EPSON

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

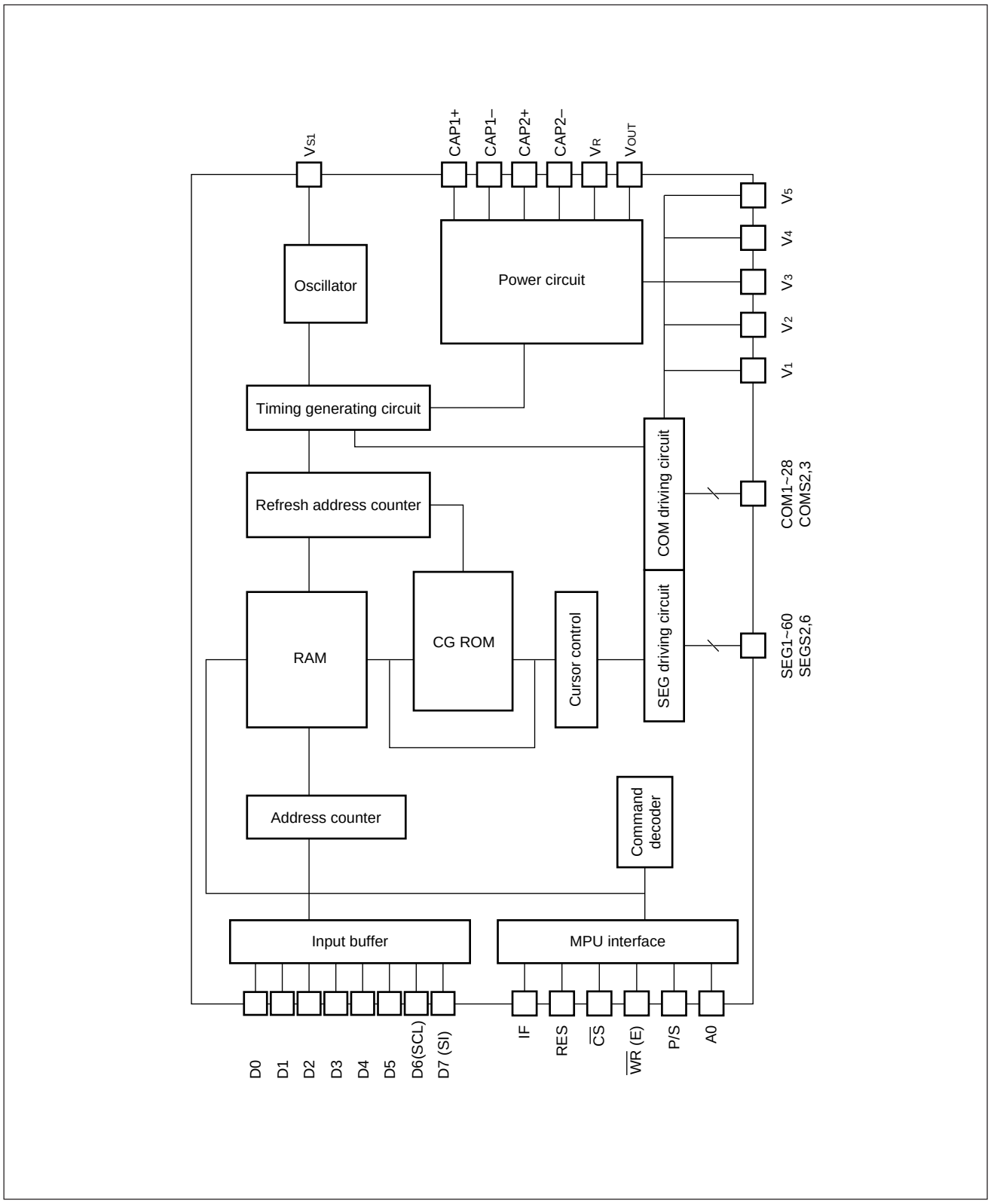
■ OVERVIEW

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.

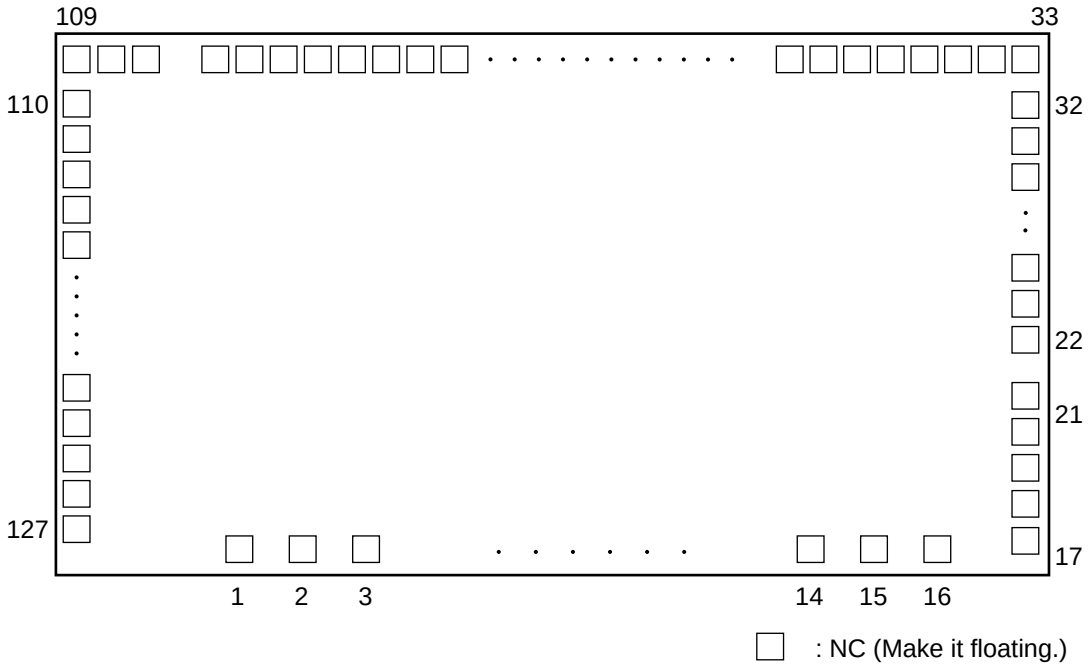
■ FEATURES

- 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
  100µA Max. (In normal operation mode: Including the operating current of the built-in power supply)
- Power supply
  V_{DD} - V_{SS} (logic section): –2.4 V to –3.6 V
  V_{DD} - V_5 (liquid crystal drive section): –5.0 V to –8.0 V
- Wide operating temperature range
  Ta = –30 to 85°C
- CMOS process
- COB assemble (Pad Pitch) 126µm Min.
- Delivery form: Chip SED123✻D✱A, SED123✻D✱C
- This IC is not designed with a protection against radioactive rays.

■ BLOCK DIAGRAM



• CHIP SPECIFICATION



SED1234D** 1/30 duty
SED1235D** 1/16 duty

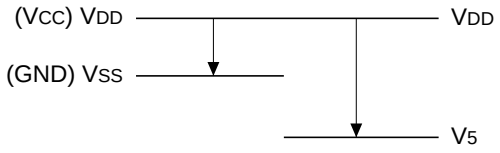
#1 Column for CG ROM pattern change

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

• 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	–16.0 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	T_{str}	–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 V_1, V_2, V_3 and V_4, keep the condition of $V_{DD} \geqq V_1 \geqq V_2 \geqq V_3 \geqq V_4 \geqq V_5$ and $V_{DD} \geqq V_{SS} \geqq V_5 \geqq V_{OUT}$ 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.

• DC CHARACTERISTICS

(V_{DD} = 0 V, V_{SS} = –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	V_{SS}		–3.6	–3.0	–2.4	V	V_{SS}
	Operable			–5.5	–3.0	–2.4		*1
Power supply voltage (2)	Recommended operation	V_5		–8.0		–5.0	V	V_5
	Operable			–11.0		–4.5		*2
	Operable	V_1, V_2		0.6×V_5		V_{DD}	V	V_1, V_2
	Operable	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}	Ta=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 = –7 V without load			100	µA	V_{DD} *5
		Standby state	Oscillation ON, Power OFF			20	µA	V_{DD} *6
		Sleep state	Oscillation OFF, Power OFF			5	µA	V_{DD}
		Access state	f_{cyc}=200KHz			500	µA	V_{DD} *7
Frame frequency		f_{FR}	Ta=25°C V_{SS}=–3.0V	70	100	130	Hz	*11
Input pin capacity		C_{IN}	Ta=25°C f=1MHz		5.0	8.0	pF	*3

Reset time	t_R		1.0			µs	*8
Reset pulse width	t_{RW}		10			µs	*9
Reset start time	t_{RES}		50			ns	*9

Built-in power supply	Input voltage	V_{SS}		–3.6		–2.4	V	*10
	Booster output voltage	V_{OUT}	Double boosting state	–7.2			V	V_{OUT}
			Triple boosting state	–10.8				
	Voltage follower operating voltage	V_5		–11.0		–4.5	V	
	Reference voltage (standard)	V_{REG}	Ta = 25°C	–3.5	–3.1	–2.7	V	*12
	Reference voltage (option)	$V_{REG(VS1)}$	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

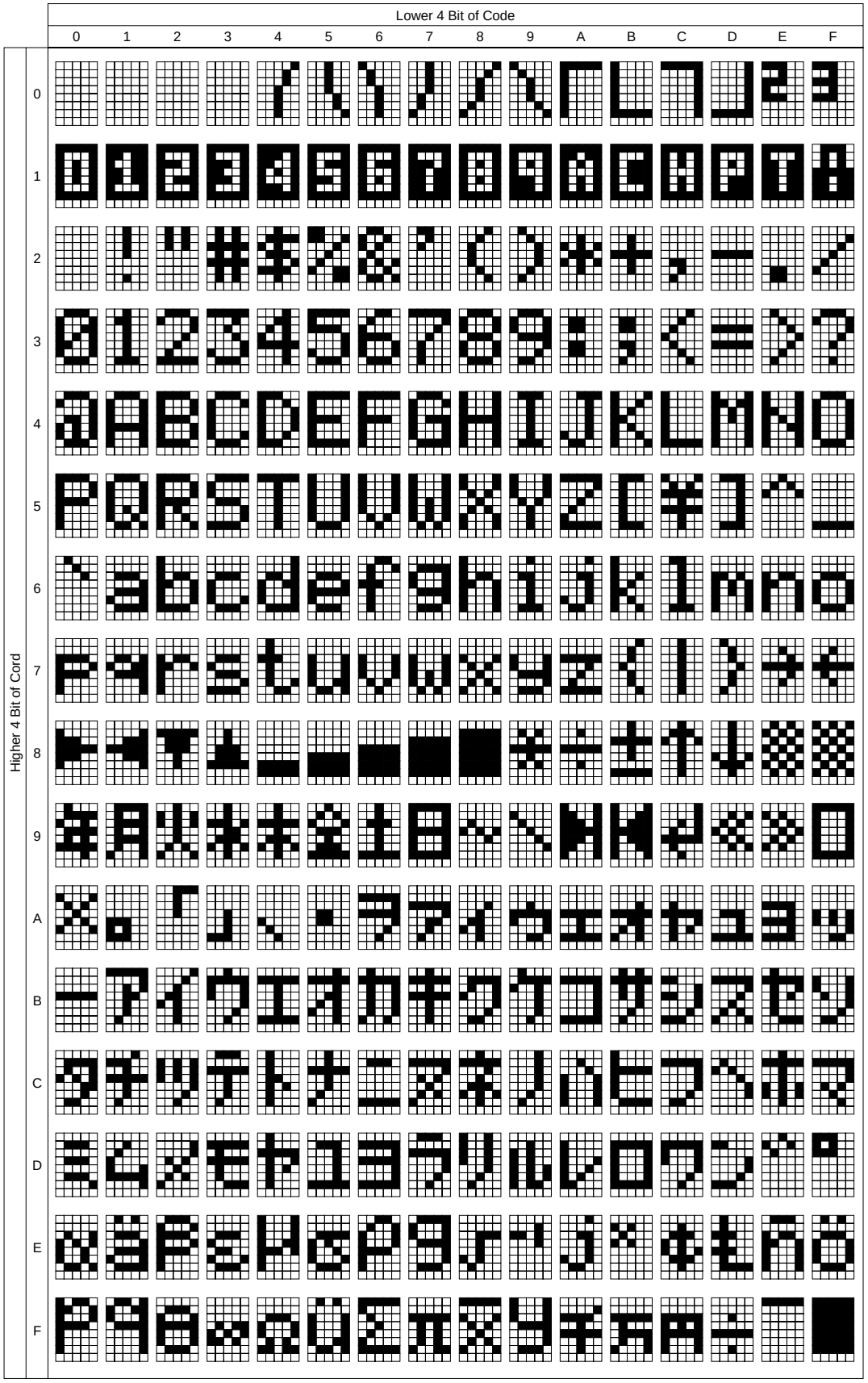
*4: This is a resistance value when a voltage of 0.1 V is applied between output pin SEGn, SEGSn, COMn or COMSn, and each power pin (V1, V2, V3 or V4). It is specified in the range of operating voltage (2).

R_{ON} = 0.1 V / ΔI

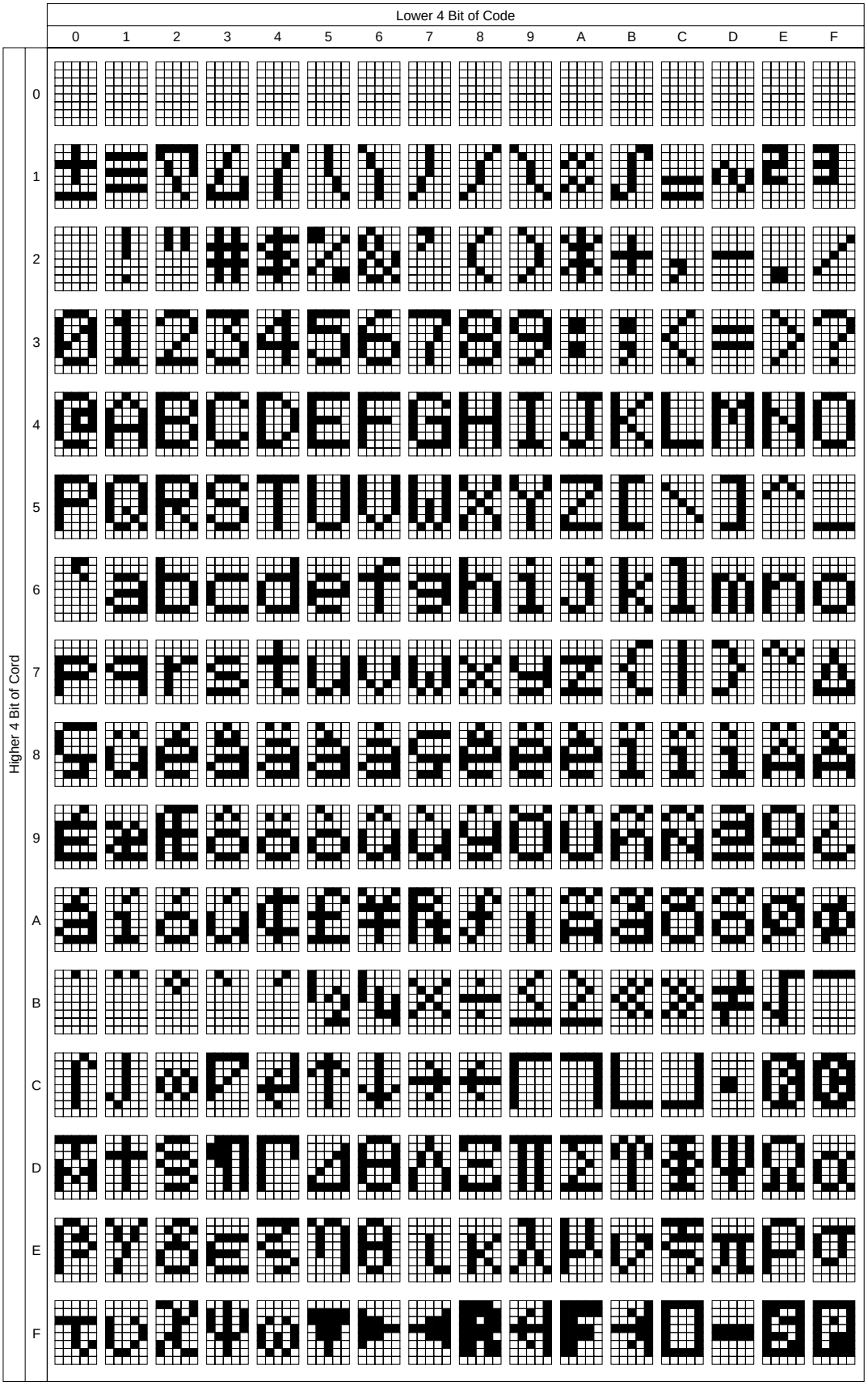
(ΔI: Current flowing when 0.1 V is applied between the power and output)

*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.

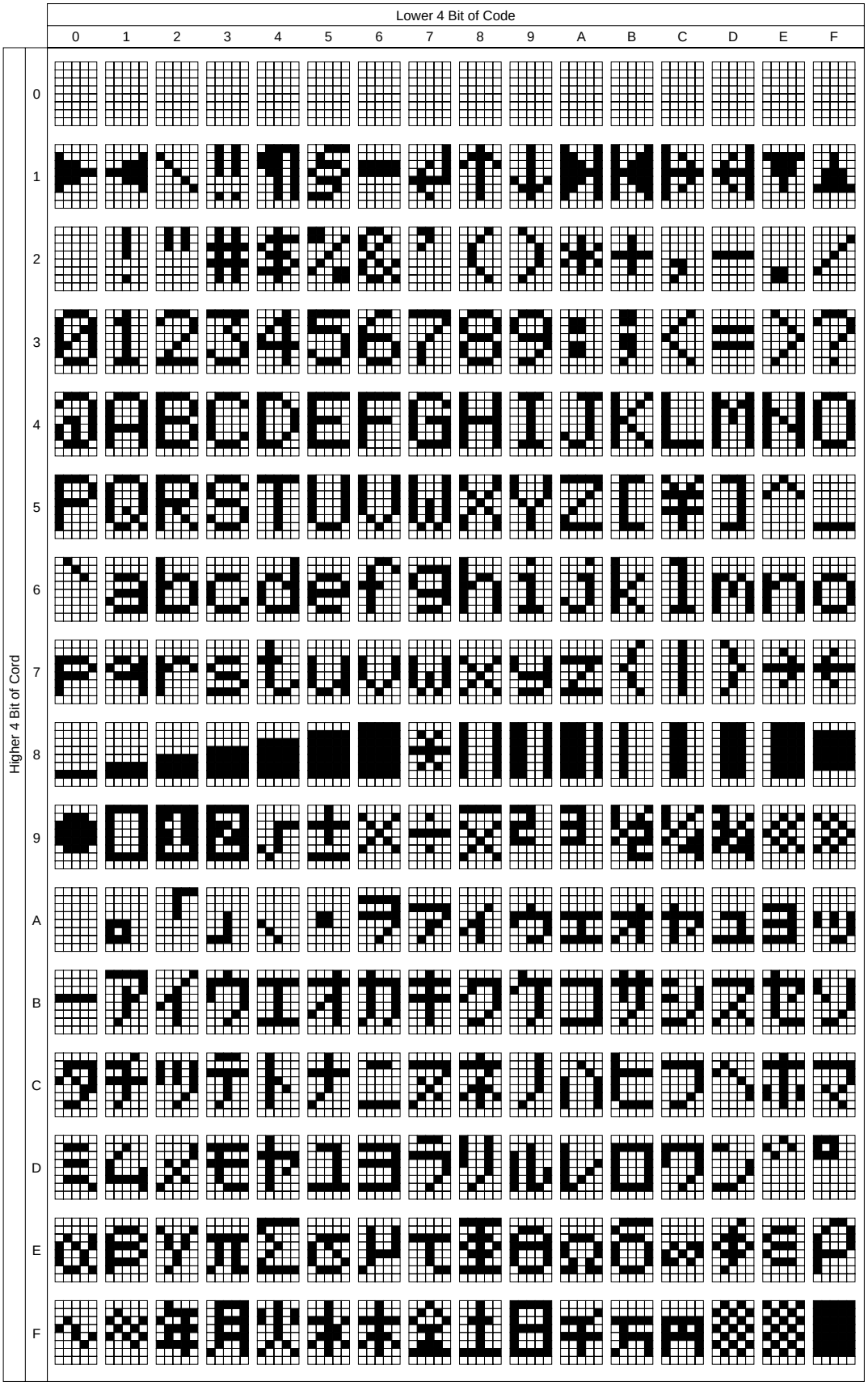
SED123*DA*


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 Cord
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 Cord
0 1 2 3 4 5 6 7 8 9 A B C D E F

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 Cord
0 1 2 3 4 5 6 7 8 9 A B C D E F

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