

# **E0C6S37**

## **4-bit Single Chip Microcomputer**



- Core CPU Architecture
- SVD Circuit / Comparator
- Super Low Operating Voltage (0.9V)
- High Quality Display LCD Driver

#### **■ DESCRIPTION**

The E0C6S37 is an advanced single-chip CMOS 4-bit microcomputer consisting of the E0C6200A CMOS 4-bit core CPU. It also contains the ROM, RAM, LCD driver circuit, time base counter and stopwatch counter. The E0C6S37 provides an excellent solution for low-power consumption systems with clock functions.

#### **■ FEATURES**

CMOS LSI 4-bit parallel processing

● ROM capacity ......1,024 words × 12 bits

● RAM capacity ......80 words × 4 bits

• Output port ......4 bits (general purpose port)

2 bits (for buzzer output) : BZ/BZ 4kHz, 2kHz

1 bit (for clock output) : 16kHz, 8kHz, 4kHz, 2kHz

● I/O port ......4 bits

Built-in supply voltage detection (SVD) circuit

Built-in stopwatch timer

● Interrupts ...... External : Input interrupt 1 line
Internal : Timer interrupt 1 line

Stopwatch interrupt 1 line

● Supply voltage ......1.5V/3.0V (Minimum operating voltage: 0.9V/1.8V)

Current consumption .......HALT mode (32.768kHz/3.0V) : 1.0μA (Typ.)
 OPERATING mode (32.768kHz/3.0V) : 2.5μA (Typ.)

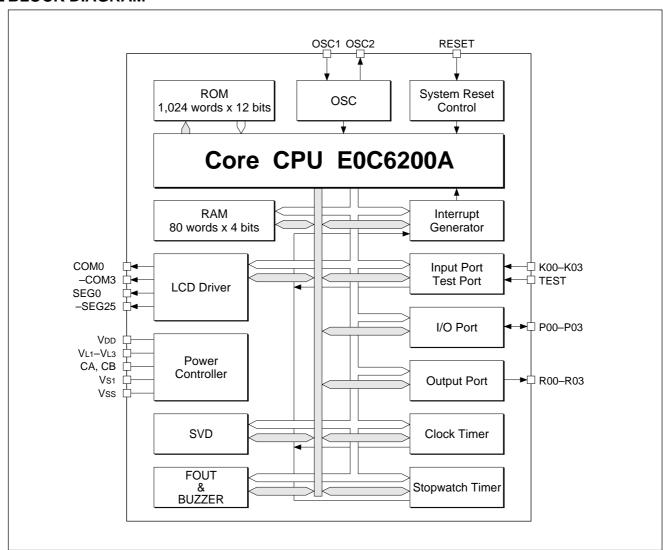
● Package ......QFP6-60pin (plastic)

Die form

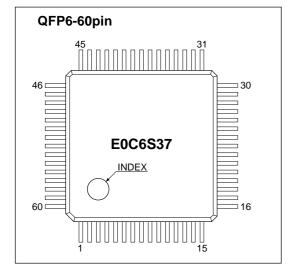
#### **■ LINE UP**

Model	Supply voltage	Clock (oscillation)
E0C6SL37	1.5V (0.9 to 2.0V)	32.768kHz Crystal or 65kHz CR oscillation (Typ.)
E0C6S37	3.0V (1.8 to 3.6V)	32.768kHz Crystal or 65kHz CR oscillation (Typ.)
E0C6SB37	3.0V (0.9 to 3.6V)	32.768kHz Crystal or 65kHz CR oscillation (Typ.)

#### **■ BLOCK DIAGRAM**



#### **■ PIN CONFIGURATION**



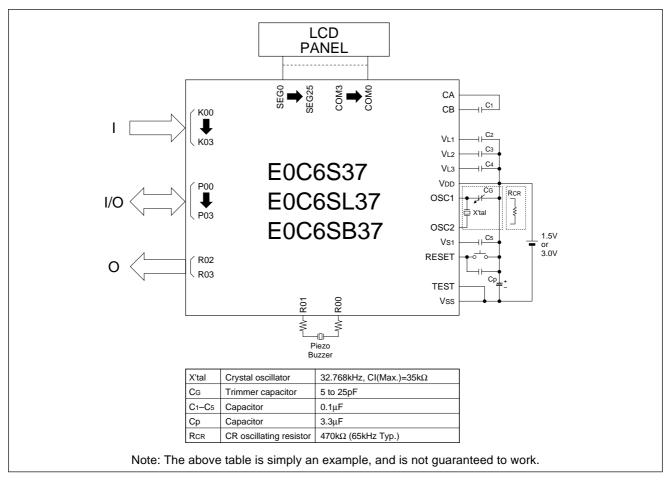
Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name
1	OSC1	16	COM2	31	TEST	46	P01
2	OSC2	17	COM3	32	SEG13	47	P02
3	N.C.	18	SEG0	33	SEG14	48	P03
4	Vs1	19	SEG1	34	SEG15	49	RESET
5	N.C.	20	SEG2	35	SEG16	50	K00
6	CA	21	SEG3	36	SEG17	51	K01
7	СВ	22	SEG4	37	SEG18	52	K02
8	N.C.	23	SEG5	38	SEG19	53	K03
9	N.C.	24	SEG6	39	SEG20	54	R00
10	N.C.	25	SEG7	40	SEG21	55	R01
11	VL1	26	SEG8	41	SEG22	56	R02
12	VL2	27	SEG9	42	SEG23	57	R03
13	VL3	28	SEG10	43	SEG24	58	N.C.
14	COM0	29	SEG11	44	SEG25	59	Vss
15	COM1	30	SEG12	45	P00	60	Vdd
		,		,	NIO	. NI- O-	

N.C.: No Connection

#### **■ PIN DESCRIPTION**

Pin name	Pin No.	I/O	Function
VDD	60	(I)	Power supply pin (+)
Vss	59	(I)	Power supply pin (–)
Vs1	4	0	Oscillation and internal logic system regulated voltage output pin
VL1	11	0	LCD system regulated voltage output pin (-1.05V)
VL2	12	0	LCD system booster voltage output pin (VL1×2)
VL3	13	0	LCD system booster voltage output pin (VL1×3)
CA, CB	6, 7	_	Voltage booster capacitor connecting pin
OSC1	1	I	Crystal oscillation input pin
OSC2	2	0	Crystal oscillation output pin
K00-K03	50–53	I	Input port pin
P00-P03	45–48	I/O	I/O port pin
R00-R03	54–57	0	Output port pin
SEG0-SEG25	18–30, 32–44	0	LCD segment output pin
COM0-COM3	14–17	0	LCD common output pin
RESET	49	I	Initial reset input pin
TEST	31	I	Testing input pin

#### **■ BASIC EXTERNAL CONNECTION DIAGRAM**



#### **■ ELECTRICAL CHARACTERISTICS**

#### Absolute Maximum Ratings

(VDD=0V)

Rating	Symbol	Value	Unit
Supply voltage	Vss	-5.0 to 0.5	V
Input voltage (1)	Vı	Vss - 0.3 to 0.5	V
Input voltage (2)	Viosc	Vss - 0.3 to 0.5	V
Permissible total output current *1	Σlvss	10	mA
Operating temperature	Topr	-20 to 70	ŷ
Storage temperature	Tstg	-65 to 150	°C
Soldering temperature / Time	Tsol	260°C, 10sec (lead section)	_
Permissible dissipation *2	PD	250	mW

<sup>\*1:</sup> The permissible total output current is the sum total of the current (average current) that simultaneously flows from the output pins (or is draw in).

#### Recommended Operating Conditions

**E0C6S37** (Ta=-20 to 70°C)

L0C0331					(1a=-20	10700)
Condition	Symbol	Remark	Min.	Тур.	Max.	Unit
Supply voltage	Vss	VDD=0V	-3.6	-3.0	-1.8	V
Oscillation frequency	fosc1	Crystal oscillation		32.768		kHz
	fosc2	CR oscillation, R=470kΩ	50	65	80	kHz
Booster capacitor	C1		0.1			μF
Capacitor between VDD and VL1	C2		0.1			μF
Capacitor between VDD and VL2	C3		0.1			μF
Capacitor between VDD and VL3	C4		0.1			μF
Capacitor between VDD and Vs1	C5		0.1			μF

**E0C6SL37** (Ta=-20 to 70°C)

					(.u- <u>-</u> 0	
Condition	Symbol	Remark	Min.	Тур.	Max.	Unit
Supply voltage	Vss	VDD=0V *3	-2.0	-1.5	-1.1	V
		VDD=0V, With software control *1	-2.0	-1.5	-0.9 *2	V
Oscillation frequency	fosc1	Crystal oscillation		32.768		kHz
	fosc2	CR oscillation, R=470kΩ	50	65	80	kHz
Booster capacitor	C1		0.1			μF
Capacitor between VDD and VL1	C2		0.1			μF
Capacitor between VDD and VL2	C3		0.1			μF
Capacitor between VDD and VL3	C4		0.1			μF
Capacitor between VDD and Vs1	C5		0.1			μF

<sup>\*1:</sup> When the heavy load protection mode is set by software and the SVD circuit is turned off. Cannot be operated when the CR oscillation circuit is used.

**E0C6SB37** (Ta=-20 to 70°C)

Symbol	Remark	Min.	Тур.	Max.	Unit
Vss	VDD=0V *3	-3.6	-1.5	-1.1	V
	VDD=0V, With software control *1	-3.6	-1.5	-0.9 *2	V
fosc1	Crystal oscillation		32.768		kHz
fosc2	CR oscillation, R=470kΩ	50	65	80	kHz
C1		0.1			μF
C2		0.1			μF
C3		0.1			μF
C4		0.1			μF
C5		0.1			μF
	Vss fosc1 fosc2 C1 C2 C3 C4 C5	Vss         Vpd=0V *3           Vpd=0V, With software control *1           fosc1         Crystal oscillation           fosc2         CR oscillation, R=470kΩ           C1         C2           C3         C4           C5         C5	Vss         Vpd=0V *3         -3.6           Vpd=0V, With software control *1         -3.6           fosc1         Crystal oscillation           fosc2         CR oscillation, R=470kΩ         50           C1         0.1           C2         0.1           C3         0.1           C4         0.1           C5         0.1	Vss         Vpd=0V *3         -3.6         -1.5           Vpd=0V, With software control *1         -3.6         -1.5           fosc1         Crystal oscillation         32.768           fosc2         CR oscillation, R=470kΩ         50         65           C1         0.1         0.1           C2         0.1         0.1           C3         0.1         0.1           C4         0.1         0.1           C5         0.1         0.1	Vss         VpD=0V *3         -3.6         -1.5         -1.1           VpD=0V, With software control *1         -3.6         -1.5         -0.9 *2           fosc1         Crystal oscillation         32.768           fosc2         CR oscillation, R=470kΩ         50         65         80           C1         0.1

<sup>\*1:</sup> When the heavy load protection mode is set by software and the SVD circuit is turned off. Cannot be operated when the CR oscillation circuit is used.

<sup>\*2:</sup> In case of plastic package (QFP6-60pin).

<sup>\*2:</sup> The voltage which can be displayed on the LCD panel will differ according to the characteristics of the LCD panel.

<sup>\*3:</sup> When there is no software control during CR oscillation or crystal oscillation.

<sup>\*2:</sup> The voltage which can be displayed on the LCD panel will differ according to the characteristics of the LCD panel.

<sup>\*3:</sup> When there is no software control during CR oscillation or crystal oscillation.

### DC Characteristics E0C6S37/6SB37

 $(Unless \ otherwise \ specified: \ VDD=0V, \ Vss=-3.0V, \ fosc=32.768kHz, \ Ta=25^{\circ}C, \ Vs1/VL1-VL3 \ are \ internal \ voltage, \ C1-C5=0.1\mu F)$ 

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
High level input voltage (1)	VIH1		K00-K03, P00-P03	0.2•Vss	71	0	V
High level input voltage (2)	VIH2		RESET	0.15•Vss		0	V
Low level input voltage (1)	VIL1		K00-K03, P00-P03	Vss		0.8•Vss	V
Low level input voltage (2)	VIL2		RESET	Vss		0.85•Vss	V
High level input current (1)	liH1	VIH1=0V, No pull down resistor	K00-K03, P00-P03	0		0.5	μΑ
High level input current (2)	IIH2	VIH2=0V, With pull down resistor	K00-K03	10		40	μΑ
High level input current (3)	Інз	Vінз=0V, With pull down resistor	P00-P03	30		100	μΑ
			RESET				
Low level input current	lı∟	VIL=VSS	K00-K03, P00-P03	-0.5		0	μΑ
			RESET, TEST				
High level output current (1)	Іон1	Voh1=0.1•Vss	R02, R03, P00-P03			-1.0	mA
High level output current (2)	Іон2	VoH2=0.1•Vss	R00, R01			-1.0	mA
		(built-in protection resistance)					
Low level output current (1)	IOL1	Vol1=0.9•Vss	R02, R03, P00-P03	3.0			mA
Low level output current (2)	IOL2	Vol2=0.9•Vss	R00, R01	3.0			mA
		(built-in protection resistance)					
Common output current	Іонз	Vонз=-0.05V	COM0-COM3			-3	μΑ
	IOL3	Vol3=Vl3+0.05V		3			μΑ
Segment output current	Іон4	Vон4=-0.05V	SEG0-SEG25			-3	μΑ
(during LCD output)	IOL4	Vol4=Vl3+0.05V		3			μΑ
Segment output current	Іон5	Voн5=0.1•Vss	SEG0-SEG25			-300	μΑ
(during DC output)	IOL5	Vol5=0.9•Vss		300			μΑ

#### E0C6SL37

 $(Unless\ otherwise\ specified:\ Vdd=0V,\ Vss=-1.5V,\ fosc=32.768kHz,\ Ta=25^{\circ}C,\ Vs1/VL1-VL3\ are\ internal\ voltage,\ C1-C5=0.1\mu F)$ 

Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit
High level input voltage (1)	VIH1		K00-K03, P00-P03	0.2•Vss		0	V
High level input voltage (2)	VIH2		RESET	0.15•Vss		0	V
Low level input voltage (1)	VIL1		K00-K03, P00-P03	Vss		0.8•Vss	V
Low level input voltage (2)	VIL2		RESET	Vss		0.85•Vss	V
High level input current (1)	IIH1	VIH1=0V, No pull down resistor	K00-K03, P00-P03	0		0.5	μΑ
High level input current (2)	IIH2	VIH2=0V, With pull down resistor	K00-K03	5.0		20	μΑ
High level input current (3)	Іінз	Vінз=0V, With pull down resistor	P00-P03	9.0		100	μΑ
			RESET				
Low level input current	lıL	VIL=VSS	K00-K03, P00-P03	-0.5		0	μΑ
			RESET, TEST				
High level output current (1)	Іон1	Voh1=0.1•Vss	R02, R03, P00-P03			-200	μΑ
High level output current (2)	Іон2	VoH2=0.1•Vss	R00, R01			-200	μA
		(built-in protection resistance)					
Low level output current (1)	lOL1	Vol1=0.9•Vss	R02, R03, P00-P03	700			μΑ
Low level output current (2)	lOL2	Vol2=0.9•Vss	R00, R01	700			μΑ
		(built-in protection resistance)					
Common output current	Іонз	Vонз=-0.05V	COM0-COM3			-3	μΑ
	IOL3	Vol3=Vl3+0.05V		3			μA
Segment output current	Іон4	VOH4=-0.05V	SEG0-SEG25			-3	μA
(during LCD output)	lOL4	Vol4=Vl3+0.05V		3			μΑ
Segment output current	Іон5	Voh5=0.1•Vss	SEG0-SEG25			-100	μA
(during DC output)	lo <sub>L5</sub>	Vol5=0.9•Vss		130			μA

#### ● Analog Circuit Characteristics and Current Consumption

#### **E0C6S37 (Crystal, Normal Operating Mode)**

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=32.768kHz, Ta=25°C, Cg=25pF, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1µF)

Characteristic	Symbol			Min.		Max.	Unit
Characteristic	Symbol			IVIII I.	Тур.	IVIAX.	Unit
Internal voltage	VL1	Connect 1MΩ load resistor betw	Connect 1MΩ load resistor between VDD and VL1			1,1,0,00	V
		(without panel load)		±•VL2-0.1		2•VL2×0.9	V
	VL2	Connect 1MΩ load resistor betw				-1.95	\/
		(without panel load)				-1.95	V
	VL3	Connect 1MΩ load resistor betw	Connect 1MΩ load resistor between VDD and VL3			3 VL2×0.9	V
		(without panel load)	vithout panel load)			2 12 0.9	V
SVD voltage	Vsvd			-2.55	-2.40	-2.25	V
SVD circuit response time	tsvd					100	μS
Current consumption	Іор	During HALT	Mith and a second		1.0	2.5	μΑ
		During execution *1	Without panel load		2.5	5.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6S37 (Crystal, Heavy Load Protection Mode)

(Unless otherwise specified: Vpp=0V, Vss=-3.0V, fosc=32.768kHz, Ta=25°C, Cg=25pF, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1µF)

Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit
Internal voltage	VL1	Connect 1MΩ load resistor betw (without panel load)	1 •VL2-0.1		1 2•VL2×0.85		
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	,			-1.95	V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	onnect 1MΩ load resistor between Vpp and VL3 vithout panel load)			3 2 VL2×0.85	V
SVD voltage	Vsvd			-2.55	-2.40	-2.25	V
SVD circuit response time	tsvd					100	μS
Current consumption	Іор	During HALT	VAP the section and all leads		2.0	5.5	μΑ
		During execution *1	Without panel load		5.5	10.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6S37 (CR, Normal Operating Mode)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=65kHz, RcR=470kΩ, Ta=25°C, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1μF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	1 VL2-0.1		1 VL2×0.9	V	
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	, ,			-1.95	V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	connect 1MΩ load resistor between Vpp and VL3 without panel load)			3 VL2×0.9	V
SVD voltage	Vsvd			-2.55	-2.40	-2.25	V
SVD circuit response time	tsvd					100	μS
Current consumption	Іор	During HALT	MCd		8.0	15.0	μΑ
		During execution *1	Without panel load		15.0	20.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6S37 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=65kHz, RcR=470kΩ, Ta=25°C, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1μF)

(Offiess offierwise specif	(Offices otherwise specified. VDD=0V, VSS=-3.0V, IOSC=05KHZ, KCR=470K2Z, Ta=25 C, VST/VL1-VL3 are internal voltage, C1-C5=0.1μΓ)									
Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit			
Internal voltage	VL1	Connect 1MΩ load resistor betw	onnect 1MΩ load resistor between VDD and VL1			1 •VL2×0.85	V			
		(without panel load)	nout panel load)			2 12 20.03	V			
	VL2	Connect 1MΩ load resistor betw	ect 1MΩ load resistor between VDD and VL2			-1.95	V			
		(without panel load)	hout panel load)			-1.95	V			
	VL3	Connect 1MΩ load resistor betw	Connect 1MΩ load resistor between VDD and VL3			3 •VL2×0.85	V			
		(without panel load)		3 √VL2-0.1		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	V			
SVD voltage	Vsvd			-2.55	-2.40	-2.25	V			
SVD circuit response time	tsvd					100	μS			
Current consumption	Іор	During HALT	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		16.0	30.0	μΑ			
		During execution *1	Without panel load		30.0	40.0	μΑ			

<sup>\*1:</sup> The SVD circuit is turned off.

#### **E0C6SL37 (Crystal, Normal Operating Mode)**

(Unless otherwise specified: VDD=0V, Vss=-1.5V, fosc=32.768kHz, Ta=25°C, Cg=25pF, Vs1/VL1–VL3 are internal voltage, C1–C5=0.1μF)

Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	-1.15	-1.05	-0.95	V	
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	nnect 1M $\Omega$ load resistor between VDD and VL2 hout panel load)				V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	3•VL1-0.1		3•VL1×0.9	V	
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	ЮР	During HALT	MCds and man all land		1.0	2.5	μΑ
		During execution *1	Without panel load		2.5	5.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SL37 (Crystal, Heavy Load Protection Mode)

(Unless otherwise specified: VDD=0V, Vss=-1.5V, fosc=32.768kHz,  $Ta=25^{\circ}C$ , Cg=25pF, Vs1/VL1-VL3 are internal voltage,  $C1-C5=0.1\mu F$ )

Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	onnect 1MΩ load resistor between V <sub>DD</sub> and V <sub>L1</sub> vithout panel load)				V
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	nnect 1M $\Omega$ load resistor between V <sub>DD</sub> and V <sub>L2</sub> thout panel load)				V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	Connect 1MΩ load resistor between V <sub>DD</sub> and V <sub>L3</sub> without panel load)			3•VL1×0.85	V
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	ЮР	During HALT	MCth and a small band		2.0	5.5	μΑ
		During execution *1	Without panel load		5.5	10.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SL37 (CR, Normal Operating Mode)

(Unless otherwise specified: VpD=0V, Vss=-1.5V, fosc=65kHz, Rcr=470kΩ, Ta=25°C, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1μF)

Characteristic	Symbol	Condition	Condition		Тур.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	connect $1M\Omega$ load resistor between VDD and VL1 vithout panel load)			-0.95	٧
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	nnect 1M $\Omega$ load resistor between VDD and VL2 hout panel load)				V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	3•VL1-0.1		3•VL1×0.9	٧	
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	Іор	During HALT	MCds and man all land		8.0	15.0	μΑ
		During execution *1	Without panel load		15.0	20.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SL37 (CR, Heavy Load Protection Mode)

(Unless otherwise specif	iea: VDD=	0V, $VSS=-1.5V$ , $IOSC=65KHZ$ , $RCR$	=470K12, Ta=25°C, VS1	i/vl1–vl3 are	e internai vo	itage, C1-Ct	$0=0.1\mu$ F)
Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit
Internal voltage	VL1	Connect 1MΩ load resistor between	een VDD and VL1	-1.15	-1.05	-0.95	V
		(without panel load)	ect 1MΩ load resistor between VDD and VL2			-0.95	V
	VL2	Connect 1MΩ load resistor between				2•VL1×0.85	V
		(without panel load)				240110.05	v
	VL3	Connect 1MΩ load resistor between	een VDD and VL3	3•VL1-0.1		3•VL1×0.85	V
		(without panel load)		3°VL1-0.1		3°VL1×0.03	V
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	ЮР	During HALT	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		16.0	30.0	μΑ
		During execution *1	Without panel load		30.0	40.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SB37 (Crystal, Normal Operating Mode)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=32.768kHz, Ta=25°C, Cg=25pF, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1µF)

Characteristic	Symbol	Condition	Condition			Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	-1.15	-1.05	-0.95	٧	
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	nect 1MΩ load resistor between VDD and VL2 nout panel load)				V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	Connect 1MΩ load resistor between VDD and VL3 without panel load)				V
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	ЮР	During HALT	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		1.0	2.5	μΑ
		During execution *1	Without panel load		2.5	5.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SB37 (Crystal, Heavy Load Protection Mode)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=32.768kHz, Ta=25°C, Cg=25pF, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1µF)

(Offices offici wise specific	(Offices officially specified: VDD=0V, VSS= 5.0V, 103C=32.700K112, Ta=25 O, OG=25pi , VSI/VE1 VES are internal voltage, OT OS=0.1µi )									
Characteristic	Symbol	Condition	Condition			Max.	Unit			
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	-1.15	-1.05	-0.95	V				
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	Connect 1MΩ load resistor between VDD and VL3			2•VL1×0.85	V			
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)				3•VL1×0.85	V			
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V			
SVD circuit response time	tsvd					100	μS			
Current consumption	Іор	During HALT	MCth and a small band		2.0	5.5	μΑ			
		During execution *1	Without panel load		5.5	10.0	μΑ			

<sup>\*1:</sup> The SVD circuit is turned off.

#### **E0C6SB37 (CR, Normal Operating Mode)**

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=65kHz, Rcr=470k $\Omega$ , Ta=25°C, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1 $\mu$ F)

Characteristic	Symbol	Condition	Condition			Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	,			-0.95	V
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	nect 1MΩ load resistor between V <sub>DD</sub> and V <sub>L2</sub> out panel load)				V
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)	Connect 1MΩ load resistor between Vpp and VL3 without panel load)			3•VL1×0.9	V
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V
SVD circuit response time	tsvd					100	μS
Current consumption	Іор	During HALT	MCth and man alliand		8.0	15.0	μΑ
		During execution *1	Without panel load		15.0	20.0	μΑ

<sup>\*1:</sup> The SVD circuit is turned off.

#### E0C6SB37 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, fosc=65kHz, RcR=470kΩ, Ta=25°C, Vs1/VL1-VL3 are internal voltage, C1-C5=0.1μF)

(Offices officiwise specif	(Offices) Office wise specified. VDD=0V, V33=-3.0V, 103C=03K11Z, 10K=470K2Z, 14=20 C, V31/VL1=VL3 are internal voltage, C1=C0=0.1µ1/J									
Characteristic	Symbol	Condition		Min.	Тур.	Max.	Unit			
Internal voltage	VL1	Connect $1M\Omega$ load resistor betw (without panel load)	-1.15	-1.05	-0.95	V				
	VL2	Connect $1M\Omega$ load resistor betw (without panel load)	connect 1MΩ load resistor between VDD and VL3			2•VL1×0.85	V			
	VL3	Connect $1M\Omega$ load resistor betw (without panel load)				3•VL1×0.85	V			
SVD voltage	Vsvd			-1.30	-1.20	-1.10	V			
SVD circuit response time	tsvd					100	μS			
Current consumption	Іор	During HALT	Mith and man all land		16.0	30.0	μΑ			
		During execution *1	Without panel load		30.0	40.0	μΑ			

<sup>\*1:</sup> The SVD circuit is turned off.

#### Oscillation Characteristics

The oscillation characteristics change depending on the conditions (components used, board pattern, etc.). Use the following characteristics as reference values.

#### E0C6S37 (Crystal)

(Unless otherwise specified: VDD=0V, VSS=-3.0V, Crystal: C-002R (CI=35kΩ), CG=25pF, CD=built-in, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Тур.	Max.	Unit
Oscillation start voltage	Vsta	tsta≤5sec (Vss)	-1.8			V
Oscillation stop voltage	Vstp	tstp≤10sec (Vss)	-1.8			V
Built-in capacitance (drain)	CD	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	∂f/∂V	Vss=-1.8 to -3.6V			5	ppm
Frequency/IC deviation	∂f/∂IC		-10		10	ppm
Frequency adjustment range	∂f/∂Cg	CG=5 to 25pF	40			ppm
Harmonic oscillation start voltage	Vhho	Cg=5pF (Vss)			-3.6	V
Permitted leak resistance	Rleak	Between OSC1 and VDD	200			ΜΩ

#### E0C6SL37 (Crystal)

 $(Unless \ otherwise \ specified: \ VdD=0V, \ Vss=-1.5V, \ Crystal: \ C-002R \ (Cl=35k\Omega), \ Cg=25pF, \ CD=built-in, \ Ta=25^{\circ}C)$ 

Characteristic	Symbol	Condition	Ì	Min.	Тур.	Max.	Unit
Oscillation start voltage	Vsta	tsta≤5sec (Vs	s)	-1.1			V
Oscillation stop voltage	Vstp	tstp≤10sec (Vs	s) -	1.1(-0.9)*1			V
Built-in capacitance (drain)	CD	Including the parasitic capacity inside the IC			20		pF
Frequency/voltage deviation	∂f/∂V	Vss=-1.1 to -2.0V (-0.9) *1				5	ppm
Frequency/IC deviation	∂f/∂IC			-10		10	ppm
Frequency adjustment range	∂f/∂Cg	CG=5 to 25pF		40			ppm
Harmonic oscillation start voltage	Vhho	Cg=5pF (Vs	s)			-2.0	V
Permitted leak resistance	Rleak	Between OSC1 and VDD		200			ΜΩ

<sup>\*1:</sup> Items enclosed in parentheses () are those used when operating at heavy load protection mode.

E0C6SB37 (Crystal)						
(Unless	otherwis	e specified: VDD=0V, Vss=-3.0V, Crystal: C-002R	$(C_1=35k\Omega), C_2$	G=25pF, C	D=built-in, T	a=25°C)
Characteristic	Symbol	Condition	Min.	Тур.	Max.	Unit
Oscillation start voltage	Vsta	tsta≤5sec (Vss)	-1.1			V
Oscillation stop voltage	Vstp	tstp≤10sec (Vss)	-1.1(-0.9)*1			V
Built-in capacitance (drain)	CD	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	∂f/∂V	Vss=-1.1 to -3.6V (-0.9) *1			5	ppm
Frequency/IC deviation	∂f/∂IC		-10		10	ppm
Frequency adjustment range	∂f/∂Cg	Cg=5 to 25pF	40			ppm
Harmonic oscillation start voltage	Vhho	Cg=5pF (Vss)			-3.6	V
Permitted leak resistance	Rleak	Between OSC1 and VDD	200			MΩ

<sup>\*1:</sup> Items enclosed in parentheses ( ) are those used when operating at heavy load protection mode.

#### E0C6S37 (CR)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, RcR=470kΩ, Ta=25°C)

		(0000 00. 0.000 00		,		~ <b>-</b> 0 0,
Characteristic	Symbol	Condition	Min.	Тур.	Max.	Unit
Oscillation frequency dispersion	fosc		-20	65kHz	20	%
Oscillation start voltage	Vsta	(Vss)	-1.8			V
Oscillation start time	tsta	Vss=-1.8 to -3.6V		3		mS
Oscillation stop voltage	Vstp	(Vss)	-1.8			V

#### E0C6SL37 (CR)

(Unless otherwise specified: VDD=0V, Vss=-1.5V, RcR=470kΩ, Ta=25°C)

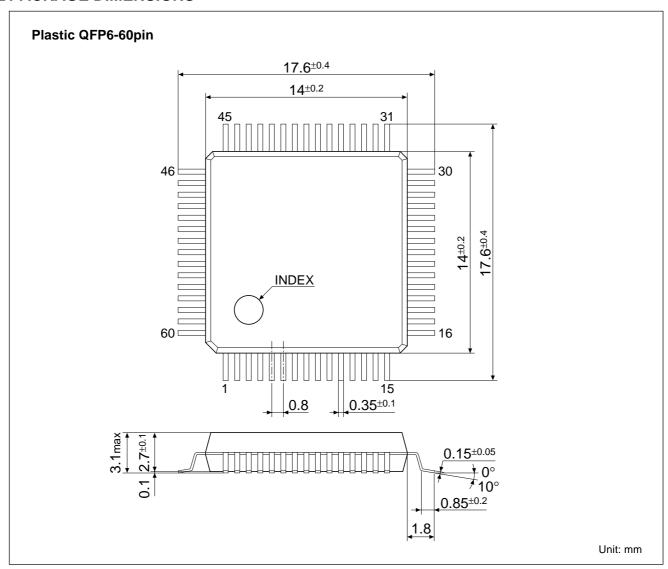
Characteristic	Symbol	Condition	Min.	Тур.	Max.	Unit
Oscillation frequency dispersion	fosc		-20	65kHz	20	%
Oscillation start voltage	Vsta	(Vss)	-1.1			V
Oscillation start time	tsta	Vss=-1.1 to -2.0V		3		mS
Oscillation stop voltage	Vstp	(Vss)	-1.1			V

#### E0C6SB37 (CR)

(Unless otherwise specified: VDD=0V, Vss=-3.0V, RcR=470kΩ, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Тур.	Max.	Unit
Oscillation frequency dispersion	fosc		-20	65kHz	20	%
Oscillation start voltage	Vsta	(Vss	-1.1			V
Oscillation start time	tsta	Vss=-1.1 to -3.6V		3		mS
Oscillation stop voltage	Vstp	(Vss	-1.1			V

#### **■ PACKAGE DIMENSIONS**



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