

# SED1234/35 Series

## Dot Matrix LCD Controller Driver

- 12 chara x 4 line (5 x 7 dot)
- Built-in Character Generator ROM and RAM
- Built-in Power Supply Circuit for LCD

### ■ OVERVIEW

The SED1234, 1235 Series is a dot matrix LCD controller driver for character display, and can display a maximum of 48 characters, 4 user-defined characters, and a maximum of 48 symbols by means of 4-bit, 8-bit or serial data sent from a microcomputer.

A built-in character generator ROM is prepared for 256 character types, and each character font consists of 5 x 7 dots. A user-defined character RAM for four characters of 5 x 7 dots are incorporated, and a symbol register is also incorporated. With these, it is possible to apply this Series to display with a high degree of freedom. This Series can operate handy units with a minimum power consumption by means of its low power consumption and sleep mode.

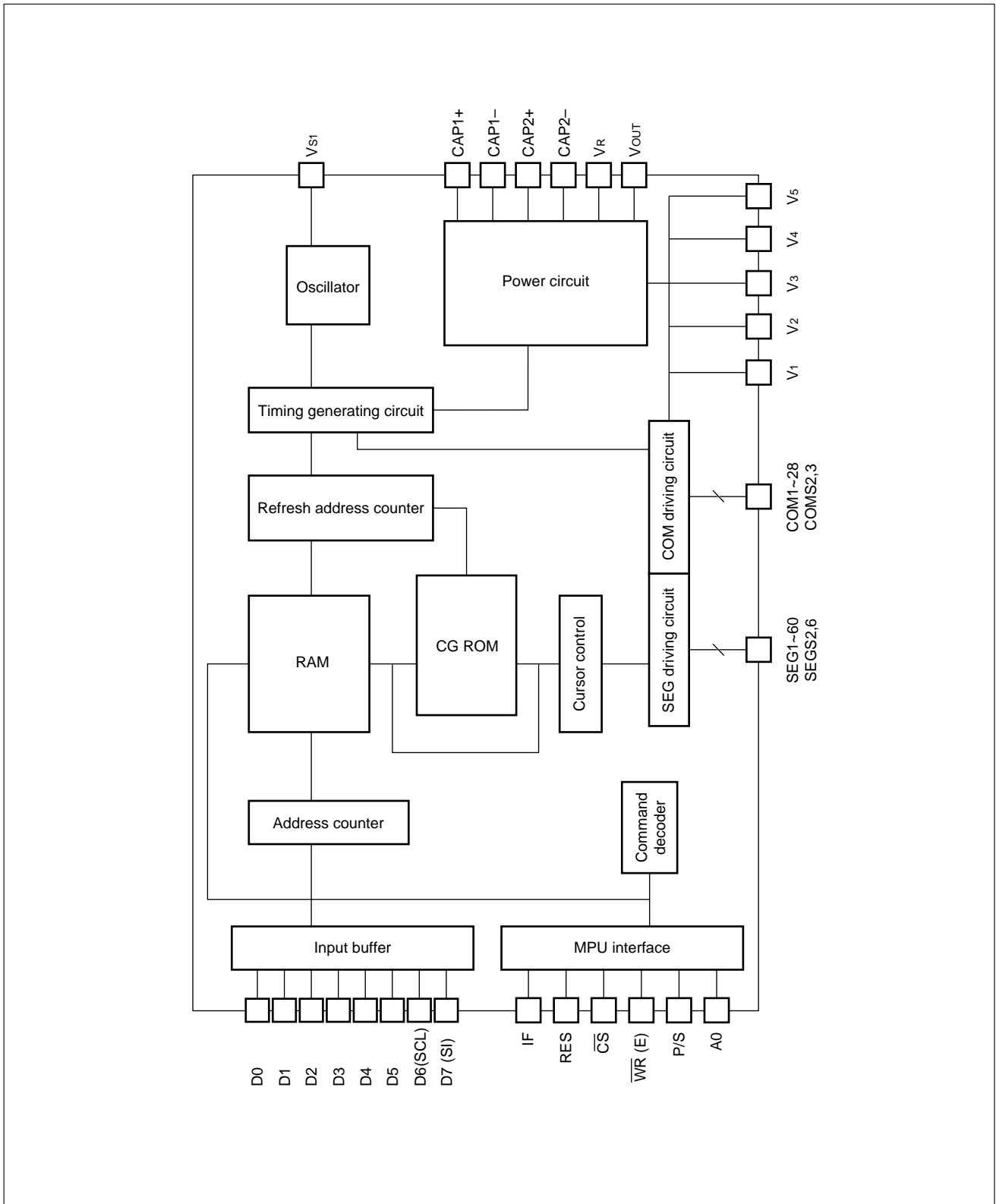
SED1234, and 1235 depending on the duty of use and the number of display columns.

### ■ FEATURES

- Built-in display RAM  
48 characters + 4 user-defined characters + 48 symbols
- CG ROM (for up to 256 characters), CG RAM (4 characters), and symbol register (48 symbols)
- Number of display columns x number of lines  
(12 columns + 2 segment for signal) x 4 lines + 48 symbols: SED1234  
(12 columns + 2 segment for signal) x 2 lines + 48 symbols: SED1235
- CR oscillation circuit (on-chip C and R)
- High-speed MPU interface  
Interfacing with both 68 series and 80 series MPU  
Interfacing in 4 bits/8 bits
- Serial interface
- Character font 5 x 7 dots
- Duty ratio 1/16 (SED1235)  
1/30 (SED1234)
- Simple command setting
- Built-in liquid crystal driving power circuit  
Power boosting circuit, power regulating circuit, voltage follower x 4
- Built-in electronic volume function
- Low power consumption  
100 $\mu$ A Max. (In normal operation mode: Including the operating current of the built-in power supply)
- Power supply  
VDD - VSS (logic section): -2.4 V to -3.6 V  
VDD - V5 (liquid crystal drive section): -5.0 V to -8.0 V
- Wide operating temperature range  
Ta = -30 to 85°C
- CMOS process (Pad Pitch)
- COB assemble 126 $\mu$ m Min.
- Delivery form: Chip SED123\*D\*A, SED123\*D\*c
- This IC is not designed with a protection against radioactive rays.

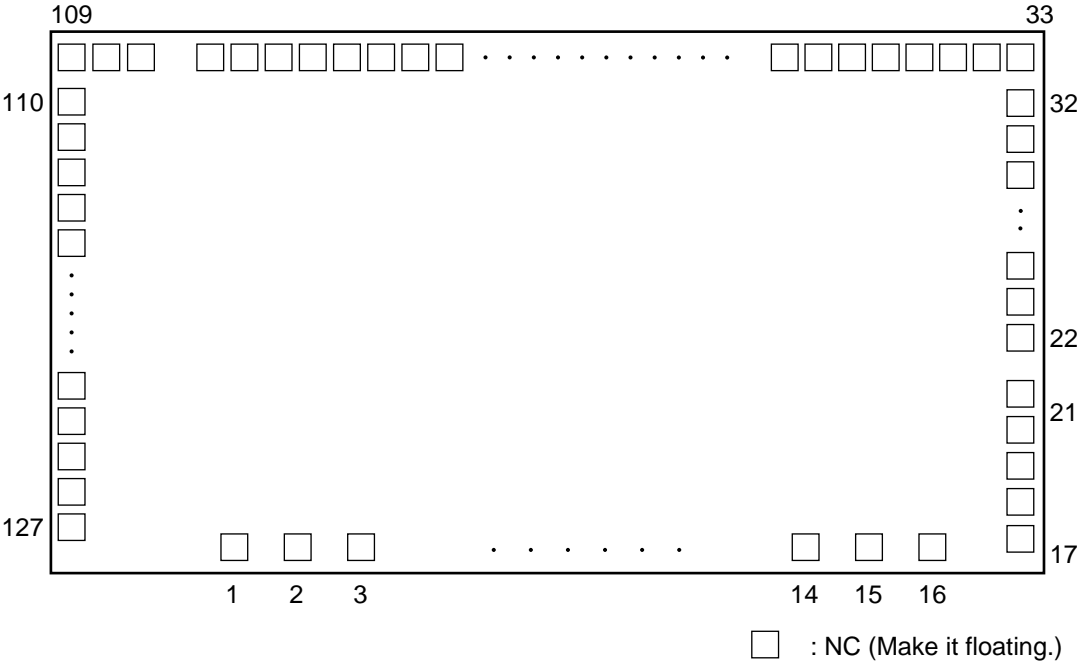
# SED1234/35 Series

## ■ BLOCK DIAGRAM



# SED1234/35 Series

## • CHIP SPECIFICATION



SED1234D\*\* 1/30 duty  
 SED1235D\*\* 1/16 duty  
 ↑  
 #1 Column for CG ROM pattern change

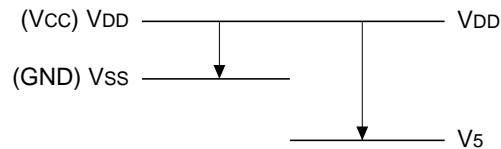
Chip size: 10.23 x 3.11 mm  
 Pad pitch: 126μm (Min.)  
 Chip thickness: 625 ± 25μm (SED123\*D\*A)  
 525 ± 25μm (SED123\*D\*c)

- 1) Al pad specification
  - Pad size: A 91μm x 90μm
  - B 114μm x 114μm

# SED1234/35 Series

## • ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Standard value	Unit
Power supply voltage (1)	V <sub>SS</sub>	-6.0 to +0.3	V
Power supply voltage (2)	V <sub>5</sub>	-16.0 to +0.3	V
Power supply voltage (3)	V <sub>1</sub> , V <sub>2</sub> , V <sub>3</sub> , V <sub>4</sub>	V <sub>5</sub> to +0.3	V
Input voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.3 to +0.3	V
Output voltage	V <sub>O</sub>	V <sub>SS</sub> -0.3 to +0.3	V
Operating temperature	T <sub>opr</sub>	-30 to +85	°C
Storage temperature	TCP	T <sub>str</sub>	°C
	Bare chip		



- Notes:
1. All the voltage values are based on V<sub>DD</sub> = 0 V.
  2. For voltages of V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub> and V<sub>4</sub>, keep the condition of V<sub>DD</sub> ≥ V<sub>1</sub> ≥ V<sub>2</sub> ≥ V<sub>3</sub> ≥ V<sub>4</sub> ≥ V<sub>5</sub> and V<sub>DD</sub> ≥ V<sub>SS</sub> ≥ V<sub>5</sub> ≥ V<sub>OUT</sub> 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.

## • DC CHARACTERISTICS

(VDD = 0 V, VSS = -3.6 V to -2.4 V, Ta = -30 to 85°C unless otherwise specified.)

Item		Symbol	Condition	min	typ	max	Unit	Applicable pin
Power supply voltage (1)	Recommended operation	VSS		-3.6	-3.0	-2.4	V	VSS
	Operable			-5.5	-3.0	-2.4		*1
Power supply voltage (2)	Recommended operation	V5		-8.0		-5.0	V	V5
	Operable			-11.0		-4.5		*2
	Operable	V1, V2		0.6×V5		VDD	V	V1, V2
	Operable	V3, V4		VDD		0.4×V5	V	V3, V4
High-level input voltage		VIHC		0.2×VSS		VDD	V	*3
Low-level input voltage		VILC		VSS		0.8×VSS	V	*3
Input leakage current		ILI	VIN = VDD or VSS	-1.0		1.0	μA	*3
LC driver ON resistance		RON	Ta=25°C V5=-7.0V ΔV=0.1V		20	40	KΩ	COM,SEG *4
Static current consumption		IDDQ			0.1	5.0	μA	VDD
Dynamic current consumption	IDD	Display State	V5 = -7 V without load			100	μA	VDD *5
		Standby state	Oscillation ON, Power OFF			20	μA	VDD *6
		Sleep state	Oscillation OFF, Power OFF			5	μA	VDD
		Access state	f <sub>cyc</sub> =200KHz			500	μA	VDD *7
Frame frequency		fFR	Ta=25°C VSS=-3.0V	70	100	130	Hz	*11
Input pin capacity		CIN	Ta=25°C f=1MHz		5.0	8.0	pF	*3

Reset time	tR		1.0				μs	*8
Reset pulse width	tRW		10				μs	*9
Reset start time	tRES		50				ns	*9

Built-in power supply	Input voltage	VSS		-3.6		-2.4	V	*10
	Booster output voltage	VOUT	Double boosting state	-7.2			V	VOUT
			Triple boosting state	-10.8				
	Voltage follower operating voltage	V5		-11.0		-4.5	V	
	Reference voltage (standard)	VREG	Ta = 25°C	-3.5	-3.1	-2.7	V	*12
Reference voltage (option)	VREG(VS1)	Ta = 25°C	-2.4	-2.1	-1.8	V	*12	

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

\*2: The operating voltage range is applicable to the case where an external power supply is used.

\*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 SEGn, SEGSn, COMn or COMSn, 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.

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SED123\*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																
	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	A																
	B																
	C																
	D																
	E																
	F																

SED123\*DB\*

		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]
	1	士	≡	∩	△	∇	∧	∨	∞	∫	∑	∏	∑	∏	∑	∏	∑
	2	[Grid]	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
	3	0	1	2	3	4	5	6	7	8	9	*	+	<	=	>	?
	4	P	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	_	[
	6	p	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	7	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	_	△
	8	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	9	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	A	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	B	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
	C	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
	D	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
	E	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]
	F	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]	[Grid]

# SED1234/35 Series

SED123\*DG+

		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																
	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	A																
	B																
	C																
	D																
	E																
	F																



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