Ordering number : EN※4834A

Character × 1 Line

No. ※4834A

DM0811

SANYO

LCD Dot Matrix Display Module

Preliminary

Overview

The DM0811 is an LCD dot matrix display module that consists of an LCD panel and a controller/driver. It can display one line of eight characters. The DM0811 includes the data RAM, character generator ROM and control circuits required for display. Both 8-bit parallel and 4-bit parallel data interfaces are supported and data can be directly written and read by the controlling microprocessor.

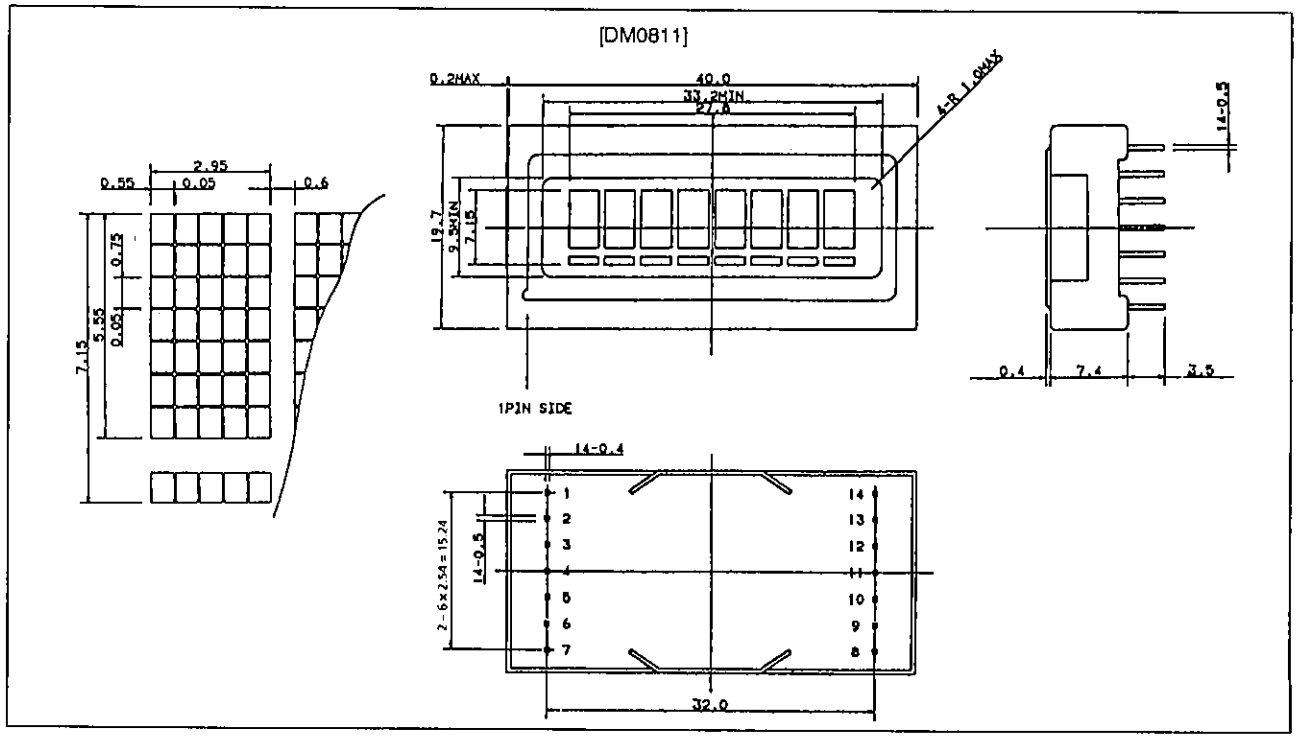
General Specifications

- Drive method: 1/8 duty – 1/4 bias
- Display size: 8 characters by 1 line
- Character structure: 5 by 7 dots plus cursor display
- Display data RAM capacity: 80 characters (8 bits each)
- CG ROM capacity: 192 characters (See the description of the built-in character generator.)
- CG RAM capacity: 8 characters (64 by 8 bits)
- Instruction functions: 11 instructions (See the description of the instruction function.)
- Circuit structure: See the block diagram.

Physical Specifications

- Module dimensions (mm): 40.0 (W) × 19.7 (H) × 7.4 (T)
- Effective display area (mm): 33.2 (W) × 9.5 (H)
- Dot pitch (mm): 0.60 (W) × 0.80 (H)
- Dot size (mm): 0.55 (W) × 0.75 (H)
- Weight (g): approx. 9.0

Module Dimensions
(unit: mm)
5012



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Module Options

DM0811-□△

(□: First digit) LCD Characteristics

	LCD type	LCD operating temperature	Power supply specifications	Viewing angle direction
0	TN	0 to 50°C	Single-voltage supply	6 H
1	TN	0 to 50°C	Single-voltage supply	12 H

(△: Second digit)

	LCD mode CD
S	Positive, reflective
B	Positive, transparent

Absolute Maximum Ratings at Ta = 25°C, $V_{DD} - V_{SS}$ = 5 ± 0.25 V

Parameter	Symbol	Ratings	Unit
Logic power supply voltage	$V_{DD} - V_{SS}$	−0.3 to +7.0	V
LCD power supply voltage	$V_{DD} - V_O$	−0.3 to +13.5	V
Input voltage	V_I	−0.3 to V_{DD} + 0.3	V
Operating temperature	Topr	0 to +50	°C
Storage temperature	Tstg	−20 to +70	°C

Electrical and Optical Characteristics at Ta = 25°C, $V_{DD} - V_{SS}$ = 5 ± 0.25 V

Parameter		Symbol	Conditions	min	typ	max	Unit	Note
Input high-level voltage		V_{IH}		2.2		V_{DD}	V	
Input low-level voltage		V_{IL}		0		0.6	V	
Output high-level voltage		V_{OH}	I_{OH} = 0.2 mA	2.4		V_{DD}	mA	
Output low-level voltage		V_{OL}	I_{OL} = 1.2 mA	0		0.4	mA	
Current drain		I_{DD}			1.5	3.0	mA	
[TN type, normal temperature range specifications]								
LCD drive voltage		$V_{DD} - V_O$	Ta = 0°C	3.7	3.8	3.9	V	1
			Ta = 25°C	3.4	3.5	3.6	V	
			Ta = 50°C	2.7	2.8	2.9	V	
Response time	Reset time	$t_r\theta$ = 0°	Ta = 0°C		200	300	ms	Figures 1 and 2
			Ta = 25°C		60	100	ms	
	Fall time	$t_f\theta$ = 0°	Ta = 0°C		300	450	ms	
			Ta = 25°C		100	150	ms	
Contrast ratio		K	θ = 0°	5	10			Figures 2 and 3
Viewing angle range		θ2 − θ1	θ = 0°, K > 1.4	30	40		deg	Figures 2 and 3

Note: 1. The contrast provided by an LCD display varies greatly with the angle of view.
An LCD drive voltage appropriate for the actual product must be used.
The indicated values are reference values only. Please contact your Sanyo representative before using this product.

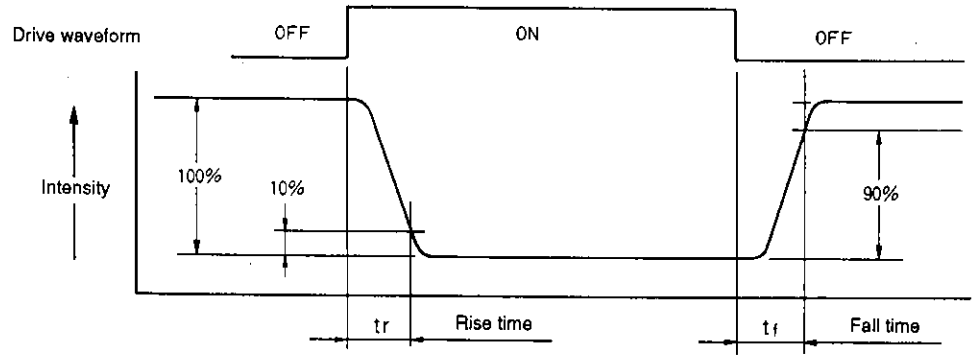


Figure 1 Response Time Definitions

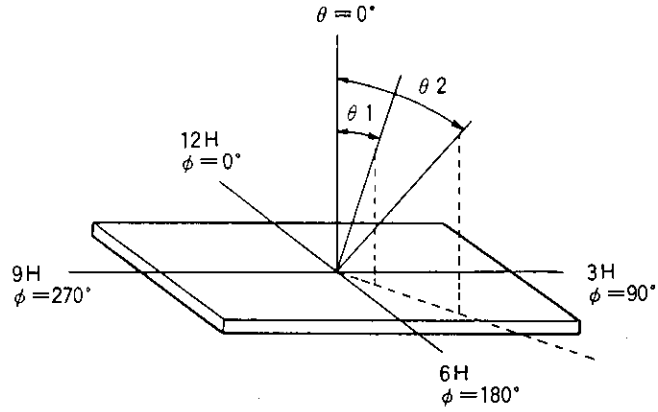


Figure 2 Definition of Angles θ and ø

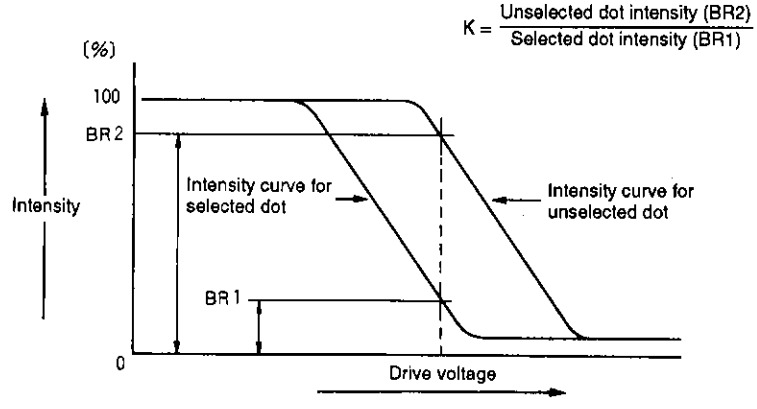
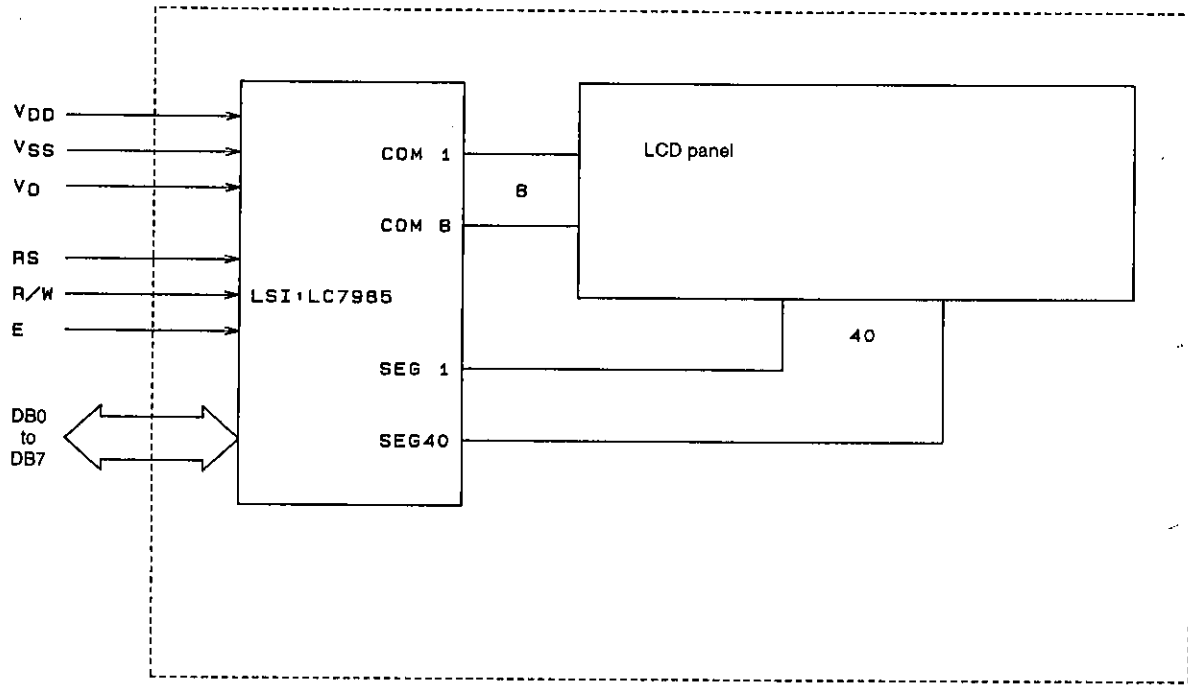


Figure 3 Definition of Contrast Ratio

Block Diagram



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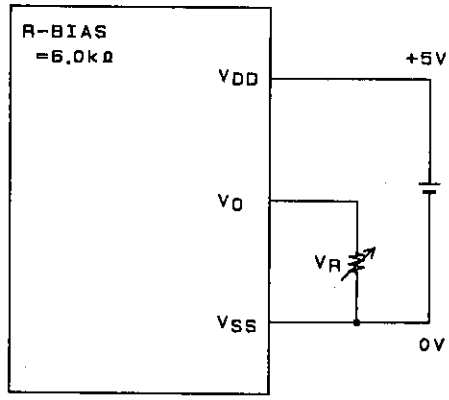
Power Supply Circuit Examples

Normal temperature range circuit
(Single voltage supply specifications)

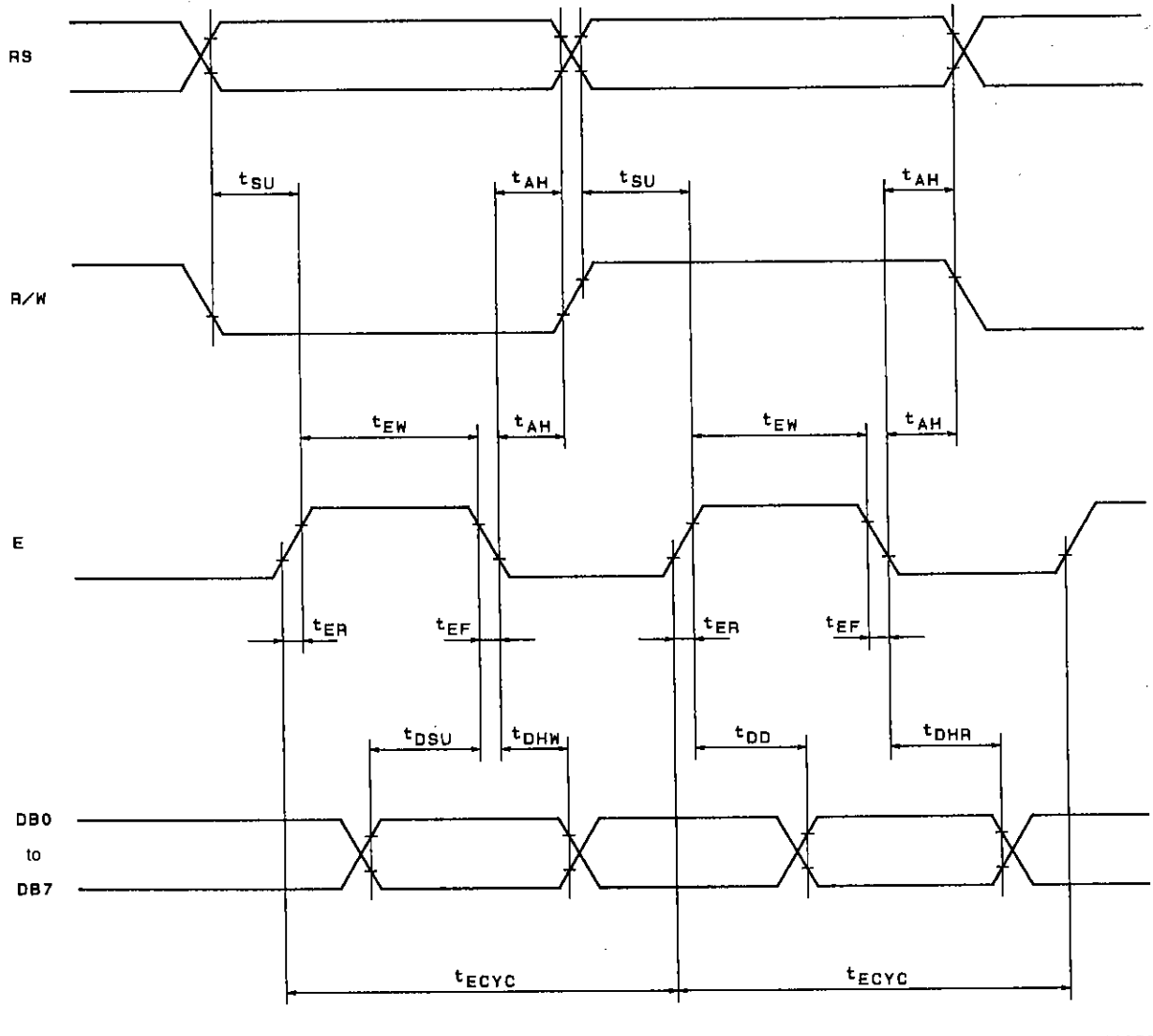


Note: When VR is 5 kΩ, the LCD drive voltage will be variable over the range 2.7 to 5.0 V.

Timing Characteristics at Ta = 25°C, V_{DD} – V_{SS} = 5 ± 0.25 V

Parameter	Symbol	min	typ	max	Unit
Enable cycle time	t_{ECYC}	1000			ns
Enable pulse width	t_{WE}	450			ns
Enable rise time	t_{ER}			25	ns
Enable fall time	t_{EF}			25	ns
Setup time	t_{SU}	140			ns
Address hold time	t_{AH}	10			ns
Data setup time	t_{DSU}	195			ns
Data hold time	t_{DHW}	10			ns
Data delay time	t_{DD}			320	ns
Data hold time	t_{DHR}	20			ns

Write and Read Operations



Interface Pin Connections

Pin No.	Symbol	Function
1	V_{SS}	Ground (0 V)
2	V_{DD}	+5 V
3	V_O	LCD drive power supply
4	RS	Register selection pin 0: Instruction register (write) Busy flag, address counter (read) 1: Data register (write or read)
5	R/W	Read/write pin 0: Write Microprocessor → LCD module 1: Read LCD module → microprocessor
6	E	Enable
7	DB0	Data bus (tristate bidirectional connections) Used as the lower 4 bits when an 8-bit interface is used. Unused when a 4-bit interface is used.
8	DB1	
9	DB2	
10	DB3	
11	DB4	Data bus (tristate bidirectional connections) Used as the upper 4 bits when an 8-bit interface is used. Used as the data bus itself when a 4-bit interface is used. DB7 is also used as the busy flag.
12	DB5	
13	DB6	
14	DB7	

Note: This module is designed so that it can be used with either a 4-bit or an 8-bit microprocessor. In four-bit mode, data is transferred in two 4-bit operations, and in 8-bit mode data is transferred in a single 8-bit operation.

CG ROM: Built-in character generator

Lower 4 bits \ Upper 4 bits	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
××××0000	CG RAM (1)												
××××0001	(2)												
××××0010	(3)												
××××0011	(4)												
××××0100	(5)												
××××0101	(6)												
××××0110	(7)												
××××0111	(8)												
××××1000	(1)												
××××1001	(2)												
××××1010	(3)												
××××1011	(4)												
××××1100	(5)												
××××1101	(6)												
××××1110	(7)												
××××1111	(8)												

Instruction Function

Instruction	Code										Function	Execution time (when f_{OSC} = 250 kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display clear	0	0	0	0	0	0	0	0	0	1	Clears the whole display and sets the address counter to DD RAM location 0.	1.64 ms
Cursor home	0	0	0	0	0	0	0	0	1	*	Sets the address counter to DD RAM location 0. The shifted display also returns to its original position. The contents of DD RAM is not changed.	1.64 ms
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor advance direction and whether or not the display is shifted. These operations are performed on data write and data read.	40 μs
Display on/off control	0	0	0	0	0	0	1	D	C	B	Sets the whole display on/off state (D), the cursor on/off state (C) and whether or not the character at the cursor position blinks (B).	40 μs
Cursor/display off	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing the contents of DD RAM.	40 μs
Set function	0	0	0	0	1	DL	N	F	*	*	Sets the interface data length (DL), the number of display lines (N) and the font (F).	40 μs
Set CG RAM address	0	0	0	1	A_{CG}						Sets the CG RAM address. The data transmitted after this instruction is CG RAM data.	40 μs
Set DD RAM address	0	0	1	A_{DD}							Sets the DD RAM address. The data transmitted after this instruction is DD RAM data.	40 μs
Read busy flag/address	0	1	BF	AC							Reads out the contents of the address counter and the busy flag (BF), which indicates whether or not an internal operation is in progress.	0 μs
Write CG RAM/ DD RAM data	1	0	Write data								Writes data to CG RAM or DD RAM.	40 μs
Read CG RAM/ DD RAM data	1	1	Read data								Reads data from CG RAM or DD RAM.	40 μs
	I/D = 1: Increment, I/D = 0: Decrement S = 1: Also shift display. S/C = 1: Shift display, S/C = 0: Move cursor R/L = 1: Right shift, R/L = 0: Left shift DL = 1: 8 bit mode, DL = 0: 4 bit mode N = 1: 2 row, N = 0: 1 row F = 1: 5 × 10 dot, F = 0: 5 × 7 dot BF = 1: Internal operation in progress, BF = 0: Instruction accepted										DD RAM: Display data RAM CG RAM: Character generator RAM A_{CG}: CG RAM address A_{DD}: DD RAM address AC: Address counter. The AC is used for both DD RAM and CG RAM.	The execution times will change if the frequency is changed. (Example) When f_{OSC} = 270 kHz $40\ \mu s \times \frac{250}{270} = 37\ \mu s$

Note: * Invalid bit.