EPSON

Micro MINI S1C60N01

4-bit Single Chip Microcomputer

Low Voltage Operation Products

- S1C6200B Core CPU
- Low Voltage and Low Power
- Built-in LCD Driver
- Low Cost Performance

■ DESCRIPTION

Micro MINI "S1C60N01" 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 S1C6200B, LCD driver (20 segments × 4 commons), 80 words RAM, 1K words ROM, clock timer and so on.

■ CONFIGURATION

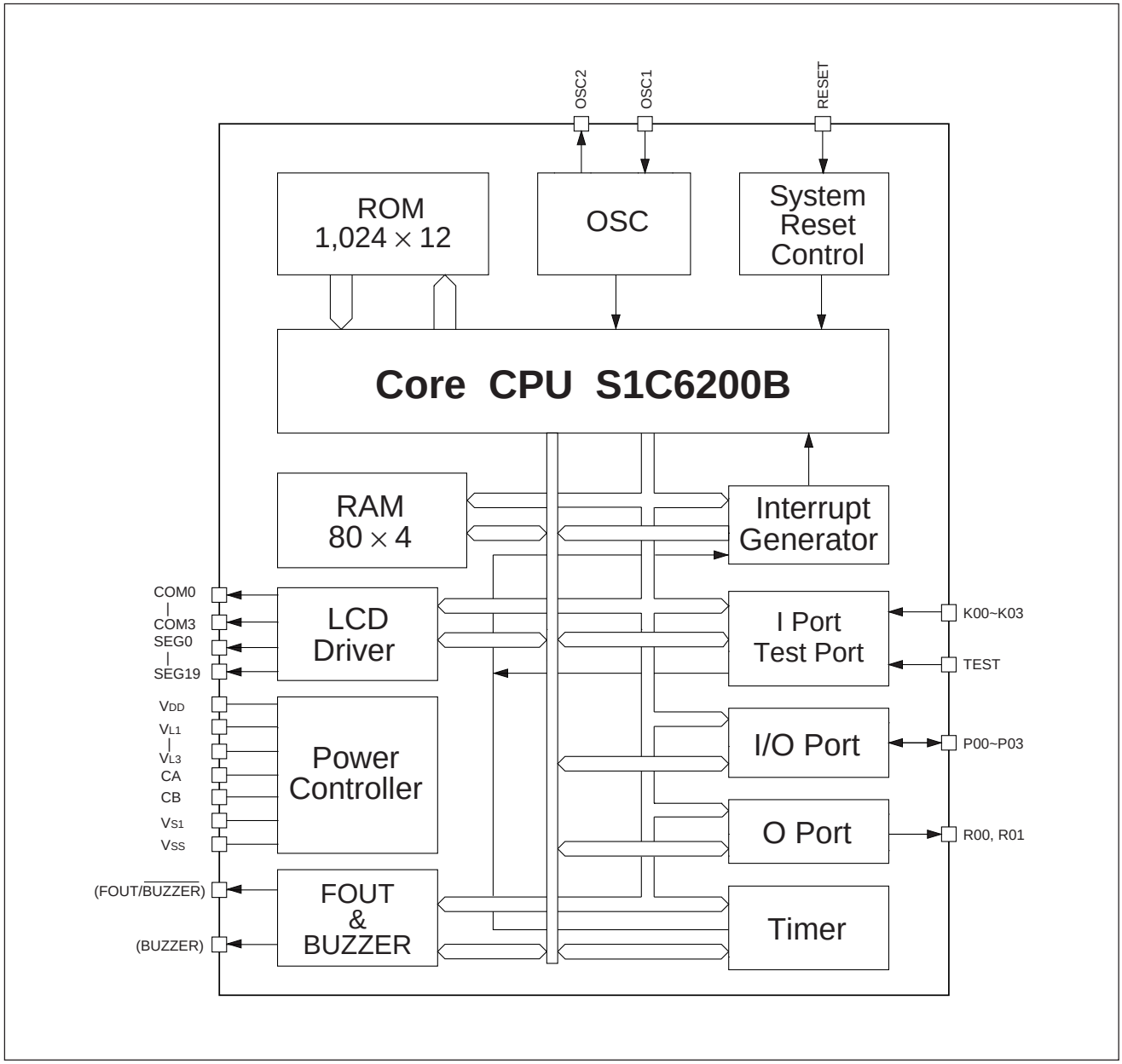
The S1C60N01 Series are configured as follows, depending on the supply voltage.

Model	Supply Voltage	Supply Voltage Range	Oscillation Circuits
S1C60N01	3.0 V	1.8–3.6 V	Crystal or CR
S1C60L01	1.5 V	1.2–2.0 V	Crystal or CR

■ FEATURES

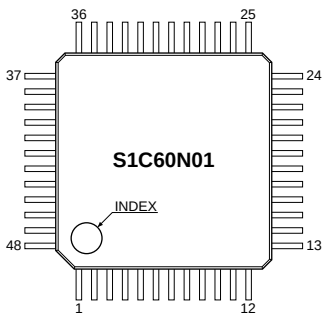
- Core CPU S1C6200B
- Built-in oscillation circuit ..... Crystal or CR oscillation circuit, 32.768 kHz (typ.)
- Instruction set ..... 100 instructions
- ROM capacity ..... 1,024 words × 12 bits
- RAM capacity ..... 80 words × 4 bits
- Input port ..... 4 bits (Supplementary pull-down resistors may be used)
- Output port ..... 2 bits (Piezo buzzer and programmable frequency output can be driven directry by mask option)
- Input/output port ..... 4 bits
- LCD driver ..... 20 segments × 4, 3 or 2 common duty
- Timer ..... 1 system: clock timer
- Interrupts:
  External interrupt ..... Input port interrupt 1 system
  Internal interrupt ..... Timer interrupt 1 system
- Supply voltage ..... 1.5 V (1.2–2.0 V) S1C60L01
  3.0 V (1.8–3.6 V) S1C60N01
- Current consumption (typ.) ..... 1.0 µA (Crystal oscillation CLK = 32.768 kHz, when halted)
  2.5 µA (Crystal oscillation CLK = 32.768 kHz, when executing)
- Supply form ..... QFP12-48pin (plastic) or chip

■ BLOCK DIAGRAM



■ PIN CONFIGURATION

QFP12-48pin



No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name
1	OSC2	13	R01	25	TEST	37	COM0
2	V_{S1}	14	R00	26	RESET	38	COM1
3	N.C.	15	SEG19	27	SEG9	39	COM2
4	P00	16	SEG18	28	SEG8	40	COM3
5	P01	17	SEG17	29	SEG7	41	V_{L3}
6	P02	18	SEG16	30	SEG6	42	V_{L2}
7	P03	19	SEG15	31	SEG5	43	V_{L1}
8	K00	20	SEG14	32	SEG4	44	CA
9	K01	21	SEG13	33	SEG3	45	CB
10	K02	22	SEG12	34	SEG2	46	V_{SS}
11	K03	23	SEG11	35	SEG1	47	V_{DD}
12	N.C.	24	SEG10	36	SEG0	48	OSC1

N.C. = No Connection

■ PIN DESCRIPTION

Pin name	Pin No.	In/Out	Function
V_{DD}	47	(I)	Power source (+) terminal
V_{SS}	46	(I)	Power source (-) terminal
V_{S1}	2	O	Oscillation and internal logic system regulated voltage output terminal
V_{L1}	43	O	LCD system reducer output terminal ($V_{L2} \times 1/2$) / LCD system reducer output terminal ($V_{L3} \times 1/3$)
V_{L2}	42	O	LCD system booster output terminal ($V_{L1} \times 2$) / LCD system reducer output terminal ($V_{L3} \times 2/3$)
V_{L3}	41	O	LCD system booster output terminal ($V_{L1} \times 3$) / LCD system booster output terminal ($V_{L2} \times 3/2$)
CA, CB	44, 45	–	Booster capacitor connecting terminal
OSC1	48	I	Crystal or CR oscillation input terminal
OSC2	1	O	Crystal or CR oscillation output terminal
K00–K03	8–11	I	Input terminal
P00–P03	4–7	I/O	I/O terminal
R00, R01	14, 13	O	Output terminal
SEG0–19	36–27 24–15	O	LCD segment output terminal (convertible to DC output terminal by mask option)
COM0–3	37–40	O	LCD common output terminal
RESET	26	I	Initial setting input terminal
TEST	25	I	Test input terminal

■ OPTION LIST

1. DEVICE TYPE AND LCD VOLTAGE
   - ☐ 1. E0C6001 (Normal Type <S1C60N01>) LCD 3 V
   - ☐ 2. E0C6001 (Normal Type <S1C60N01>) LCD 4.5 V
   - ☐ 3. E0C60L01 (Low Power Type <S1C60L01>) LCD 3 V
   - ☐ 4. E0C60L01 (Low Power Type <S1C60L01>) LCD 4.5 V

2. MULTIPLE KEY ENTRY RESET
   - • COMBINATION ..... ☐ 1. Not Use
     - ☐ 2. Use K00, K01
     - ☐ 3. Use K00, K01, K02
     - ☐ 4. Use K00, K01, K02, K03

3. INTERRUPT NOISE REJECTOR
   - • K00–K03 ..... ☐ 1. Use ☐ 2. Not Use

4. INPUT PORT PULL DOWN RESISTOR
   - • K00 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
   - • K01 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
   - • K02 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
   - • K03 ..... ☐ 1. With Resistor ☐ 2. Gate Direct

5. R00 SPECIFICATION
   - • OUTPUT TYPE ..... ☐ 1. DC Output
     - ☐ 2. Buzzer Inverted Output (R00 Control)
     - ☐ 3. Buzzer Inverted Output (R01 Control)
     - ☐ 4. FOUT Output
   - • FOUT OUTPUT SPACIFICATION

F1	F2 .....
☐ 1. 256[Hz]	☐ 1. 512[Hz]
☐ 2. 512[Hz]	☐ 2. 1,024[Hz]
☐ 3. 1,024[Hz]	☐ 3. 2,048[Hz]
☐ 4. 2,048[Hz]	☐ 4. 4,096[Hz]
☐ 5. 4,096[Hz]	☐ 5. 8,192[Hz]

F3 ..... ☐ 1. 1,024[Hz] F4 ..... ☐ 1. 2,048[Hz]
☐ 2. 2,048[Hz] ☐ 2. 4,096[Hz]
☐ 3. 4,096[Hz] ☐ 3. 8,192[Hz]
☐ 4. 8,192[Hz] ☐ 4. 16,384[Hz]
☐ 5. 16,384[Hz] ☐ 5. 32,768[Hz]

• OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Pch-Open Drain

6. R01 SPECIFICATION
• OUTPUT TYPE ..... ☐ 1. DC Output ☐ 2. Buzzer Output
• OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Pch-Open Drain

7. I/O PORT SPECIFICATION
• P00 ..... ☐ 1. Complementary ☐ 2. Pch-Open Drain
• P01 ..... ☐ 1. Complementary ☐ 2. Pch-Open Drain
• P02 ..... ☐ 1. Complementary ☐ 2. Pch-Open Drain
• P03 ..... ☐ 1. Complementary ☐ 2. Pch-Open Drain

8. LCD COMMON DUTY AND BIAS
☐ 1. 1/4 Duty 1/3 Bias
☐ 2. 1/3 Duty 1/3 Bias
☐ 3. 1/2 Duty 1/3 Bias
☐ 4. 1/4 Duty 1/2 Bias
☐ 5. 1/3 Duty 1/2 Bias
☐ 6. 1/2 Duty 1/2 Bias

9. OSC1 SYSTEM CLOCK
☐ 1. Crystal
☐ 2. CR

■ ELECTRICAL CHARACTERISTICS

● Absolute Maximum Ratings

(V_{DD}=0V)

Rating	Symbol	Value	Unit
Power voltage	V_{SS}	-5.0 to 0.5	V
Input voltage (1)	V_I	V_{SS} - 0.3 to 0.5	V
Input voltage (2)	V_{IOSC}	V_{SS} - 0.3 to 0.5	V
Permissible total output current *1	ΣI_{VSS}	10	mA
Operating temperature	Topr	-20 to 70	°C
Storage temperature	Tstg	-65 to 150	°C
Soldering temperature / Time	Tsol	260°C, 10sec (lead section)	–
Allowable 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 draw in).
∗2: In case of plastic package (QFP12-48pin).

● Recommended Operating Conditions

S1C60N01

(Ta=-20 to 70°C)

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Power voltage	V_{SS}	V_{DD}=0V	-3.6	-3.0	-1.8	V
Oscillation frequency	f_{OSC1}	Crystal oscillation		32.768		kHz
	f_{OSC2}	CR oscillation, R=470kΩ	50	65	80	kHz
Booster capacitor	C1		0.1			µF
Capacitor between V_{DD} and V_{L1}	C2		0.1			µF
Capacitor between V_{DD} and V_{L2}	C3		0.1			µF
Capacitor between V_{DD} and V_{L3}	C4		0.1			µF
Capacitor between V_{DD} and V_{S1}	C5		0.1			µF

S1C60L01

(Ta=-20 to 70°C)

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Power voltage	V_{SS}	V_{DD}=0V	-2.0	-1.5	-1.2	V
Oscillation frequency	f_{OSC1}	Crystal oscillation		32.768	80	kHz
	f_{OSC2}	CR oscillation, R=470kΩ	50	65		kHz
Booster capacitor	C1		0.1			µF
Capacitor between V_{DD} and V_{L1}	C2		0.1			µF
Capacitor between V_{DD} and V_{L2}	C3		0.1			µF
Capacitor between V_{DD} and V_{L3}	C4		0.1			µF
Capacitor between V_{DD} and V_{S1}	C5		0.1			µF

● DC Characteristics

S1C60N01

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC}=32.768kHz, Ta=25°C, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
High level input voltage (1)	V_{IH1}		K00–K03, P00–P03	0.2•V_{SS}		0	V
High level input voltage (2)	V_{IH2}		RESET	0.15•V_{SS}		0	V
Low level input voltage (1)	V_{IL1}		K00–K03, P00–P03	V_{SS}		0.8•V_{SS}	V
Low level input voltage (2)	V_{IL2}		RESET	V_{SS}		0.85•V_{SS}	V
High level input current (1)	I_{IH1}	V_{IH1}=0V, No pull down resistor	K00–K03, P00–P03	0		0.5	µA
High level input current (2)	I_{IH2}	V_{IH2}=0V, With pull down resistor	K00–K03	10		40	µA
High level input current (3)	I_{IH3}	V_{IH3}=0V, With pull down resistor	P00–P03 RESET	30		100	µA
Low level input current	I_{IL}	V_{IL}=V_{SS}	K00–K03, P00–P03 RESET, TEST	-0.5		0	µA
High level output current (1)	I_{OH1}	V_{OH1}=0.1•V_{SS}	P00–P03			-1.0	mA
High level output current (2)	I_{OH2}	V_{OH2}=0.1•V_{SS} (built-in protection resistance)	R00, R01			-1.0	mA
Low level output current (1)	I_{OL1}	V_{OL1}=0.9•V_{SS}	P00–P03	3.0			mA
Low level output current (2)	I_{OL2}	V_{OL2}=0.9•V_{SS} (built-in protection resistance)	R00, R01	3.0			mA
Common output current	I_{OH3}	V_{OH3}=-0.05V	COM0–COM3			-3	µA
	I_{OL3}	V_{OL3}=V_{L3}+0.05V		3			µA
Segment output current (during LCD output)	I_{OH4}	V_{OH4}=-0.05V	SEG0–SEG19			-3	µA
	I_{OL4}	V_{OL4}=V_{L3}+0.05V		3			µA
Segment output current (during DC output)	I_{OH5}	V_{OH5}=0.1•V_{SS}	SEG0–SEG19			-300	µA
	I_{OL5}	V_{OL5}=0.9•V_{SS}		300			µA

S1C60L01

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, f_{OSC}=32.768kHz, Ta=25°C, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
High level input voltage (1)	V_{IH1}		K00–K03, P00–P03	0.2•V_{SS}		0	V
High level input voltage (2)	V_{IH2}		RESET	0.15•V_{SS}		0	V
Low level input voltage (1)	V_{IL1}		K00–K03, P00–P03	V_{SS}		0.8•V_{SS}	V
Low level input voltage (2)	V_{IL2}		RESET	V_{SS}		0.85•V_{SS}	V
High level input current (1)	I_{IH1}	V_{IH1}=0V, No pull down resistor	K00–K03, P00–P03	0		0.5	µA
High level input current (2)	I_{IH2}	V_{IH2}=0V, With pull down resistor	K00–K03	5.0		20	µA
High level input current (3)	I_{IH3}	V_{IH3}=0V, With pull down resistor	P00–P03 RESET	9.0		100	µA
Low level input current	I_{IL}	V_{IL}=V_{SS}	K00–K03, P00–P03 RESET, TEST	-0.5		0	µA
High level output current (1)	I_{OH1}	V_{OH1}=0.1•V_{SS}	P00–P03			-200	µA
High level output current (2)	I_{OH2}	V_{OH2}=0.1•V_{SS} (built-in protection resistance)	R00, R01			-200	µA
Low level output current (1)	I_{OL1}	V_{OL1}=0.9•V_{SS}	P00–P03	700			µA
Low level output current (2)	I_{OL2}	V_{OL2}=0.9•V_{SS} (built-in protection resistance)	R00, R01	700			µA
Common output current	I_{OH3}	V_{OH3}=-0.05V	COM0–COM3			-3	µA
	I_{OL3}	V_{OL3}=V_{L3}+0.05V		3			µA
Segment output current (during LCD output)	I_{OH4}	V_{OH4}=-0.05V	SEG0–SEG19			-3	µA
	I_{OL4}	V_{OL4}=V_{L3}+0.05V		3			µA
Segment output current (during DC output)	I_{OH5}	V_{OH5}=0.1•V_{SS}	SEG0–SEG19			-100	µA
	I_{OL5}	V_{OL5}=0.9•V_{SS}		130			µA

● Analog Circuit Characteristics and Current Consumption

S1C60N01 (Normal Operating Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC}=32.768kHz (crystal oscillation), Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)		1/2•V_{L2} -0.1		1/2•V_{L2} ×0.9	V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)			V_{SS}		V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3/2•V_{L2} -0.1		3/2•V_{L2} ×0.9	V
Power current consumption	I_{OP}	During HALT	Without panel load		1.0	2.5	µA
		During execution			2.5	5.0	µA

S1C60N01 (Heavy Load Protection Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC}=32.768kHz (crystal oscillation), Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)		1/2•V_{L2} -0.1		1/2•V_{L2} ×0.85	V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)			V_{SS}		V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3/2•V_{L2} -0.1		3/2•V_{L2} ×0.85	V
Power current consumption	I_{OP}	During HALT	Without panel load		2.0	5.5	µA
		During execution			5.5	10.0	µA

S1C60L01 (Normal Operating Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, f_{OSC}=32.768kHz (crystal oscillation), Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)			V_{SS}		V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)		2•V_{L1} -0.1		2•V_{L1} ×0.9	V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3•V_{L1} -0.1		3•V_{L1} ×0.9	V
Power current consumption	I_{OP}	During HALT	Without panel load		1.0	2.5	µA
		During execution			2.5	5.0	µA

S1C60L01 (Heavy Load Protection Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, f_{OSC}=32.768kHz (crystal oscillation), Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)			V_{SS}		V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)		2•V_{L1} -0.1		2•V_{L1} ×0.85	V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3•V_{L1} -0.1		3•V_{L1} ×0.85	V
Power current consumption	I_{OP}	During HALT	Without panel load		2.0	5.5	µA
		During execution			5.5	10.0	µA

S1C60N01 (CR, Normal Operating Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC}=65kHz, Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF, Recommended external resistance for CR oscillation=470kΩ)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)		1/2•V_{L2} -0.1		1/2•V_{L2} ×0.9	V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)			V_{SS}		V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3/2•V_{L2} -0.1		3/2•V_{L2} ×0.9	V
Power current consumption	I_{OP}	During HALT	Without panel load		8.0	15.0	µA
		During execution			15.0	20.0	µA

S1C60N01 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC}=65kHz, Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF, Recommended external resistance for CR oscillation=470kΩ)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)		1/2•V_{L2} -0.1		1/2•V_{L2} ×0.85	V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)			V_{SS}		V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3/2•V_{L2} -0.1		3/2•V_{L2} ×0.85	V
Power current consumption	I_{OP}	During HALT	Without panel load		16.0	30.0	µA
		During execution			30.0	40.0	µA

S1C60L01 (CR, Normal Operating Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, f_{OSC}=65kHz, Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF, Recommended external resistance for CR oscillation=470kΩ)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)			V_{SS}		V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)		2•V_{L1} -0.1		2•V_{L1} ×0.9	V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3•V_{L1} -0.1		3•V_{L1} ×0.9	V
Power current consumption	I_{OP}	During HALT	Without panel load		8.0	15.0	µA
		During execution			15.0	20.0	µA

S1C60L01 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, f_{OSC}=65kHz, Ta=25°C, C_G=25pF, V_{S1}/V_{L1}–V_{L3} are internal voltage, C_1–C_5=0.1µF, Recommended external resistance for CR oscillation=470kΩ)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect 1MΩ load resistor between V_{DD} and V_{L1} (without panel load)			V_{SS}		V
	V_{L2}	Connect 1MΩ load resistor between V_{DD} and V_{L2} (without panel load)		2•V_{L1} -0.1		2•V_{L1} ×0.85	V
	V_{L3}	Connect 1MΩ load resistor between V_{DD} and V_{L3} (without panel load)		3•V_{L1} -0.1		3•V_{L1} ×0.85	V
Power current consumption	I_{OP}	During HALT	Without panel load		16.0	30.0	µA
		During execution			30.0	40.0	µA

● Oscillation Characteristics

Oscillation characteristics will vary according to different conditions. Use the following characteristics are as reference values.

S1C60N01

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, Crystal: Q13MC146, C_G=25pF, C_D=built-in, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start voltage	Vsta	tsta≤5sec (V_{SS})	-1.8			V
Oscillation stop voltage	Vstp	tstp≤10sec (V_{SS})	-1.8			V
Built-in capacitance (drain)	C_D	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	∂f/∂V	V_{SS}=-1.8 to -3.6V			5	ppm
Frequency/IC deviation	∂f/∂IC		-10		10	ppm
Frequency adjustment range	∂f/∂C_G	C_G=5 to 25pF	40			ppm
Harmonic oscillation start voltage	V_{hho}	C_G=5pF (V_{SS})			-3.6	V
Allowable leak resistance	R_{leak}	Between OSC1 and V_{DD}	200			MΩ

S1C60L01

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, Crystal: Q13MC146, C_G=25pF, C_D=built-in, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start voltage	Vsta	tsta≤5sec (V_{SS})	-1.2			V
Oscillation stop voltage	Vstp	tstp≤10sec (V_{SS})	-1.2			V
Built-in capacitance (drain)	C_D	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	∂f/∂V	V_{SS}=-1.2 to -2.0V			5	ppm
Frequency/IC deviation	∂f/∂IC		-10		10	ppm
Frequency adjustment range	∂f/∂C_G	C_G=5 to 25pF	40			ppm
Harmonic oscillation start voltage	V_{hho}	C_G=5pF (V_{SS})			-2.0	V
Allowable leak resistance	R_{leak}	Between OSC1 and V_{DD}	200			MΩ

S1C60N01 (CR)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, R_{CR}=470kΩ, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	f_{OSC}		-20	65kHz	20	%
Oscillation start voltage	Vsta		-1.8			V
Oscillation start time	tsta	V_{SS}=-1.8 to -3.6V		3		mS
Oscillation stop voltage	Vstp		-1.8			V

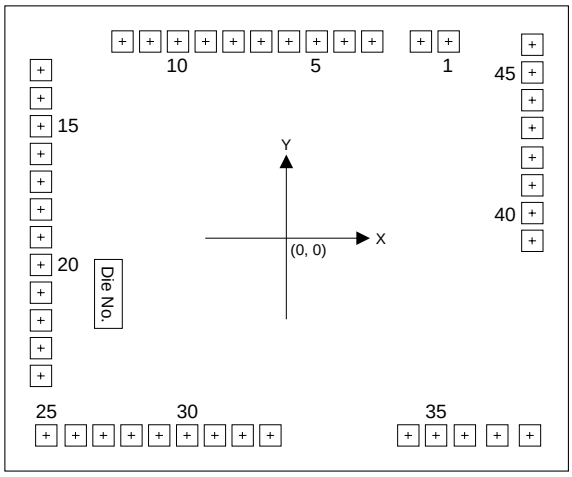
S1C60L01 (CR)

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-1.5V, R_{CR}=470kΩ, Ta=25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	f_{OSC}		-20	65kHz	20	%
Oscillation start voltage	Vsta		-1.2			V
Oscillation start time	tsta	V_{SS}=-1.2 to -2.0V		3		mS
Oscillation stop voltage	Vstp		-1.2			V

■ PAD LAYOUT

● Diagram of Pad Layout



Chip size: 2,640 µm (X) x 2,180 µm (Y)

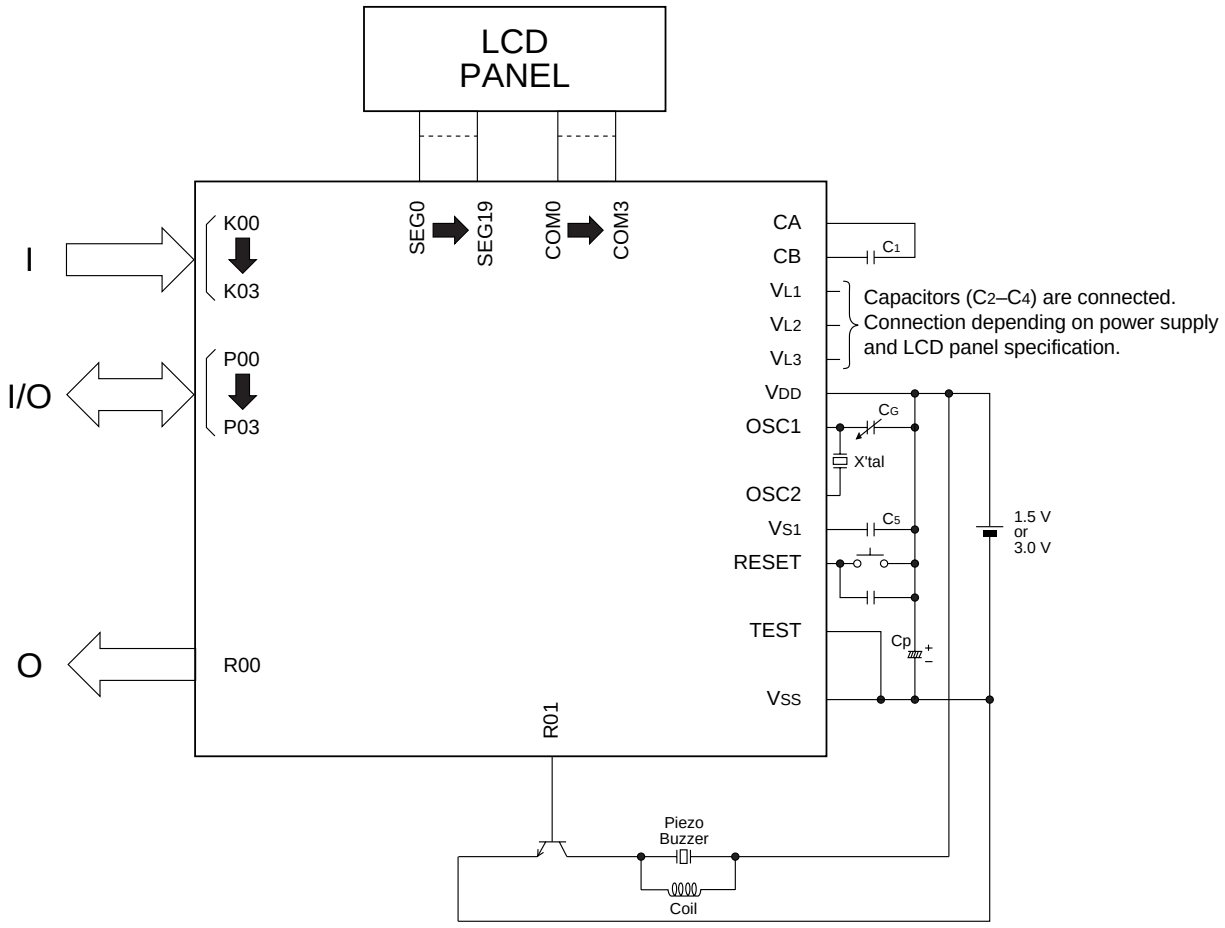
● Pad Coordinates

Pad No.	Pad name	X	Y	Pad No.	Pad name	X	Y
1	R01	759	923	24	SEG0	-1,151	-644
2	R00	629	923	25	COM0	-1,126	-923
3	SEG19	401	923	26	COM1	-988	-923
4	SEG18	271	923	27	COM2	-858	-923
5	SEG17	141	923	28	COM3	-727	-923
6	SEG16	11	923	29	V_{L3}	-597	-923
7	SEG15	-119	923	30	V_{L2}	-466	-923
8	SEG14	-249	923	31	V_{L1}	-336	-923
9	SEG13	-379	923	32	CA	-206	-923
10	SEG12	-509	923	33	CB	-76	-923
11	SEG11	-639	923	34	V_{SS}	570	-923
12	SEG10	-769	923	35	V_{DD}	700	-923
13	TEST	-1,151	789	36	OSC1	835	-923
14	RESET	-1,151	657	37	OSC2	987	-923
15	SEG9	-1,151	526	38	V_{S1}	1,140	-923
16	SEG8	-1,151	396	39	P00	1,151	-11
17	SEG7	-1,151	266	40	P01	1,151	119
18	SEG6	-1,151	136	41	P02	1,151	249
19	SEG5	-1,151	6	42	P03	1,151	379
20	SEG4	-1,151	-124	43	K00	1,151	518
21	SEG3	-1,151	-254	44	K01	1,151	648
22	SEG2	-1,151	-384	45	K02	1,151	778
23	SEG1	-1,151	-514	46	K03	1,151	908

(Unit: µm)

■ BASIC EXTERNAL CONNECTION DIAGRAM

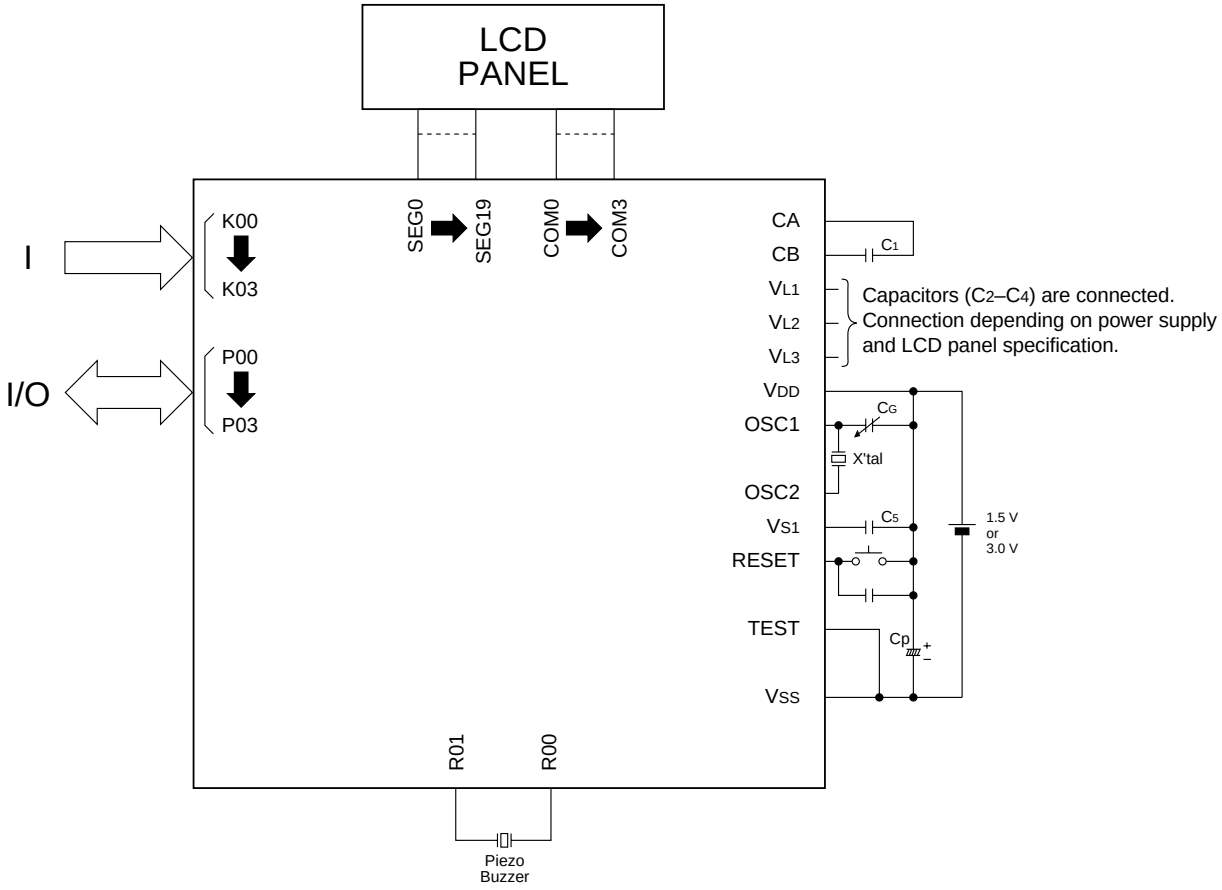
Piezo Buzzer Single Terminal Driving



X'tal	Crystal oscillator	32.768 kHz CI(MAX) = 35 kΩ
C_G	Trimmer capacitor	5–25 pF
C_1–C_5	Capacitor	0.1 µF
Cp	Capacitor	3.3 µF

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

Piezo Buzzer Direct Driving

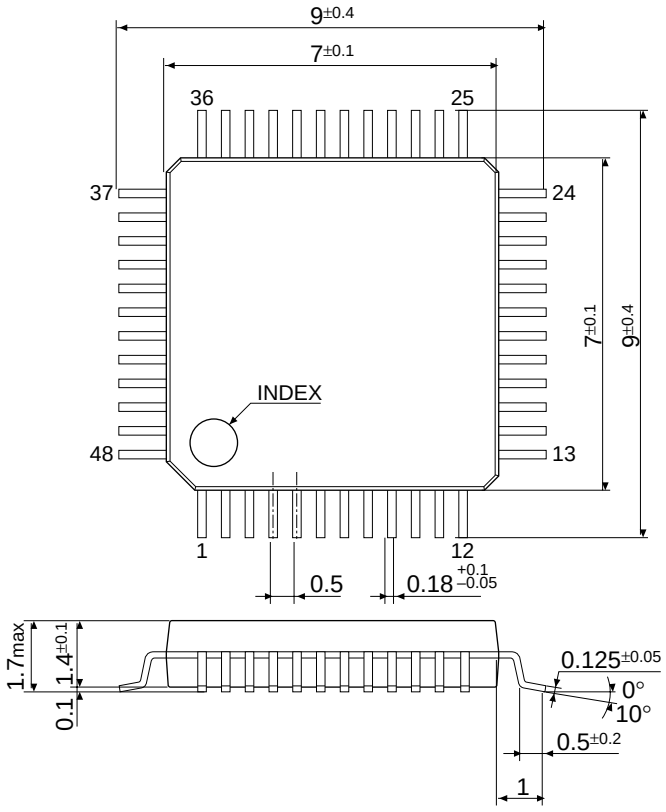


X'tal	Crystal oscillator	32.768 kHz CI(MAX) = 35 kΩ
C_G	Trimmer capacitor	5–25 pF
C_1–C_5	Capacitor	0.1 µF
Cp	Capacitor	3.3 µF

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

■ PACKAGE

Plastic QFP12-48pin



(Unit: mm)

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