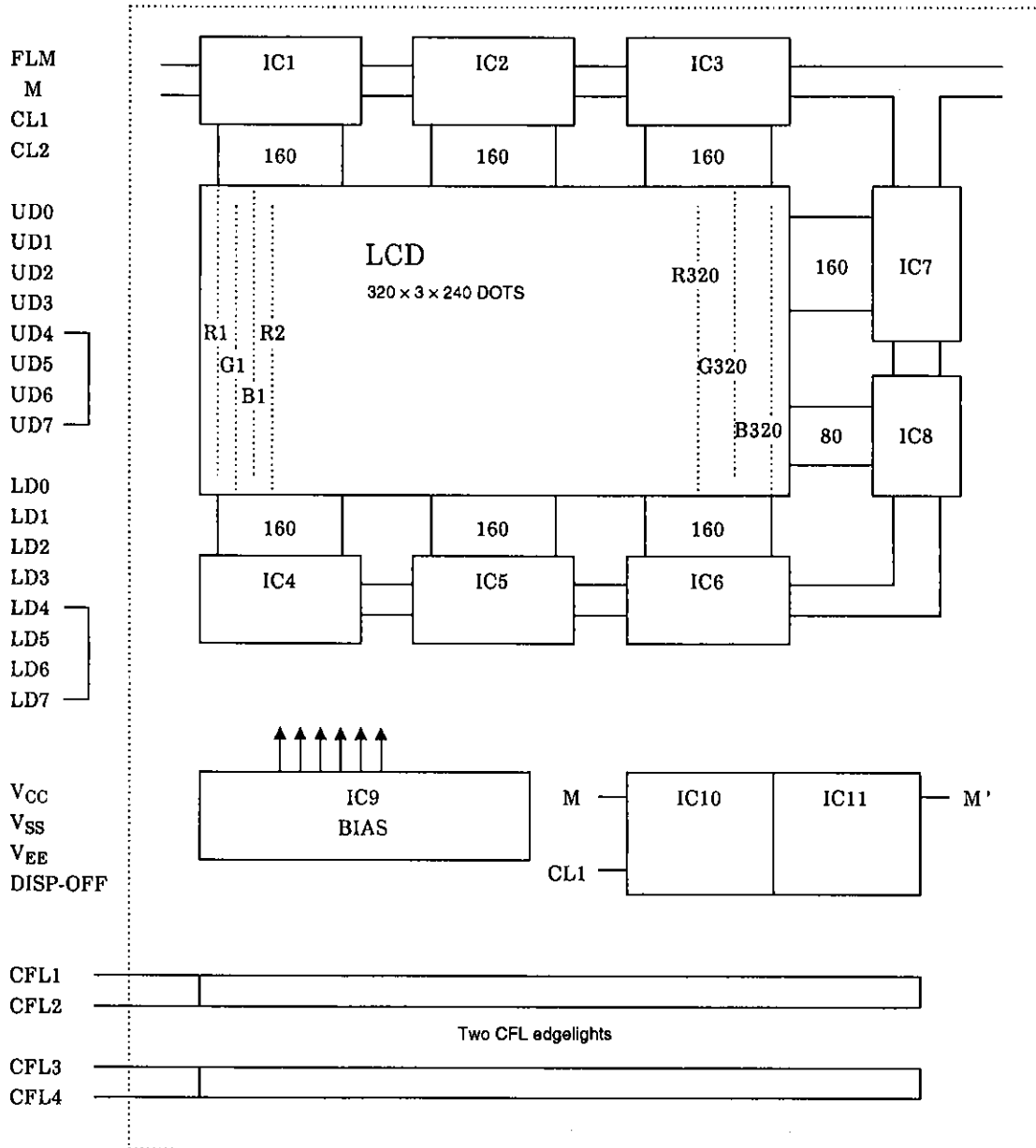
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■ Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

Block Diagram

DG24320C5PC (5.7 inch STN color)



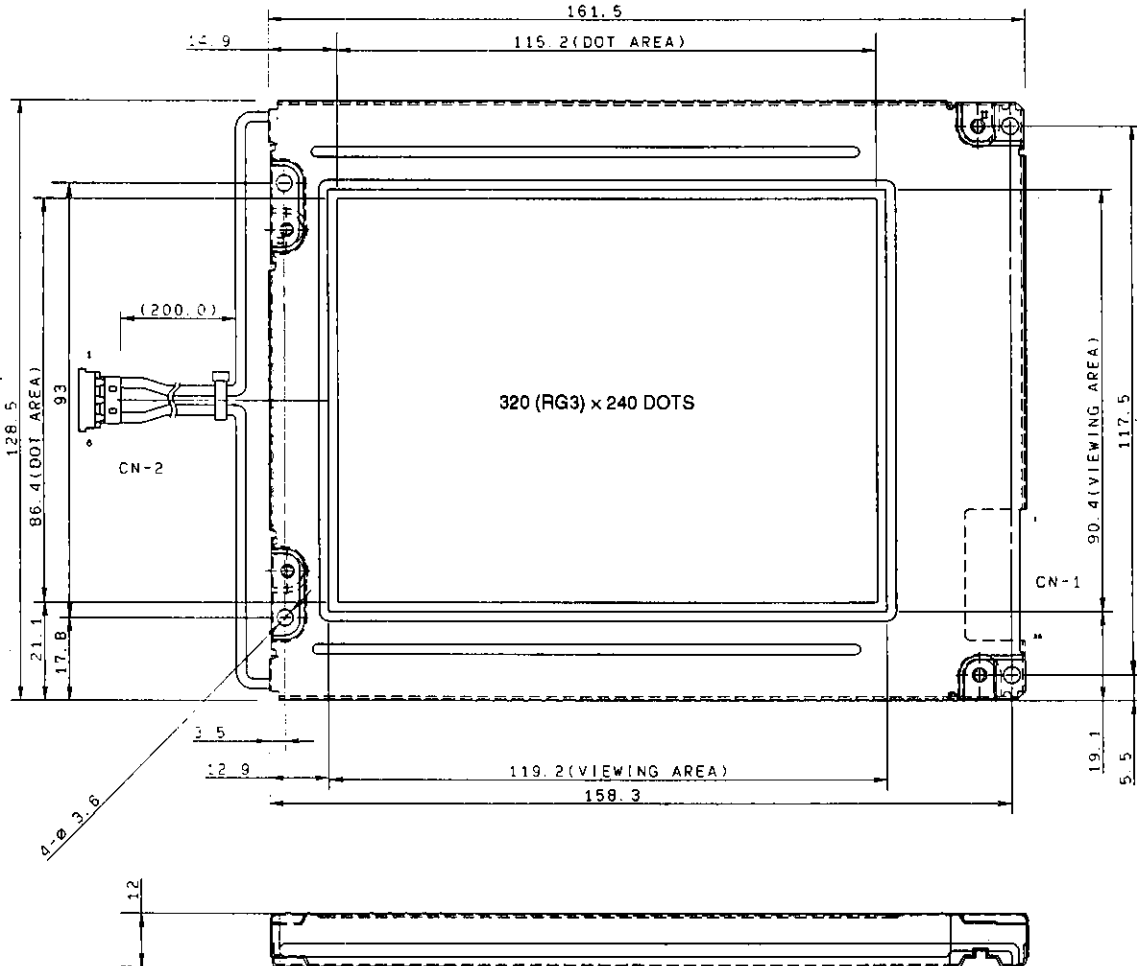
- Note:
1. Two input modes, selected by a solder option, are available: an 8-bit by 2 mode that uses UD0 to UD7 and LD0 to LD7 and a 4-bit by 2 mode that uses UD0 to UD3 and LD0 to LD3.
  2. Connect UD4 to UD7 and LD4 to LD7 to the V<sub>SS</sub> level when using the 4-bit mode.
  3. When using 4-bit mode, the data order can be changed to the regular positions by making the connections listed below for the 8 bit x 1 screen. Connect D0, D2, D4 and D6 to UD0, UD1, UD2 and UD3 respectively. Connect D1, D3, D5 and D7 to LD0, LD1, LD2 and LD3 respectively.

# DG24320C5PC

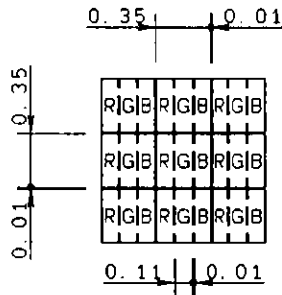
## Module Dimensions 3202

unit: mm

DG24320C5PC (5.7 inch STN color)



### LCD Dot Structure in Detail



#### CN-1 (1/F connector)

Manufacturer — Burndy Japan Ltd.

Model No. — SFR-1STE1

#### CN-2 (CFL connector)

Manufacturer — Hirose Electric Co., Ltd.

Model No. — DF3-6S-2C (housing)

— DF3-2428SCF (contact pin)