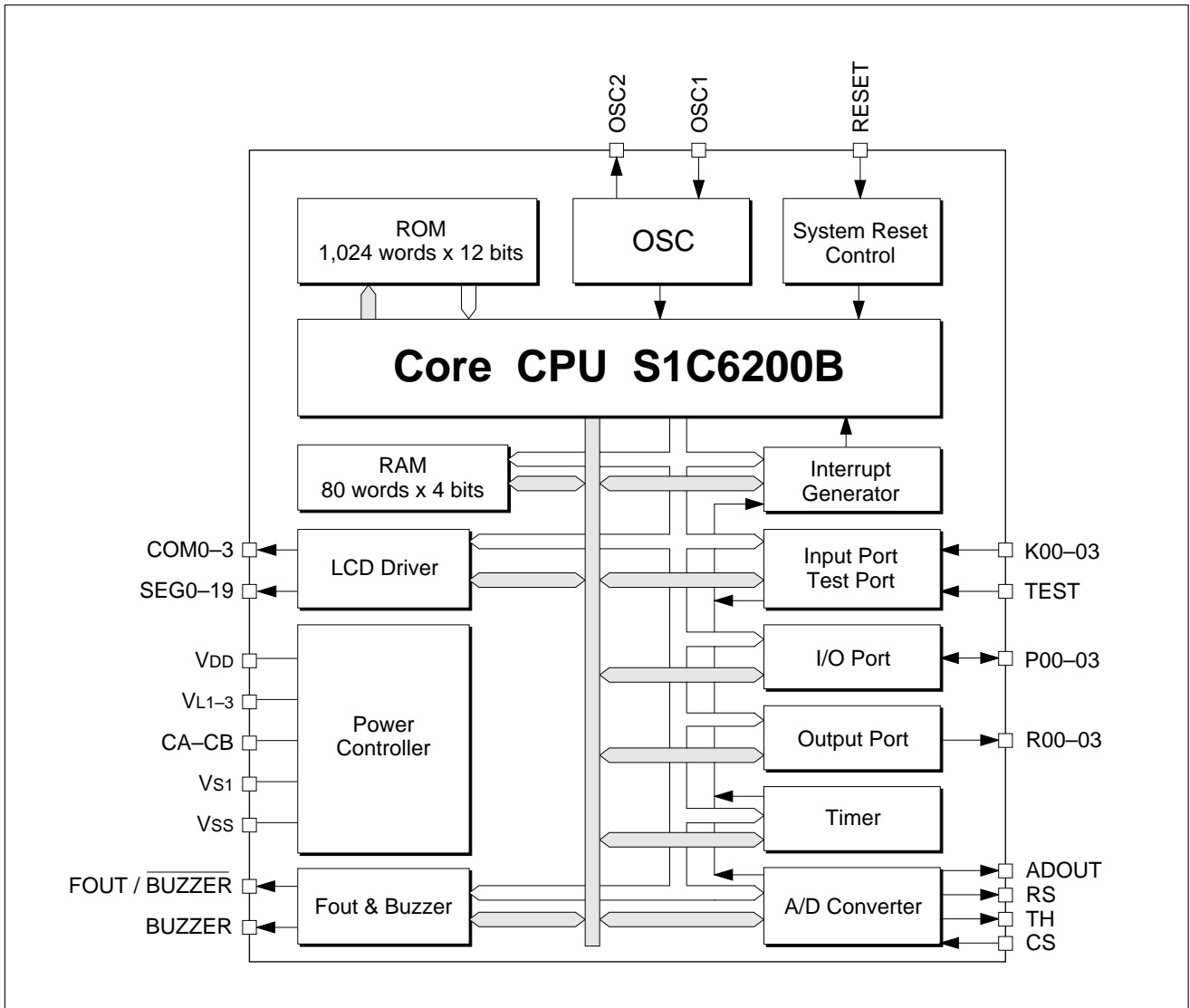
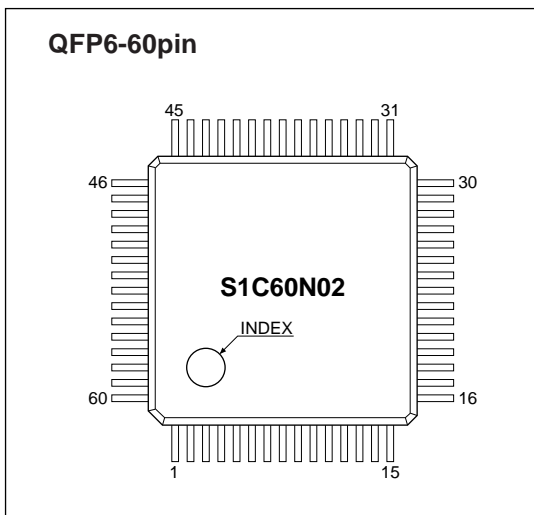


S1C60N02

■ BLOCK DIAGRAM



■ PIN CONFIGURATION



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

N.C. : No Connection

PIN DESCRIPTION

Pin name	Pin No.	In/Out	Function
VDD	38	(I)	Power source (+) terminal
VSS	37	(I)	Power source (-) terminal
VS1	41	O	Oscillation and internal logic system regulated voltage output terminal
VL1	34	O	LCD system regulated voltage output terminal
VL2	33	O	LCD system booster output terminal
VL3	32	O	LCD system booster output terminal
CA, CB	35, 36	–	Booster capacitor connecting terminal
OSC1	39	I	Crystal or CR oscillation input terminal
OSC2	40	O	Crystal or CR oscillation output terminal
K00–K03	47–50	I	Input terminal
P00–P03	42–45	I/O	I/O terminal
R00–R03	51–54	O	Output terminal
SEG0–19	1–12 19–26	O	LCD segment output terminal (convertible to DC output terminal by mask option)
COM0–3	27–30	O	LCD common output terminal
CS	57	I	A/D converter CR oscillation input terminal
RS	55	O	A/D converter CR oscillation output terminal
TH	56	O	A/D converter CR oscillation output terminal
ADOUT	58	O	A/D converter oscillation frequency output terminal
RESET	18	I	Initial setting input terminal
TEST	17	I	Test input terminal

OPTION LIST

1. DEVICE TYPE AND LCD VOLTAGE

1. E0C6002 (Normal Type <S1C60N02>) LCD 3 V
 2. E0C6002 (Normal Type <S1C60N02>) LCD 4.5 V
 3. E0C60L02 (Low Power Type <S1C60L02>) LCD 3 V
 4. E0C60L02 (Low Power Type <S1C60L02>) 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 (Control bit is R00)
 3. Buzzer Inverted Output (Control bit is R01)
 4. F OUT Output
- FOUT OUTPUT SPACIFICATION F1 1. 256[Hz] F3 1. 1,024[Hz]
 2. 512[Hz] 2. 2,048[Hz]
 3. 1,024[Hz] 3. 4,096[Hz]
 4. 2,048[Hz] 4. 8,192[Hz]
 5. 4,096[Hz] 5. 16,384[Hz]
- F2 1. 512[Hz] F4 1. 2,048[Hz]
 2. 1,024[Hz] 2. 4,096[Hz]
 3. 2,048[Hz] 3. 8,192[Hz]
 4. 4,096[Hz] 4. 16,384[Hz]
 5. 8,192[Hz] 5. 32,768[Hz]
- OUTPUT SPECIFICATION.. 1. Complementary 2. Pch-OpenDrain

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6. R01 SPECIFICATION

- OUTPUT TYPE 1. DC Output 2. Buzzer Output
- OUTPUT SPECIFICATION.. 1. Complementary 2. Pch-OpenDrain

7. OUTPUT SPECIFICATION (R02, R03)

- R02 1. Complementary 2. Pch-OpenDrain
- R03 1. Complementary 2. Pch-OpenDrain

8. I/O PORT SPECIFICATION

- P00 1. Complementary 2. Pch-OpenDrain
- P01 1. Complementary 2. Pch-OpenDrain
- P02 1. Complementary 2. Pch-OpenDrain
- P03 1. Complementary 2. Pch-OpenDrain

9. 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

10. 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
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)	—
Allowable dissipation *1	P _D	250	mW

*1: In case of plastic package (QFP6-60pin).

● Recommended Operating Conditions

S1C60N02

(T_a=-20 to 70°C)

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Power voltage	V _{SS}	V _{DD} =0V	-3.5	-3.0	-1.8	V
Oscillation frequency	f _{osc1}	Crystal oscillation		32.768		kHz
	f _{osc2}	CR oscillation, R=420kΩ		65	80	kHz
Booster capacitor	C ₁		0.1			μF
Capacitor between V _{DD} and V _{S1}	C ₂		0.1			μF

S1C60L02

(T_a=-20 to 70°C)

Condition	Symbol	Remark	Min.	Typ.	Max.	Unit
Power voltage	V _{SS}	V _{DD} =0V *3	-2.0	-1.5	-1.2	V
		V _{DD} =0V, With software correspondence *1	-2.0	-1.5	-0.9 *2	V
Oscillation frequency	f _{osc1}	Crystal oscillation		32.768		kHz
	f _{osc2}	CR oscillation, R=420kΩ		65	80	kHz
Booster capacitor	C ₁		0.1			μF
Capacitor between V _{DD} and V _{S1}	C ₂		0.1			μF

*1: When switching to the heavy load protection mode.

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

*3: When there is no software correspondence during CR oscillation or crystal oscillation.

● DC Characteristics S1C60N02

(Unless otherwise specified: VDD=0V, VSS=-3.0V, fosc=32.768kHz, Ta=25°C, VS1/VL1-VL3 are internal voltage, C1=C2=0.1μF)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	VIH1		0.2•VSS		0	V
High level input voltage (2)	VIH2		0.15•VSS		0	V
Low level input voltage (1)	VIL1		VSS		0.8•VSS	V
Low level input voltage (2)	VIL2		VSS		0.85•VSS	V
High level input current (1)	IiH1	VIH1=0V, No pull down resistor	0		0.5	μA
High level input current (2)	IiH2	VIH2=0V, With pull down resistor	5		16	μA
High level input current (3)	IiH3	VIH3=0V, With pull down resistor	30		100	μA
Low level input current	IiL	VIL=VSS	-0.5		0	μA
High level output current (1)	IOH1	VOH1=0.1•VSS			-1.0	mA
High level output current (2)	IOH2	VOH2=0.1•VSS (built-in protection resistance)			-1.0	mA
High level output current (3)	IOH3	VOH3=-1.0V			-1.0	mA
Low level output current (1)	IOL1	VOL1=0.9•VSS	3.0			mA
Low level output current (2)	IOL2	VOL2=0.9•VSS (built-in protection resistance)	3.0			mA
Low level output current (3)	IOL3	VOL3=-2.0V	3.0			mA
Common output current	IOH4	VOH4=-0.05V			-3	μA
	IOL4	VOL4=VL3+0.05V	3			μA
Segment output current (during LCD output)	IOH5	VOH5=-0.05V			-3	μA
	IOL5	VOL5=VL3+0.05V	3			μA
Segment output current (during DC output)	IOH6	VOH6=0.1•VSS			-300	μA
	IOL6	VOL6=0.9•VSS	300			μA

S1C60L02

(Unless otherwise specified: VDD=0V, VSS=-1.5V, fosc=32.768kHz, Ta=25°C, VS1/VL1-VL3 are internal voltage, C1=C2=0.1μF)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
High level input voltage (1)	VIH1		0.2•VSS		0	V
High level input voltage (2)	VIH2		0.15•VSS		0	V
Low level input voltage (1)	VIL1		VSS		0.8•VSS	V
Low level input voltage (2)	VIL2		VSS		0.85•VSS	V
High level input current (1)	IiH1	VIH1=0V, No pull down resistor	0		0.5	μA
High level input current (2)	IiH2	VIH2=0V, With pull down resistor	2.0		16	μA
High level input current (3)	IiH3	VIH3=0V, With pull down resistor	9.0		100	μA
Low level input current	IiL	VIL=VSS	-0.5		0	μA
High level output current (1)	IOH1	VOH1=0.1•VSS			-200	μA
High level output current (2)	IOH2	VOH2=0.1•VSS (built-in protection resistance)			-200	μA
High level output current (3)	IOH3	VOH3=-0.5V			-200	μA
Low level output current (1)	IOL1	VOL1=0.9•VSS	700			μA
Low level output current (2)	IOL2	VOL2=0.9•VSS (built-in protection resistance)	700			μA
Low level output current (3)	IOL3	VOL3=-1.0V	700			μA
Common output current	IOH4	VOH4=-0.05V			-3	μA
	IOL4	VOL4=VL3+0.05V	3			μA
Segment output current (during LCD output)	IOH5	VOH5=-0.05V			-3	μA
	IOL5	VOL5=VL3+0.05V	3			μA
Segment output current (during DC output)	IOH6	VOH6=0.1•VSS			-100	μA
	IOL6	VOL6=0.9•VSS	130			μA

S1C60N02

● Analog Circuit Characteristics and Current Consumption

S1C60N02 (Normal Operating Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $f_{osc}=32.768kHz$, $T_a=25^\circ C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
<During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L1} (without panel load)	$1/2 \cdot V_{L2}$ -0.1		$1/2 \cdot V_{L2}$ $\times 0.9$	V
	V_{L2}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L2} (without panel load)		V_{SS}		V
	V_{L3}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L3} (without panel load)	$3/2 \cdot V_{L2}$ -0.1		$3/2 \cdot V_{L2}$ $\times 0.9$	V
Power current consumption	IOP	During HALT	Without panel load	1.0	2.5	μA
		During execution		2.5	5.0	μA
		During A/D conversion (HALT)		30	40	μA

S1C60N02 (Heavy Load Protection Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $f_{osc}=32.768kHz$, $T_a=25^\circ C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
<During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L1} (without panel load)	$1/2 \cdot V_{L2}$ -0.1		$1/2 \cdot V_{L2}$ $\times 0.85$	V
	V_{L2}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L2} (without panel load)		V_{SS}		V
	V_{L3}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L3} (without panel load)	$3/2 \cdot V_{L2}$ -0.1		$3/2 \cdot V_{L2}$ $\times 0.85$	V
Power current consumption	IOP	During HALT	Without panel load	2.0	5.5	μA
		During execution		5.5	10.0	μA
		During A/D conversion (HALT)		31	41.5	μA

S1C60L02 (Normal Operating Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, $f_{osc}=32.768kHz$, $T_a=25^\circ C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
<During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L1} (without panel load)		V_{SS}		V
	V_{L2}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L2} (without panel load)	$2 \cdot V_{L1}$ -0.1		$2 \cdot V_{L1}$ $\times 0.9$	V
	V_{L3}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L3} (without panel load)	$3 \cdot V_{L1}$ -0.1		$3 \cdot V_{L1}$ $\times 0.9$	V
Power current consumption	IOP	During HALT	Without panel load	1.0	2.5	μA
		During execution		2.5	5.0	μA
		During A/D conversion (HALT)		30	40	μA

S1C60L02 (Heavy Load Protection Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, $f_{osc}=32.768kHz$, $T_a=25^\circ C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
<During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	V_{L1}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L1} (without panel load)		V_{SS}		V
	V_{L2}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L2} (without panel load)	$2 \cdot V_{L1}$ -0.1		$2 \cdot V_{L1}$ $\times 0.85$	V
	V_{L3}	Connect $1M\Omega$ load resistor between V_{DD} and V_{L3} (without panel load)	$3 \cdot V_{L1}$ -0.1		$3 \cdot V_{L1}$ $\times 0.85$	V
Power current consumption	IOP	During HALT	Without panel load	2.0	5.5	μA
		During execution		5.5	10.0	μA
		During A/D conversion (HALT)		31	41.5	μA

S1C60N02 (CR, Normal Operating Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $f_{osc}=65kHz$, $T_a=25^{\circ}C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
Recommended external resistance for CR oscillation= $420k\Omega$ <During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor between V_{DD} and VL1 (without panel load)	$1/2 \cdot V_{L2}$ -0.1		$1/2 \cdot V_{L2}$ $\times 0.9$	V
	VL2	Connect $1M\Omega$ load resistor between V_{DD} and VL2 (without panel load)		V_{SS}		V
	VL3	Connect $1M\Omega$ load resistor between V_{DD} and VL3 (without panel load)	$3/2 \cdot V_{L2}$ -0.1		$3/2 \cdot V_{L2}$ $\times 0.9$	V
Power current consumption	IOP	During HALT		8.0	15.0	μA
		During execution		15.0	20.0	μA
		During A/D conversion (HALT)		37	52.5	μA

S1C60N02 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $f_{osc}=65kHz$, $T_a=25^{\circ}C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
Recommended external resistance for CR oscillation= $420k\Omega$ <During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor between V_{DD} and VL1 (without panel load)	$1/2 \cdot V_{L2}$ -0.1		$1/2 \cdot V_{L2}$ $\times 0.85$	V
	VL2	Connect $1M\Omega$ load resistor between V_{DD} and VL2 (without panel load)		V_{SS}		V
	VL3	Connect $1M\Omega$ load resistor between V_{DD} and VL3 (without panel load)	$3/2 \cdot V_{L2}$ -0.1		$3/2 \cdot V_{L2}$ $\times 0.85$	V
Power current consumption	IOP	During HALT		16.0	30.0	μA
		During execution		30.0	40.0	μA
		During A/D conversion (HALT)		45	57.5	μA

S1C60L02 (CR, Normal Operating Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, $f_{osc}=65kHz$, $T_a=25^{\circ}C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
Recommended external resistance for CR oscillation= $420k\Omega$ <During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor between V_{DD} and VL1 (without panel load)		V_{SS}		V
	VL2	Connect $1M\Omega$ load resistor between V_{DD} and VL2 (without panel load)	$2 \cdot V_{L1}$ -0.1		$2 \cdot V_{L1}$ $\times 0.9$	V
	VL3	Connect $1M\Omega$ load resistor between V_{DD} and VL3 (without panel load)	$3 \cdot V_{L1}$ -0.1		$3 \cdot V_{L1}$ $\times 0.9$	V
Power current consumption	IOP	During HALT		8.0	15.0	μA
		During execution		15.0	20.0	μA
		During A/D conversion (HALT)		37	52.5	μA

S1C60L02 (CR, Heavy Load Protection Mode)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, $f_{osc}=65kHz$, $T_a=25^{\circ}C$, $C_G=25pF$, $V_{S1}/V_{L1}-V_{L3}$ are internal voltage, $C_1=C_2=0.1\mu F$
Recommended external resistance for CR oscillation= $420k\Omega$ <During A/D conversion: $R_S=49.8k\Omega$, $T_H=50k\Omega$, $C_{AD}=2,200pF$ >)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Internal voltage	VL1	Connect $1M\Omega$ load resistor between V_{DD} and VL1 (without panel load)		V_{SS}		V
	VL2	Connect $1M\Omega$ load resistor between V_{DD} and VL2 (without panel load)	$2 \cdot V_{L1}$ -0.1		$2 \cdot V_{L1}$ $\times 0.85$	V
	VL3	Connect $1M\Omega$ load resistor between V_{DD} and VL3 (without panel load)	$3 \cdot V_{L1}$ -0.1		$3 \cdot V_{L1}$ $\times 0.85$	V
Power current consumption	IOP	During HALT		16.0	30.0	μA
		During execution		30.0	40.0	μA
		During A/D conversion (HALT)		45	57.5	μA

S1C60N02

● Oscillation Characteristics

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

S1C60N02

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, Crystal: Q13MC146, $C_G=25pF$, $C_D=$ built-in, $T_a=25^{\circ}C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start voltage	Vsta	$t_{sta} \leq 5sec$ (V_{SS})	-1.8			V
Oscillation stop voltage	Vstp	$t_{stp} \leq 10sec$ (V_{SS})	-1.8			V
Built-in capacitance (drain)	C_D	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	$\partial f/\partial V$	$V_{SS}=-1.8$ to $-3.5V$			5	ppm
Frequency/IC deviation	$\partial f/\partial IC$		-10		10	ppm
Frequency adjustment range	$\partial f/\partial C_G$	$C_G=5$ to $25pF$	40			ppm
Harmonic oscillation start voltage	Vhho	$C_G=5pF$ (V_{SS})			-3.6	V
Allowable leak resistance	Rleak	Between OSC1 and V_{DD} , and between V_{SS} and OSC1	200			$M\Omega$

S1C60L02

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, Crystal: Q13MC146, $C_G=25pF$, $C_D=$ built-in, $T_a=25^{\circ}C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start voltage	Vsta	$t_{sta} \leq 5sec$ (V_{SS})	-1.2			V
Oscillation stop voltage	Vstp	$t_{stp} \leq 10sec$ (V_{SS})	-1.2			V
Built-in capacitance (drain)	C_D	Including the parasitic capacity inside the IC		20		pF
Frequency/voltage deviation	$\partial f/\partial V$	$V_{SS}=-1.2$ to $-2.0V$ (-0.9) *1			5	ppm
Frequency/IC deviation	$\partial f/\partial IC$		-10		10	ppm
Frequency adjustment range	$\partial f/\partial C_G$	$C_G=5$ to $25pF$	40			ppm
Harmonic oscillation start voltage	Vhho	$C_G=5pF$ (V_{SS})			-2.0	V
Allowable leak resistance	Rleak	Between OSC1 and V_{DD} , and between V_{SS} and OSC1	200			$M\Omega$

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

S1C60N02 (CR)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-3.0V$, $R_{CR}=420k\Omega$, $T_a=25^{\circ}C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc		-20	65kHz	20	%
Oscillation start voltage	Vsta		-1.8			V
Oscillation start time	tsta	$V_{SS}=-1.8$ to $-3.5V$		3		mS
Oscillation stop voltage	Vstp		-1.8			V

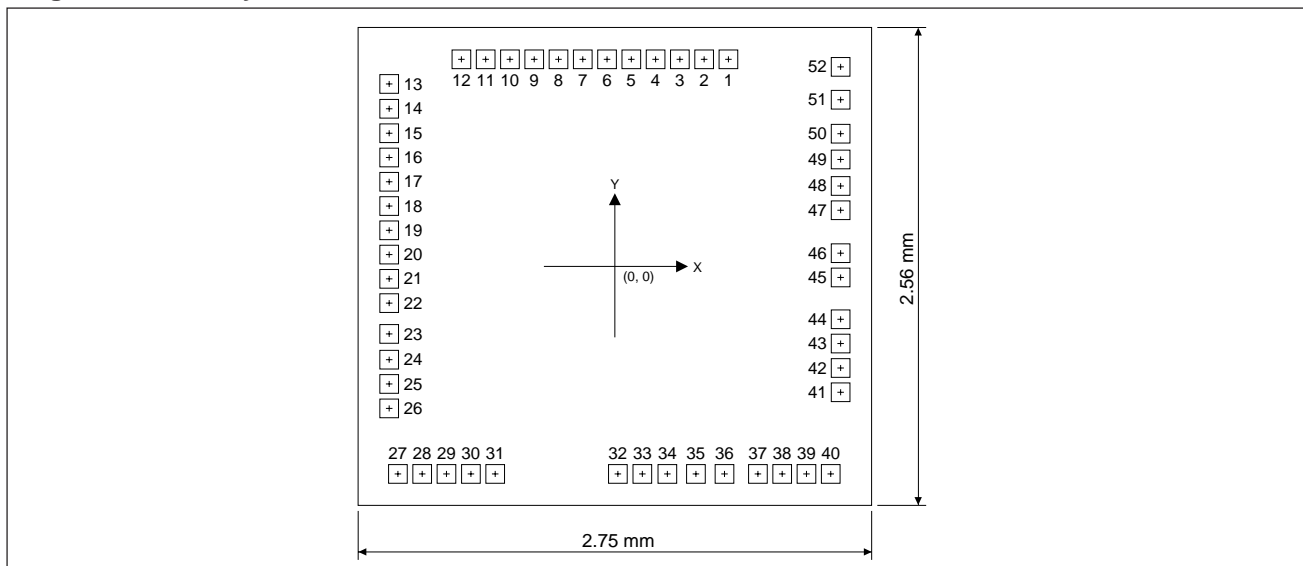
S1C60L02 (CR)

(Unless otherwise specified: $V_{DD}=0V$, $V_{SS}=-1.5V$, $R_{CR}=420k\Omega$, $T_a=25^{\circ}C$)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency dispersion	fosc		-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



● Pad Coordinates

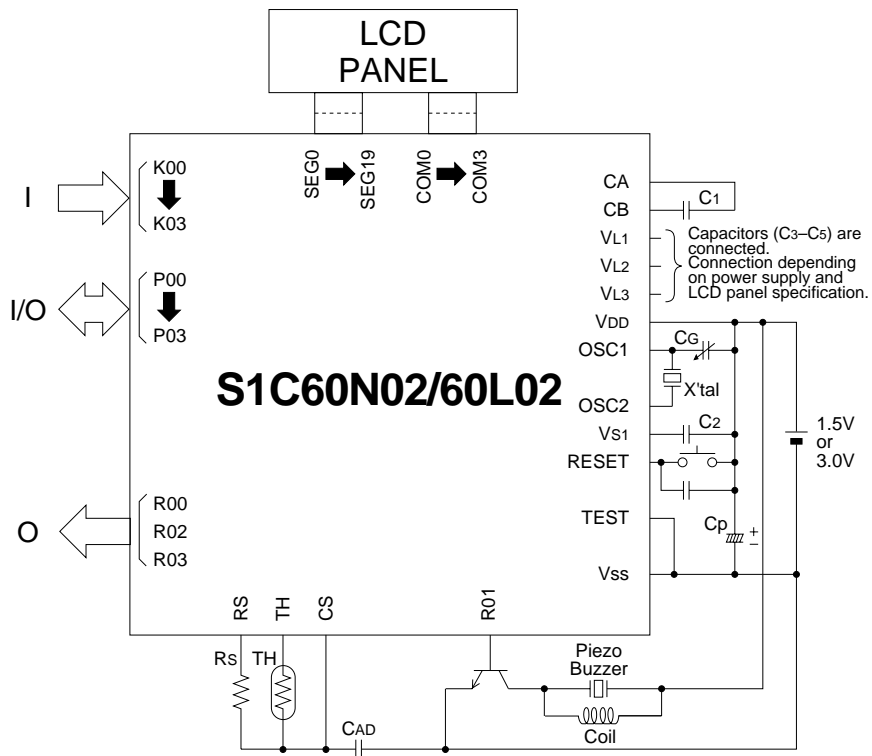
Pad No.	Pad name	X	Y	Pad No.	Pad name	X	Y
1	SEG0	608	1,111	27	VL3	-1,162	-1,111
2	SEG1	478	1,111	28	VL2	-1,032	-1,111
3	SEG2	348	1,111	29	VL1	-902	-1,111
4	SEG3	218	1,111	30	CA	-771	-1,111
5	SEG4	88	1,111	31	CB	-641	-1,111
6	SEG5	-42	1,111	32	VSS	16	-1,111
7	SEG6	-172	1,111	33	VDD	147	-1,111
8	SEG7	-302	1,111	34	OSC1	281	-1,111
9	SEG8	-432	1,111	35	OSC2	434	-1,111
10	SEG9	-562	1,111	36	Vs1	587	-1,111
11	SEG10	-692	1,111	37	P00	766	-1,111
12	SEG11	-822	1,111	38	P01	896	-1,111
13	TEST	-1,209	978	39	P02	1,026	-1,111
14	RESET	-1,209	845	40	P03	1,156	-1,111
15	SEG12	-1,209	714	41	K00	1,209	-674
16	SEG13	-1,209	584	42	K01	1,209	-544
17	SEG14	-1,209	454	43	K02	1,209	-413
18	SEG15	-1,209	324	44	K03	1,209	-283
19	SEG16	-1,209	194	45	R00	1,209	-59
20	SEG17	-1,209	64	46	R01	1,209	71
21	SEG18	-1,209	-66	47	R02	1,209	301
22	SEG19	-1,209	-196	48	R03	1,209	431
23	COM0	-1,209	-361	49	RS	1,209	573
24	COM1	-1,209	-499	50	TH	1,209	711
25	COM2	-1,209	-629	51	CS	1,209	893
26	COM3	-1,209	-760	52	ADOUT	1,209	1,069

(Unit: μm)

S1C60N02

■ BASIC EXTERNAL CONNECTION DIAGRAM

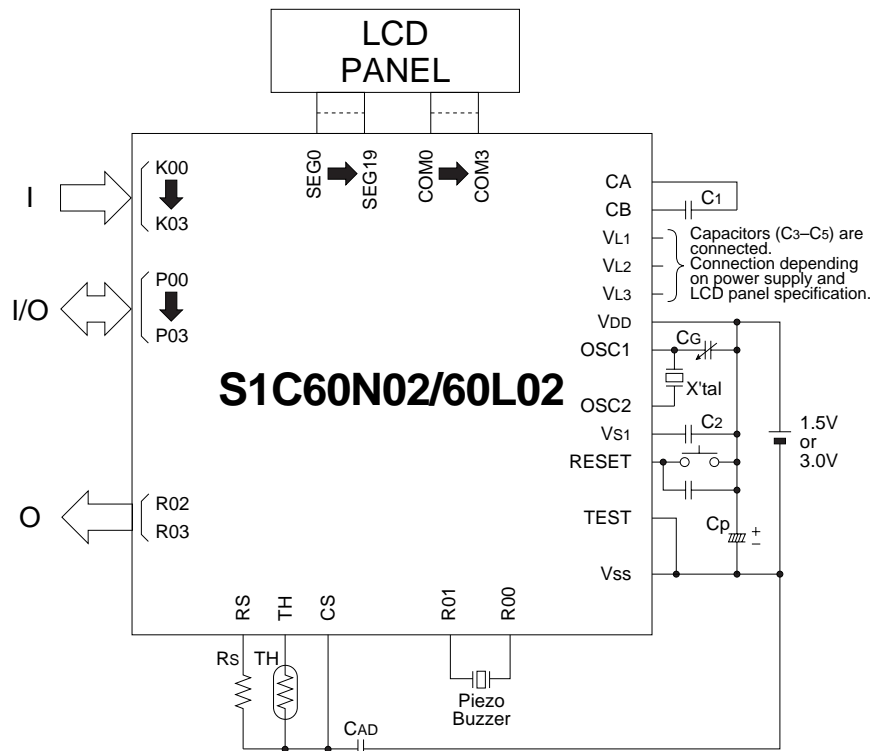
Piezo Buzzer Single Terminal Driving



X'tal	Crystal oscillator	32,768 Hz	CI(MAX) = 35 kΩ
Cg	Trimmer capacitor	5-25 pF	
C1-C5	Capacitor	0.1 μF	
Cp	Capacitor	3.3 μF	
TH	Thermistor	50 kΩ	
Rs	Resistor	49.8 kΩ	
CAD	Capacitor	2,200 pF	

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

Piezo Buzzer Direct Driving



X'tal	Crystal oscillator	32,768 Hz	CI(MAX) = 35 kΩ
Cg	Trimmer capacitor	5–25 pF	
C1–C5	Capacitor	0.1 μF	
Cp	Capacitor	3.3 μF	
TH	Thermistor	50 kΩ	
Rs	Resistor	49.8 kΩ	
CAD	Capacitor	2,200 pF	

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

