

SED1220 Series

Dot Matrix LCD Controller Driver

- 12 chara x 3 line (5 x 8 dot)
- Built-in Character Generator ROM and RAM
- Built-in Power Supply Circuit for LCD

OVERVIEW

SED1220 is a dot matrix LCD controller/driver for character display. Using 4bits data, 8bits data or serial data being provided from the micro computer, it displays up to 24 characters, 4 user defined characters and up to 120 symbols. Up to 256 types of built-in character generator ROMs are prepared. Each character font is consisted of 5 x 8 dots. It also contains the RAM for displaying 4 user defined characters each font consisting of 5 x 8 dots. Its symbol register allows character display with high degree of freedom. This handy equipment can be operated with minimum power consumption with its low power consumption design, standby and sleeping mode.

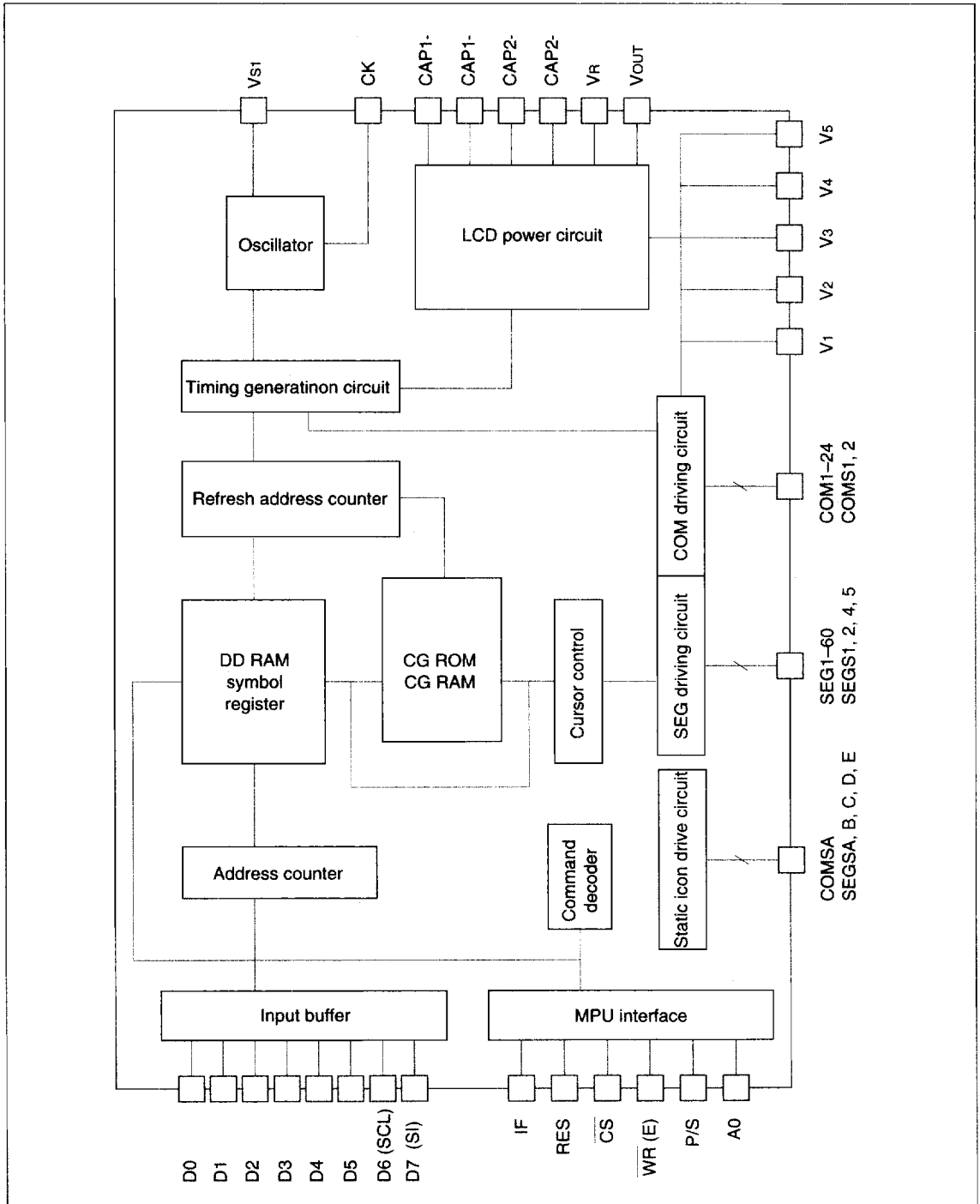
FEATURES

- Built-in data display RAM – 36 characters + 4 user defined characters + 120 symbols.
- CG ROM (For up to 256 characters), CG RAM (for 4 characters) and symbol register (for 120 symbols).
- No. of display digit and lines
 - < In normal mode >
 - (1) (12 digits + 4 segments for signal) x 3 lines + 120 symbols + 5 static symbols (SED1220D**)
 - (2) (12 digits + 4 segments for signal) x 2 lines + 120 symbols + 5 static symbols (SED1221D**)
 - (3) 12 digits x 2 lines + 120 symbols + 5 static symbols (SED1222D*A)
 - (4) 12 digits x 2 lines + 120 symbols + 10 static symbols (SED122AD*B)
 - < In standby mode >
 - (1) 5 static symbols
 - (2) 5 static symbols
- Built-in CR oscillation circuit (C and R contained)
- Accepts external clock input
- High-speed MPU interface
 - Affords interface with both 68/80 system MPUs
 - Affords interface through 4 bits and 8 bits
- Affords serial interface
- Character font consists of 5 x 8 dots
- Duty ratio (1) 1/26
(2) 1/18
- Simplified command setting
- Built-in power circuit for driving liquid crystal
 - Power amplifier circuit, power regulation circuit and voltage followers x 4
- Built-in electronic volume function
- Low power consumption
 - 80 μ A max. (In normal operation, including operating current of the power supply).
 - TBD μ A max. (In standby mode for displaying static icon).
 - TBD μ A max. (In sleeping mode when display is turned off).
- Power supply
 - VDD - VSS -2.4 V to -3.6 V
 - VDD - V5 -4.0 V to -6.0 V
- Temperature range for wide range operation
 - Ta = -30 to 85°C
- CMOS process
- Shipping style

Chip (Al pad product)	SED1222D*A
Chip (Au bump product)	SED122*D*B
TCP	SED122*T**
- This unit does not employ radiation protection design

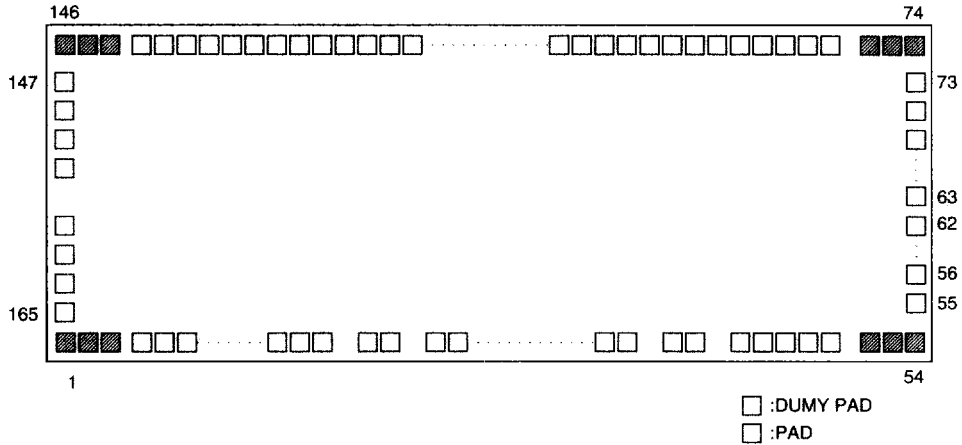
SED1220 Series

■ BLOCK DIAGRAM



SED1220 Series

■ CHIP SPECIFICATION (SED1220D**, SED1221D**, SED122AD**)



SED122*D**

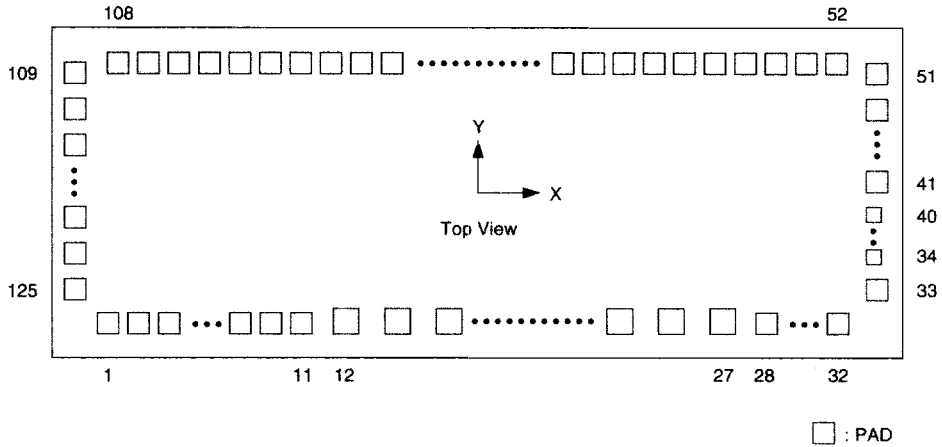
↑
 Digits prepared for CGROM pattern changes

Chip size: 7.70 × 2.77 mm
 Pad pitch: 100 μm (Minimum)
 Chip thickness (for reference): 625 ± 25 μm (SED122*D*A)
 (SED122*D*B)

- 1) A1 pad specifications
 - Pad size on Y side: 75 μm × 135 μm
 - Pad size on X side: 135 μm × 75 μm
 - 2) Au bump specifications
 - Bump size on Y side: 69 μm × 129 μm
 - Bump size on X side: 129 μm × 69 μm
 - Bump height (for reference) 22.5 μm ± 5.5 μm
- <Fuse Pines>
- 1) Al pad. pad size 86 μm × 75 μm
 - 2) Au bump
 Bump size 80 μm × 69 μm

SED1220 Series

SED1222D**



SED1222D**

↑
Digits prepared for CGROM pattern changes

Chip size: 7.70 × 2.77 mm
 Pad pitch: 124 μm (Min.)
 Chip thickness (for reference): 625 ± 50 μm (SED1222D*A)

1) A1 pad specifications

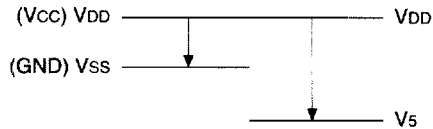
Pad size on Y side: 90 μm × 96 μm
 Pad size on X side: 96 μm × 90 μm (PAD. NO 1–11, 28–32, 52–108)
 175 μm × 135 μm (PAD. NO 12–27)

<Fuse Pines>

1) A1 pad. pad size 86 μm × 75 μm

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Standard value	Unit
Power supply voltage (1)	V _{SS}	-6.0 to +0.3	V
Power supply voltage (2)	V ₅ , V _{out}	-6.0 to +0.3	V
Power supply voltage (3)	V ₁ , V ₂ , V ₃ , V ₄	V ₅ to +0.3	V
Input voltage	V _{IN}	V _{SS} -0.3 to +0.3	V
Output voltage	V _O	V _{SS} -0.3 to +0.3	V
Operating temperature	T _{opr}	-30 to +85	°C
Storage temperature	TCP	-55 to +100	°C
	Bare chip	-65 to +125	



- Notes:
1. All the voltage values are based on V_{DD} = 0 V.
 2. For voltages of V₁, V₂, V₃ and V₄, keep the condition of V_{DD} ≥ V₁ ≥ V₂ ≥ V₃ ≥ V₄ ≥ V₅ and V_{DD} ≥ V_{SS} ≥ V₅ ≥ V_{OUT} at all times.
 3. If the LSI is used exceeding the absolute maximum ratings, it may lead to permanent destruction. In ordinary operation, it is desirable to use the LSI in the condition of electrical characteristics. If the LSI is used out of this condition, it may cause a malfunction of the LSI and have a bad effect on the reliability of the LSI.

SED1220 Series

DC CHARACTERISTICS

(V_{DD} = 0 V, V_{SS} = -3.6 V to -2.4 V, T_a = -30 to 85°C unless otherwise specified.)

Item		Symbol	Condition	min	typ	max	Unit	Applicable pin
Power supply voltage (1)	Recommended operation	V _{SS}		-3.6	-3.0	-2.4	V	V _{SS}
	Operatable			-5.5	-3.0	-2.4		*1
	Data retain voltage			-5.5		-2.0		
Power supply voltage (2)	Recommended operation	V ₅		-6.0		-4.0	V	V ₅
	Operatable			-6.5		-4.0		*2
	Operatable	V ₁ , V ₂		0.6×V ₅		V _{DD}	V	V ₁ , V ₂
	Operatable	V ₃ , V ₄		V _{DD}		0.4×V ₅	V	V ₃ , V ₄
High-level input voltage		V _{IHC}		0.2×V _{SS}		V _{DD}	V	*3
Low-level input voltage		V _{ILC}		V _{SS}		0.8×V _{SS}	V	*3
Input leakage current		I _{LI}	V _{IN} = V _{DD} or V _{SS}	-1.0		1.0	μA	*3
LC driver ON resistance		R _{ON}	T _a =25°C V ₅ =-7.0V ΔV=0.1V		20	40	KΩ	COM, SEG *4
Static current consumption		I _{DDQ}			0.1	5.0	μA	V _{DD}
Dynamic current consumption	I _{DD}	Display State	V ₅ = -6 V without load			80	μA	V _{DD} *5
		Sleep state	Oscillation OFF, Power OFF			5	μA	V _{DD}
		Access state	f _{cyc} =200KHz			500	μA	V _{DD} *6
Input pin capacity		C _{IN}	T _a =25°C f=1MHz		5.0	8.0	pF	*3

Frame frequency	f _{FR}	T _a =25°C V _{SS} =-3.0V	70	100	130	Hz	*10
External clock frequency	f _{ck}	Display of 2 lines		23.4		KHz	*10 *11
	f _{ck}	Display of 3 lines		33.8		KHz	*10 *11

Reset time	t _R		1.0			μs	*7
Reset pulse width	t _{RW}		10			μs	*8
Reset start time	t _{RES}		50			ns	*8

Dynamic system

Built-in power supply	Input voltage	V _{S1}		-2.1		V	*9
	Amplified voltage output voltage	V _{OUT}	When voltage is doubled	-6.0		V	V _{OUT}
	Voltage follower operating voltage	V ₅		-6.0		-3.5	V
	Reference voltage	V _{REG}	T _a = 25°C		-2.0		V

*1: A wide operating voltage range is guaranteed but an abrupt voltage variation in the access status of the MPU is not guaranteed.


*2: When the voltage is Tripled, care must be paid to supply the voltage V_{SS} so that operating voltage of V_{OUT} and V₅ may not be exceeded.

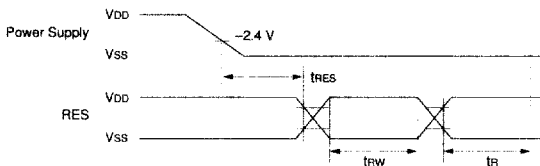
*3: D0 to D5, D6 (SCL), D7 (SI), A0, RES, \overline{CS} , \overline{WR} (E), P/S, IF

*4: This is a resistance value when a voltage of 0.1 V is applied between output pin SEG_n, SEGS_n, COM_n or COMS_n, and each power pin (V₁, V₂, V₃ or V₄). It is specified in the range of operating voltage (2).

$$R_{ON} = 0.1 \text{ V} / \Delta I$$

(ΔI: Current flowing when 0.1 V is applied between the power and output)

- *5: Character "  " display. This is applicable to the case where no access is made from the MPU and the built-in power circuit and oscillating circuit are in operation.
- *6: Current consumption when data is always written by f_{cyc} . The current consumption in the access state is almost proportional to the access frequency (f_{cyc}). When no access is made, only I_{DD} (I) occurs.
- *7: t_R (reset time) indicates the internal circuit reset completion time from the edge of the RES signal. Accordingly, the SED1220 usually enters the operating state after t_R .
- *8: Specifies the minimum pulse width of the RES signal. It is reset when a signal having the pulse width greater than t_{RW} is entered.



All signal timings are based on 20% and 80% of VSS signals.

- *9: When operating the boosting circuit, the power supply VSS must be used within the input voltage range.

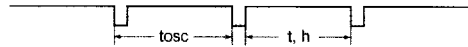
- *10: The f_{osc} frequency of the oscillator circuit for internal circuit drive may differ from the f_{BST} boosting clock on some models. The following provides the relationship between the f_{osc} frequency, f_{BST} boosting clock, and f_{FR} frame frequency.

$$f_{osc} = (\text{No. of digits}) \times (1/\text{Duty}) \times f_{FR}$$

$$f_{BST} = (1/2) \times (1/\text{No. of digits}) \times f_{osc}$$

- *11: When operations are performed using the external clock instead of the built-in oscillation circuit, following waveforms must be entered.

- $\text{Duty} = (t_h/t_{osc}) \times 100 = 70\text{-}80\%$
- $f_{osc} = 1/t_{osc}$



SED1220 Series

SED122*DA*

		Lower 4 Bit of Code															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Higher 4 Bit of Code	0	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
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SED122*DB*

		Lower 4 Bit of Code															
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Higher 4 Bit of Code	0	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
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SED1220 Series

SED122*DG+

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