

Micro MINI E0C6004

4-bit Single Chip Microcomputer



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

■ DESCRIPTION

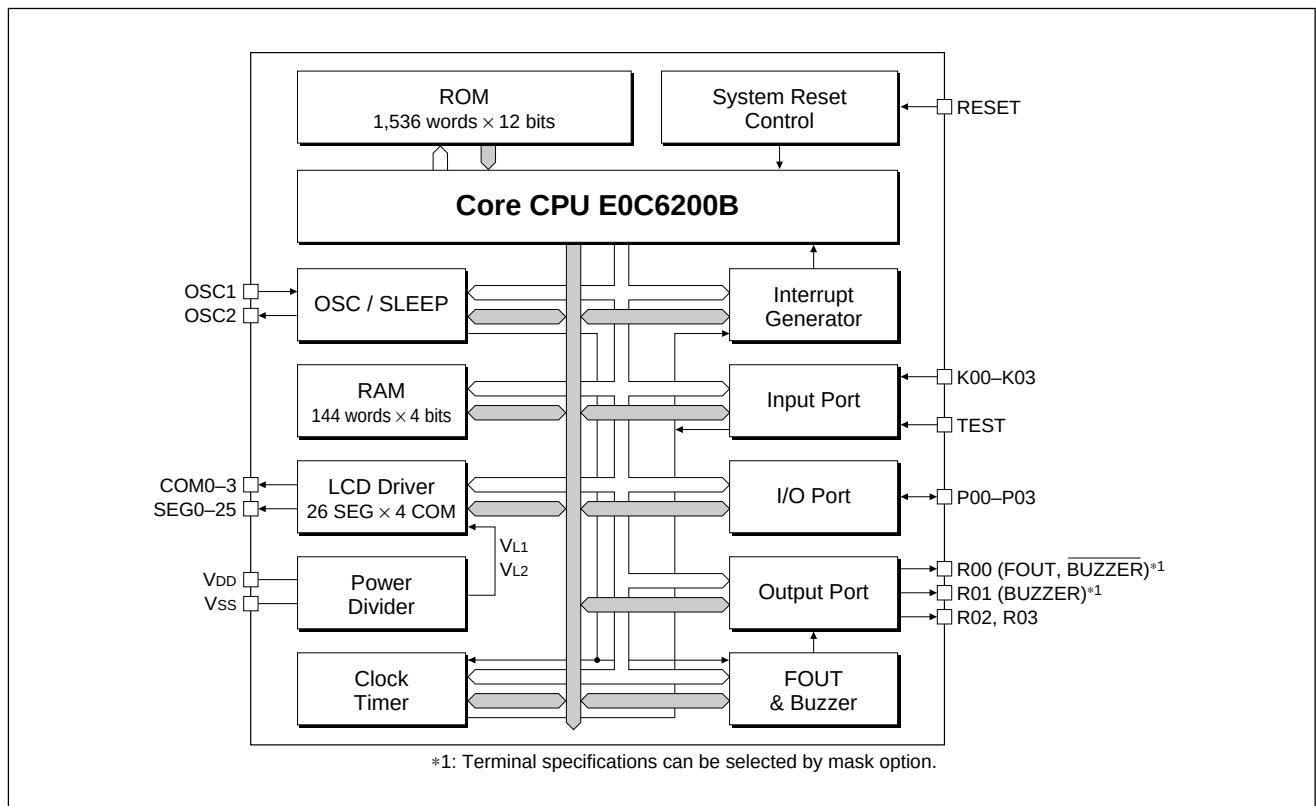
Micro MINI "E0C6004" is a single chip microcomputer for battery-driven products with 7-segment LCD display. It achieves low cost performance, and is suitable for a product added some feature instead of standard IC. It consists that Seiko Epson's original core CPU E0C6200B, LCD driver (26 segments × 4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

■ FEATURES

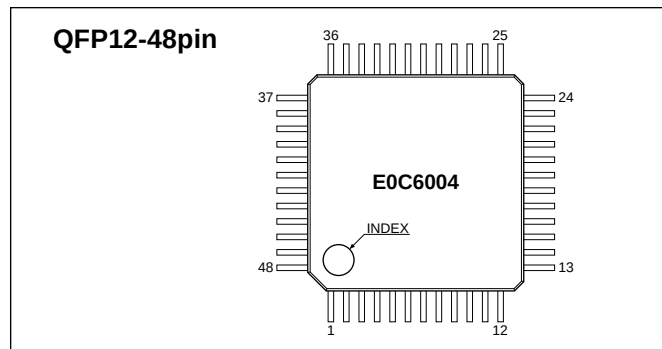
- CMOS LSI 4-bit parallel processing
- Clock 2MHz (CR oscillation)
- Instruction set 100 instructions
- ROM capacity 1.5K × 12 bits
- RAM capacity 144 × 4 bits
- I/O port I: 4 bits (with pull-down resistor selectable by mask option)
O: 4 bits (1 bit with 20mA drive)
I/O: 4 bits
- LCD driver 26 segments × 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

E0C6004

■ BLOCK DIAGRAM



■ PIN CONFIGURATION



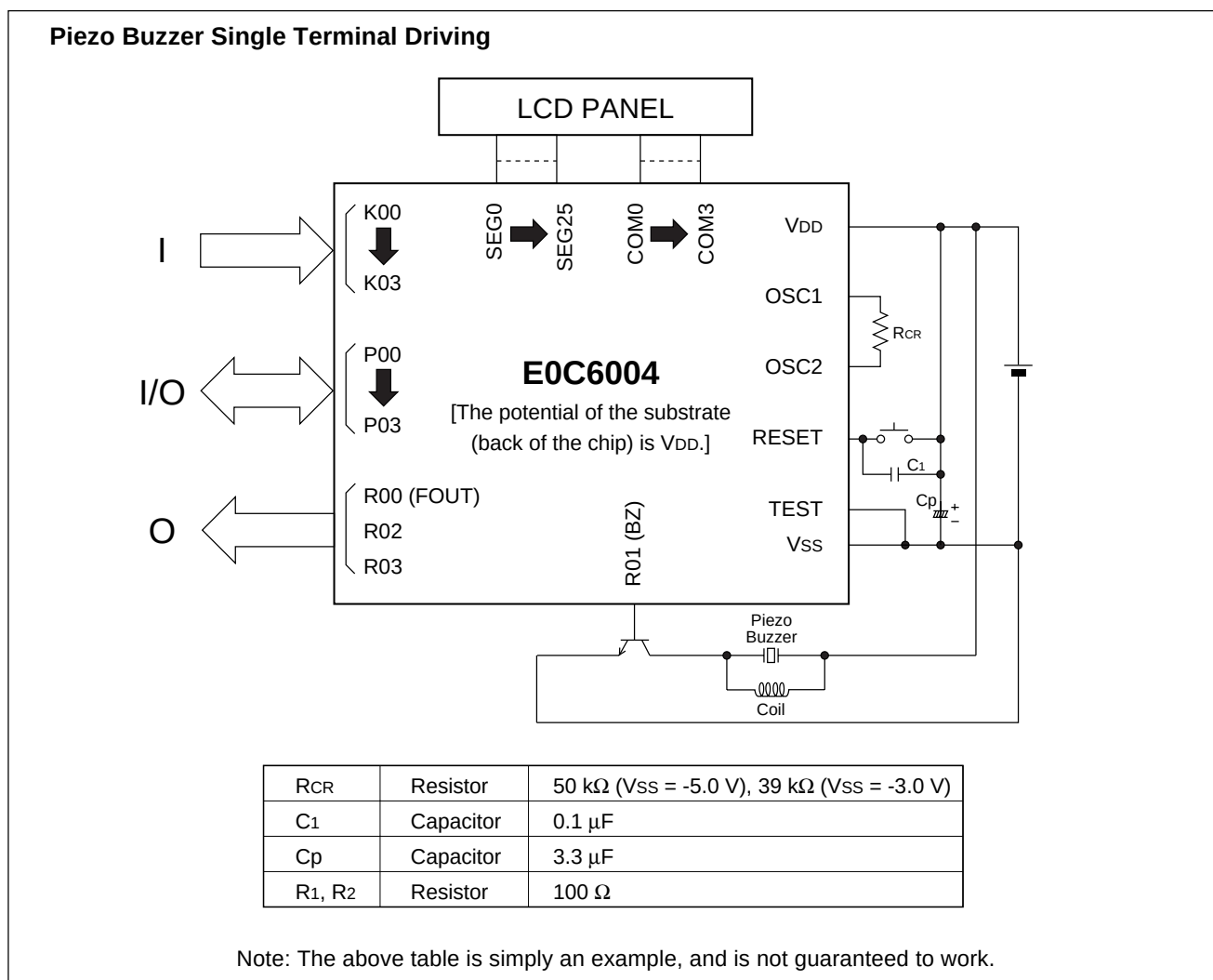
No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name
1	K02	13	SEG24	25	SEG12	37	SEG0
2	K01	14	SEG23	26	SEG11	38	COM0
3	K00	15	SEG22	27	SEG10	39	COM1
4	P03	16	SEG21	28	SEG9	40	COM2
5	P02	17	SEG20	29	SEG8	41	COM3
6	P01	18	SEG19	30	SEG7	42	TEST
7	P00	19	SEG18	31	SEG6	43	RESET
8	R03	20	SEG17	32	SEG5	44	VDD
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



■ ELECTRICAL CHARACTERISTICS

● Absolute Maximum Ratings

Rating	Symbol	Value	Unit
Supply voltage	V _{SS}	-7.0 to 0.5	V
Input voltage (1)	V _I	V _{SS} - 0.3 to 0.5	V
Input voltage (2)	V _{IOsc}	V _{S1} - 0.3 to 0.5	V
Permissible total output current *1	ΣI _{VSS}	40	mA
Operating temperature	T _{opr}	-20 to 70	°C
Storage temperature	T _{stg}	-65 to 150	°C
Soldering temperature / time	T _{sol}	260°C, 10sec (lead section)	—
Permissible dissipation *2	P _D	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	V _{SS}	3 V system, V _{DD} =0V	-3.6	-3.0	-2.7	V
		5 V system, V _{DD} =0V	-5.5	-5.0	-4.5	V
Oscillation frequency	f _{osc}	CR oscillation, R _{CR} =50kΩ, V _{SS} =-5V		2		MHz

● DC Characteristics

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-5.0V, f_{osc}=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	V _{IH1}	K00-03, P00-03	0.2·V _{SS}		0	V
High level input voltage (2)	V _{IH2}	RESET	0.1·V _{SS}		0	V
Low level input voltage (1)	V _{IL1}	K00-03, P00-03	V _{SS}		0.8·V _{SS}	V
Low level input voltage (2)	V _{IL2}	RESET	V _{SS}		0.9·V _{SS}	V
High level input current (1)	I _{IH1}	V _{IH1} =0V, No pull-down	0		0.5	μA
High level input current (2)	I _{IH2}	V _{IH2} =0V, Pull-down	20	40	70	μA
High level input current (3)	I _{IH3}	V _{IH3} =0V, Pull-down	50	100	150	μA
Low level input current	I _{IL}	V _{IL} =V _{SS}	-0.5		0	μA
High level output current (1)	I _{OH1}	V _{OH1} =0.1·V _{SS}			-3.0	mA
High level output current (2)	I _{OH2}	V _{OH2} =0.1·V _{SS} (with protection resistor)			-3.0	mA
High level output current (3)	I _{OH3}	V _{OH3} =0.1·V _{SS} , V _{SS} =-4.5V			-15	mA
Low level output current (1)	I _{OL1}	V _{OL1} =0.9·V _{SS}	3.0			mA
Low level output current (2)	I _{OL2}	V _{OL2} =0.9·V _{SS} (with protection resistor)	3.0			mA
Common output current	I _{OH4}	V _{OH4} =-0.05V			-3	μA
	I _{OL4}	V _{OL4} =V _{SS} +0.05V	3			μA
Segment output current (during LCD output)	I _{OH5}	V _{OH5} =-0.05V			-3	μA
	I _{OL5}	V _{OL5} =V _{SS} +0.05V	3			μA
Segment output current (during DC output)	I _{OH6}	V _{OH6} =0.1·V _{SS}			-450	μA
	I _{OL6}	V _{OL6} =0.9·V _{SS}	450			μA

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{osc}=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	V _{IH1}	K00-03, P00-03	0.2·V _{SS}		0	V
High level input voltage (2)	V _{IH2}	RESET	0.1·V _{SS}		0	V
Low level input voltage (1)	V _{IL1}	K00-03, P00-03	V _{SS}		0.8·V _{SS}	V
Low level input voltage (2)	V _{IL2}	RESET	V _{SS}		0.9·V _{SS}	V
High level input current (1)	I _{IH1}	V _{IH1} =0V, No pull-down	0		0.5	μA
High level input current (2)	I _{IH2}	V _{IH2} =0V, Pull-down	10	25	40	μA
High level input current (3)	I _{IH3}	V _{IH3} =0V, Pull-down	30	60	100	μA
Low level input current	I _{IL}	V _{IL} =V _{SS}	-0.5		0	μA
High level output current (1)	I _{OH1}	V _{OH1} =0.1·V _{SS}			-1.0	mA
High level output current (2)	I _{OH2}	V _{OH2} =0.1·V _{SS} (with protection resistor)			-1.0	mA
High level output current (3)	I _{OH3}	V _{OH3} =0.1·V _{SS} , V _{SS} =-2.7V			-5	mA
Low level output current (1)	I _{OL1}	V _{OL1} =0.9·V _{SS}	3.0			mA
Low level output current (2)	I _{OL2}	V _{OL2} =0.9·V _{SS} (with protection resistor)	3.0			mA
Common output current	I _{OH4}	V _{OH4} =-0.05V			-3	μA
	I _{OL4}	V _{OL4} =V _{SS} +0.05V	3			μA
Segment output current (during LCD output)	I _{OH5}	V _{OH5} =-0.05V			-3	μA
	I _{OL5}	V _{OL5} =V _{SS} +0.05V	3			μA
Segment output current (during DC output)	I _{OH6}	V _{OH6} =0.1·V _{SS}			-200	μA
	I _{OL6}	V _{OL6} =0.9·V _{SS}	200			μA

● Current Consumption

(Unless otherwise specified: V_{DD}=0V, f_{osc}=2MHz, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	ISLP2	During SLEEP, LCD off	V _{SS} =-3.0V no panel load R _{CR} =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	V _{SS} =-5.0V no panel load R _{CR} =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: $V_{DD}=0V$, $V_{SS}=-5.0V$, $R_{CR}=50k\Omega$, $T_a=25^\circ C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency voltage dispersion	$\Delta f/\Delta V_1$	$V_{SS}=-4.5$ to $-5.5V$			20	%
Frequency IC dispersion	$\Delta f/\Delta IC_1$	$V_{SS}=-5V$	-20	(2MHz)	20	%
Oscillation start time	t_{sta}	$V_{SS}=-4.5$ to $-5.5V$		3		mS

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $R_{CR}=39k\Omega$, $T_a=25^\circ C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency voltage dispersion	$\Delta f/\Delta V_1$	$V_{SS}=-2.7$ to $-3.6V$			30	%
Frequency IC dispersion	$\Delta f/\Delta IC_1$	$V_{SS}=-3V$	-20	(2MHz)	20	%
Oscillation start time	t_{sta}	$V_{SS}=-2.7$ to $-3.6V$		3		mS

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