

Micro MINI E0C6004

4-bit Single Chip Microcomputer



- E0C6200B Core CPU
- Low Voltage and Low Power
- High Speed Operation (2MHz)
- Low Cost Performance

■ DESCRIPTION

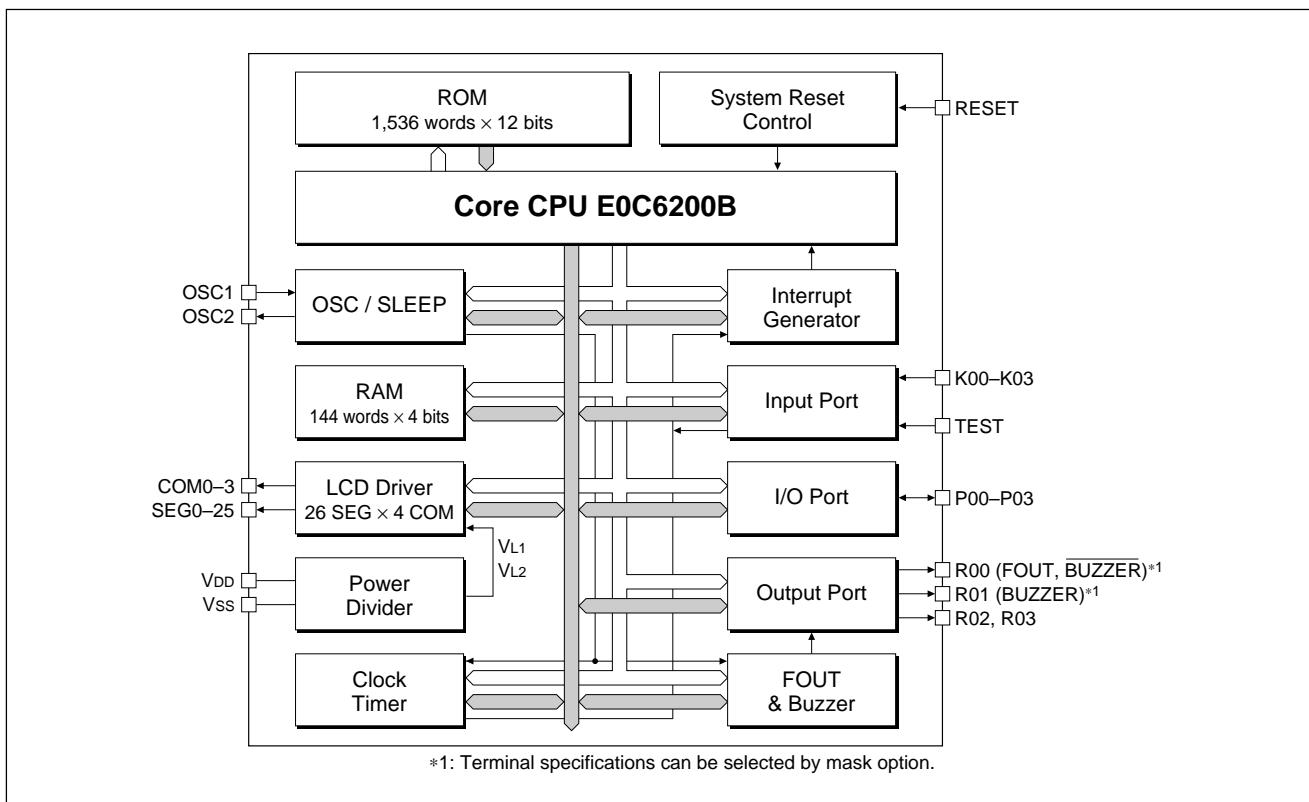
Micro MINI "E0C6004" is a single chip microcomputer for battery-driven products with 7-segment LCD display. It achieves low cost performance, and is suitable for a product added some feature instead of standard IC. It consists that Seiko Epson's original core CPU E0C6200B, LCD driver (26 segments × 4 commons), 144 words RAM, 1.5K words ROM, clock timer and so on.

■ FEATURES

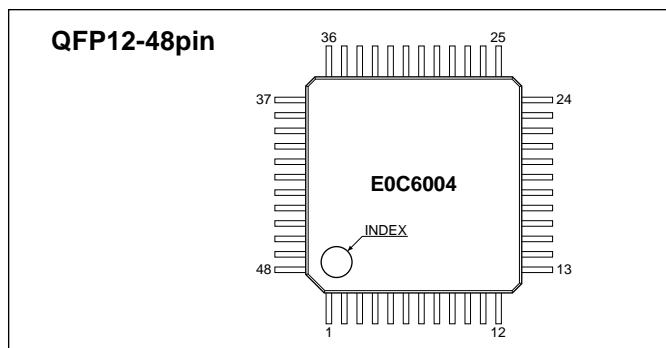
- CMOS LSI 4-bit parallel processing
- Clock 2MHz (CR oscillation)
- Instruction set 100 instructions
- ROM capacity 1.5K × 12 bits
- RAM capacity 144 × 4 bits
- I/O port
 - I: 4 bits (with pull-down resistor selectable by mask option)
 - O: 4 bits (1 bit with 20mA drive)
 - I/O: 4 bits
- LCD driver 26 segments × 4/3/2 commons
- Free running timer
- Interrupt
 - External : Key interrupt 1 line
 - Internal : Timer interrupt 1 line
- Operation voltage
 - 2.7 to 3.6V
 - 4.5 to 5.5V
- Power consumption
 - 100nA (2MHz CR, 3.0V, SLEEP)
 - 100nA (2MHz CR, 5.0V, SLEEP)
 - 330µA (2MHz CR, 3.0V, HALT)
 - 1000µA (2MHz CR, 5.0V, HALT, LCDON)
 - 450µA (2MHz CR, 3.0V, RUN)
 - 1100µA (2MHz CR, 5.0V, RUN, LCDON)
- Package Die form (pad pitch = 130µm) or QFP12-48pin

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■ BLOCK DIAGRAM



■ PIN CONFIGURATION



No.	Pin name						
1	K02	13	SEG24	25	SEG12	37	SEG0
2	K01	14	SEG23	26	SEG11	38	COM0
3	K00	15	SEG22	27	SEG10	39	COM1
4	P03	16	SEG21	28	SEG9	40	COM2
5	P02	17	SEG20	29	SEG8	41	COM3
6	P01	18	SEG19	30	SEG7	42	TEST
7	P00	19	SEG18	31	SEG6	43	RESET
8	R03	20	SEG17	32	SEG5	44	VDD
9	R02	21	SEG16	33	SEG4	45	OSC1
10	R01	22	SEG15	34	SEG3	46	OSC2
11	R00	23	SEG14	35	SEG2	47	Vss
12	SEG25	24	SEG13	36	SEG1	48	K03

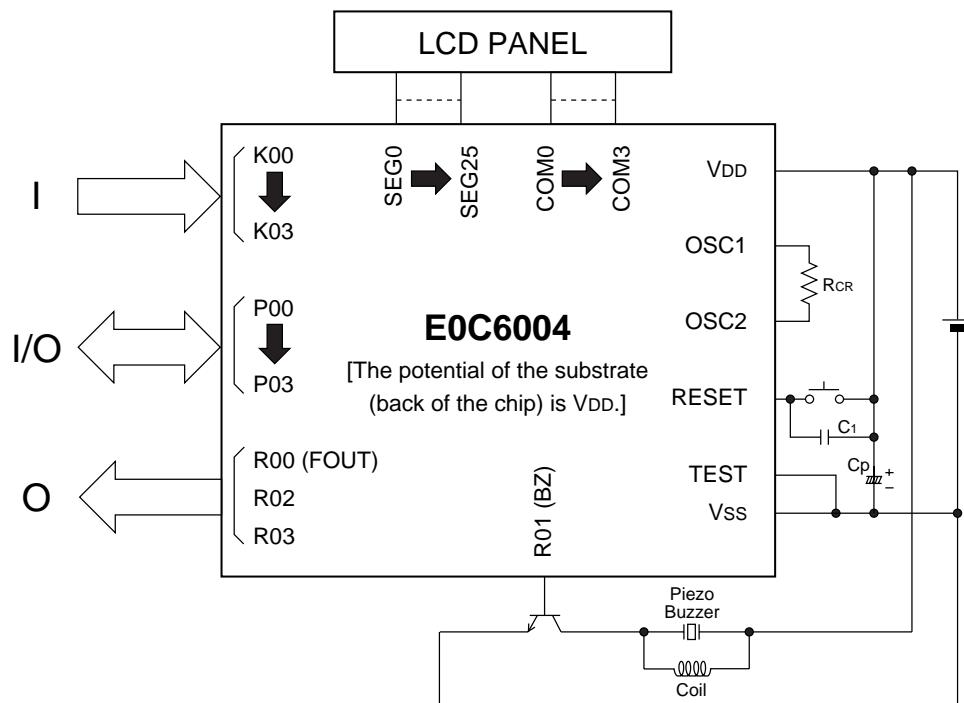
■ PIN DESCRIPTION

Pin name	Pin No.	I/O	Function
VDD	44	(I)	Power supply pin (+)
Vss	47	(I)	Power supply pin (-)
OSC1	45	I	CR oscillation input pin
OSC2	46	O	CR oscillation output pin
K00-K03	3-1, 48	I	Input port pin
P00-P03	7-4	I/O	I/O port pin
R00	11	O	Output port pin, BUZZER or FOUT output pin *
R01	10	O	Output port pin or BUZZER output pin *
R02, R03	9, 8	O	Output port pin
SEG0-25	37-12	O	LCD segment output pin or DC output pin *
COM0-3	38-41	O	LCD common output pin (1/4 duty, 1/3 or 1/2 duty are selectable *)
RESET	43	I	Initial reset input pin
TEST	42	I	Input pin for test

* Can be selected by mask option

■ BASIC EXTERNAL CONNECTION DIAGRAM

Piezo Buzzer Single Terminal Driving



RCR	Resistor	50 kΩ (Vss = -5.0 V), 39 kΩ (Vss = -3.0 V)
C1	Capacitor	0.1 μF
Cp	Capacitor	3.3 μF
R1, R2	Resistor	100 Ω

Note: The above table is simply an example, and is not guaranteed to work.

■ ELECTRICAL CHARACTERISTICS

● Absolute Maximum Ratings

Rating	Symbol	Value	(VDD=0V)
Supply voltage	Vss	-7.0 to 0.5	V
Input voltage (1)	Vi	Vss - 0.3 to 0.5	V
Input voltage (2)	Viosc	Vs1 - 0.3 to 0.5	V
Permissible total output current *1	ΣIvss	40	mA
Operating temperature	Topr	-20 to 70	°C
Storage temperature	Tstg	-65 to 150	°C
Soldering temperature / time	Tsol	260°C, 10sec (lead section)	—
Permissible dissipation *2	Pd	250	mW

*1: The permissible total output current is the sum total of the current (average current) that simultaneously flows from the output pins (or is drawn in).

*2: In case of plastic package (QFP12-48pin).

● Recommended Operating Conditions

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Supply voltage	Vss	3 V system, VDD=0V 5 V system, VDD=0V	-3.6	-3.0	-2.7	V
Oscillation frequency	fosc	CR oscillation, RCR=50kΩ, Vss=-5V		2		MHz

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● DC Characteristics

(Unless otherwise specified: VDD=0V, Vss=-5.0V, fosc=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	VIH1	K00–03, P00–03	0.2·Vss		0	V
High level input voltage (2)	VIH2	RESET	0.1·Vss		0	V
Low level input voltage (1)	VIL1	K00–03, P00–03	Vss		0.8·Vss	V
Low level input voltage (2)	VIL2	RESET	Vss		0.9·Vss	V
High level input current (1)	IiH1	VIH1=0V, No pull-down	K00–03, P00–P03	0		0.5 μA
High level input current (2)	IiH2	VIH2=0V, Pull-down	K00–03	20	40	70 μA
High level input current (3)	IiH3	VIH3=0V, Pull-down	P00–03, RESET	50	100	150 μA
Low level input current	IiL	ViL=Vss	K00–03, P00–03, RESET, TEST	-0.5		0 μA
High level output current (1)	IOH1	VOH1=0.1·Vss	R02, R03, P00–03			-3.0 mA
High level output current (2)	IOH2	VOH2=0.1·Vss (with protection resistor)	R00, R01			-3.0 mA
High level output current (3)	IOH3	VOH3=0.1·Vss, Vss=-4.5V	R03			-15 mA
Low level output current (1)	IOL1	VOL1=0.9·Vss	R02, R03, P00–03	3.0		mA
Low level output current (2)	IOL2	VOL2=0.9·Vss (with protection resistor)	R00, R01	3.0		mA
Common output current	IOH4	VOH4=-0.05V	COM0–3			-3 μA
	IOL4	VOL4=Vss+0.05V		3		μA
Segment output current (during LCD output)	IOH5	VOH5=-0.05V	SEG0–25			-3 μA
	IOL5	VOL5=Vss+0.05V		3		μA
Segment output current (during DC output)	IOH6	VOH6=0.1·Vss	SEG0–25			-450 μA
	IOL6	VOL6=0.9·Vss		450		μA

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	VIH1	K00–03, P00–03	0.2·Vss		0	V
High level input voltage (2)	VIH2	RESET	0.1·Vss		0	V
Low level input voltage (1)	VIL1	K00–03, P00–03	Vss		0.8·Vss	V
Low level input voltage (2)	VIL2	RESET	Vss		0.9·Vss	V
High level input current (1)	IiH1	VIH1=0V, No pull-down	K00–03, P00–P03	0		0.5 μA
High level input current (2)	IiH2	VIH2=0V, Pull-down	K00–03	10	25	40 μA
High level input current (3)	IiH3	VIH3=0V, Pull-down	P00–03, RESET	30	60	100 μA
Low level input current	IiL	ViL=Vss	K00–03, P00–03, RESET, TEST	-0.5		0 μA
High level output current (1)	IOH1	VOH1=0.1·Vss	R02, R03, P00–03			-1.0 mA
High level output current (2)	IOH2	VOH2=0.1·Vss (with protection resistor)	R00, R01			-1.0 mA
High level output current (3)	IOH3	VOH3=0.1·Vss, Vss=-2.7V	R03			-5 mA
Low level output current (1)	IOL1	VOL1=0.9·Vss	R02, R03, P00–03	3.0		mA
Low level output current (2)	IOL2	VOL2=0.9·Vss (with protection resistor)	R00, R01	3.0		mA
Common output current	IOH4	VOH4=-0.05V	COM0–3			-3 μA
	IOL4	VOL4=Vss+0.05V		3		μA
Segment output current (during LCD output)	IOH5	VOH5=-0.05V	SEG0–25			-3 μA
	IOL5	VOL5=Vss+0.05V		3		μA
Segment output current (during DC output)	IOH6	VOH6=0.1·Vss	SEG0–25			-200 μA
	IOL6	VOL6=0.9·Vss		200		μA

● Current Consumption

(Unless otherwise specified: VDD=0V, fosc=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	ISLP2	During SLEEP, LCD off	Vss=-3.0V no panel load Rcr=39kΩ			100 nA
	IHALT2	During HALT, LCD off			300	800 μA
	IHALT4	During HALT, LCD on			330	800 μA
	IEXE2	During operation, LCD off			420	1000 μA
	IEXE4	During operation, LCD on			450	1000 μA
	ISLP1	During SLEEP, LCD off	Vss=-5.0V no panel load Rcr=50kΩ			100 nA
	IHALT1	During HALT, LCD off			950	1500 μA
	IHALT3	During HALT, LCD on			1000	1500 μA
	IEXE1	During operation, LCD off			1050	1800 μA
	IEXE3	During operation, LCD on			1100	1800 μA

● Oscillation Characteristics

Oscillation characteristics will vary according to different conditions (elements used, board pattern). Use the following characteristics as reference values.

CR Oscillation

(Unless otherwise specified: VDD=0V, Vss=-5.0V, RCR=50kΩ, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency voltage dispersion	$\Delta f/\Delta V_1$	Vss=-4.5 to -5.5V			20	%
Frequency IC dispersion	$\Delta f/\Delta I_{C1}$	Vss=-5V	-20	(2MHz)	20	%
Oscillation start time	tsta	Vss=-4.5 to -5.5V		3		mS

(Unless otherwise specified: VDD=0V, Vss=-3.0V, RCR=39kΩ, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency voltage dispersion	$\Delta f/\Delta V_1$	Vss=-2.7 to -3.6V			30	%
Frequency IC dispersion	$\Delta f/\Delta I_{C1}$	Vss=-3V	-20	(2MHz)	20	%
Oscillation start time	tsta	Vss=-2.7 to -3.6V		3		mS

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