EPSON

Micro MINI S1C60N07

4-bit Single Chip Microcomputer

Low Voltage Operation Products

- S1C6200C Core CPU
- Low Voltage and Low Power
- Built-in LCD Driver

■ DESCRIPTION

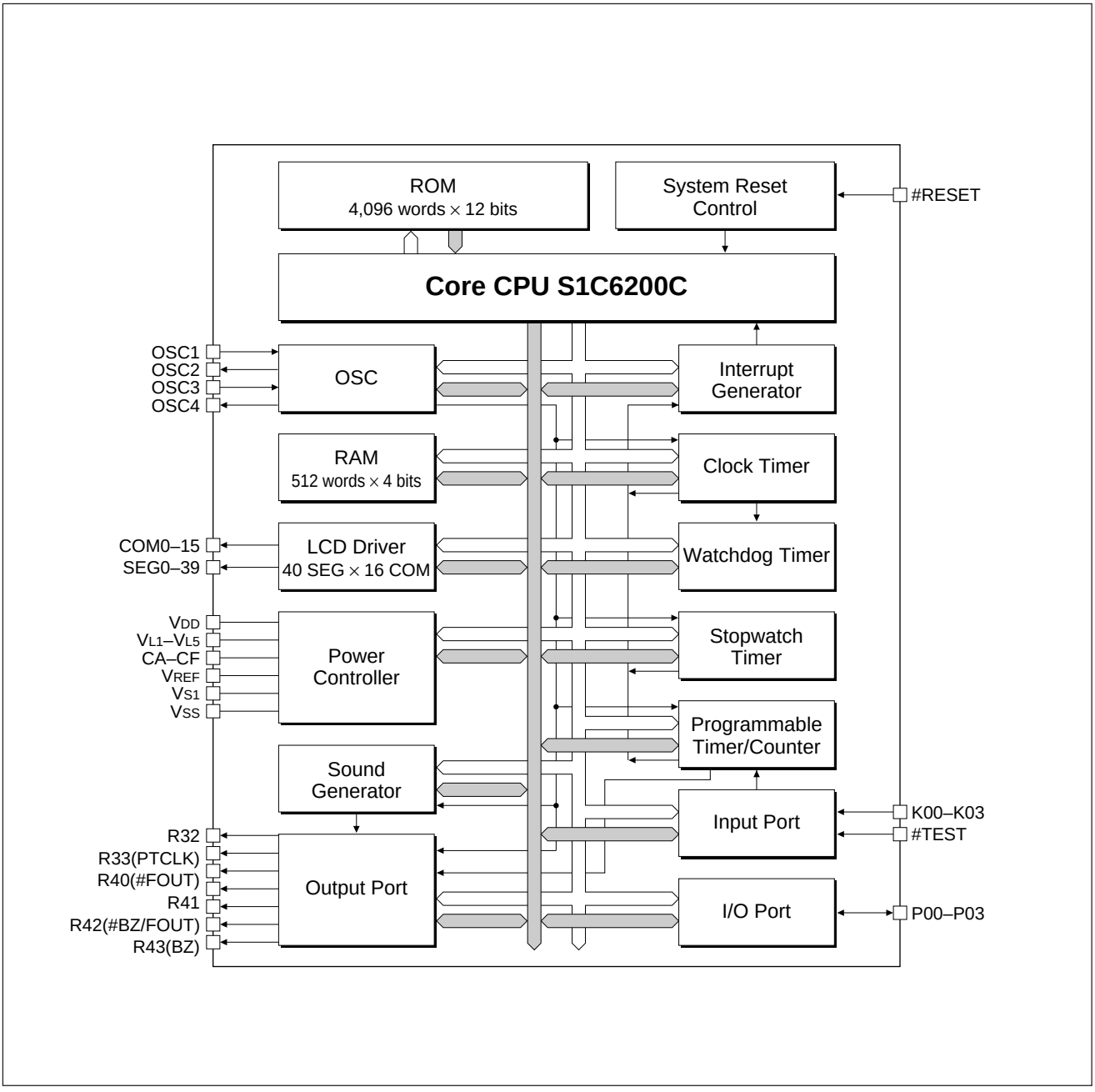
The S1C60N07 is a microcomputer with a C-MOS 4-bit core CPU S1C6200C as main component, and ROM, RAM, dot matrix LCD driver, time base counter and other circuits built-in.

■ FEATURES

- Oscillation circuit ..... OSC1: 32.768 kHz (Typ.) Crystal or CR oscillation circuit (∗1)
  OSC3: 2 MHz (Max.) CR or ceramic oscillation circuit (∗1)
- Instruction set ..... 108 types
- Instruction execution time ..... 32.768 kHz: 152.6 µsec 213.6 µsec 366.2 µsec
  1 MHz: 5.0 µsec 7.0 µsec 12.0 µsec
  2 MHz: 2.5 µsec 3.5 µsec 6.0 µsec
- ROM capacity ..... 4,096 words × 12 bits
- RAM capacity ..... Data memory: 512 words × 4 bits
  Display memory: 160 words × 4 bits
- Input port ..... 4 bits (Pull-up resistors may be supplemented ∗1)
- Output port ..... 6 bits (Buzzer and clock outputs are possible ∗1)
- I/O port ..... 4 bits
- Dot matrix type LCD driver ..... 40 segments × 16 or 8 commons (∗2)
- Time base counter ..... Clock timer, stopwatch timer
- Programmable timer ..... 8-bit timer × 1 ch., with event counter and clock output functions
- Watchdog timer ..... Built-in
- Sound generator ..... 8 programmable sounds (8 types of frequency)
  with envelope and 1-shot output functions
- External interrupt ..... Input port interrupt: 1 system
- Internal interrupt ..... Clock timer interrupt: 1 system
  Stopwatch timer interrupt: 1 system
  Programmable timer interrupt: 1 system
- Power supply voltage ..... 2.2 V to 5.5 V
  (Min. 1.8 V when the OSC3 oscillation circuit is not used)
- Current consumption (Typ.) ..... During HALT: 32.768 kHz (crystal oscillation), 3.0 V 2.5 µA
  During operation: 32.768 kHz (crystal oscillation), 3.0 V 6.5 µA
  2 MHz (CR oscillation), 3.0 V 1 mA
- Package ..... QFP15-100pin (plastic) or chip

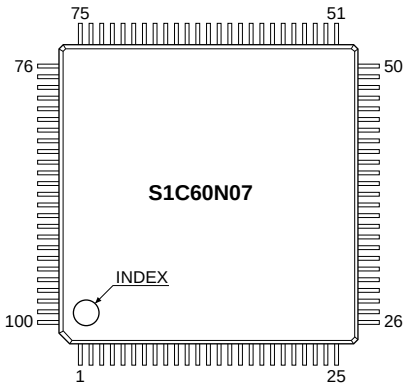
∗1: Can be selected with mask option ∗2: Can be selected with software

■ BLOCK DIAGRAM



■ PIN CONFIGURATION

QFP15-100pin



No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name	No.	Pin name
1	V_{L4}	21	COM12	41	SEG25	61	SEG6	81	R41
2	V_{L5}	22	COM13	42	SEG24	62	SEG5	82	R40
3	CF	23	COM14	43	SEG23	63	SEG4	83	R33
4	CE	24	COM15	44	SEG22	64	SEG3	84	R32
5	CD	25	N.C.	45	SEG21	65	SEG2	85	#RESET
6	CC	26	N.C.	46	SEG20	66	SEG1	86	#TEST
7	CB	27	SEG39	47	SEG19	67	SEG0	87	V_{SS}
8	CA	28	SEG38	48	SEG18	68	K03	88	OSC4
9	COM0	29	SEG37	49	SEG17	69	K02	89	OSC3
10	COM1	30	SEG36	50	SEG16	70	K01	90	V_{S1}
11	COM2	31	SEG35	51	N.C.	71	K00	91	OSC2
12	COM3	32	SEG34	52	SEG15	72	P03	92	OSC1
13	COM4	33	SEG33	53	SEG14	73	P02	93	V_{DD}
14	COM5	34	SEG32	54	SEG13	74	P01	94	V_{REF}
15	COM6	35	SEG31	55	SEG12	75	P00	95	V_{L1}
16	COM7	36	SEG30	56	SEG11	76	N.C.	96	V_{L2}
17	COM8	37	SEG29	57	SEG10	77	N.C.	97	V_{L3}
18	COM9	38	SEG28	58	SEG9	78	N.C.	98	N.C.
19	COM10	39	SEG27	59	SEG8	79	R43	99	N.C.
20	COM11	40	SEG26	60	SEG7	80	R42	100	N.C.

N.C. = No Connection

■ PIN DESCRIPTION

Pin name	Pin No.	I/O	Function	
V_{DD}	93	–	Power supply (+)	
V_{SS}	87	–	Power supply (-)	
V_{S1}	90	–	Internal logic system/oscillation system regulated voltage output	
V_{L1}–V_{L5}	95–97, 1, 2	–	LCD system power supply 1/4 bias generated internally, 1/5 bias generated externally *1	
V_{REF}	94	O	LCD system power test pin *2	
CA–CF	8–3	–	LCD system voltage booster condenser connecting pin	
OSC1	92	I	Crystal or CR oscillator input *1	
OSC2	91	O	Crystal or CR oscillator output *1, C_D buiil-in	
OSC3	89	I	CR or ceramic oscillator input *1	
OSC4	88	O	CR or ceramic oscillator output *1	
COM0–COM15	9–24	O	LCD common output (1/8 duty or 1/16 duty is selected on software)	
SEG0–SEG39	67–52, 50–27	O	LCD segment output	
K00–K03	71–68	I	Input port (pull up resistor is available by mask option) *1	
P00–P03	75–72	I/O	I/O port	Complementary output or Nch open drain output *1
R32	84	O	Output port	
R33	83	O	Output port or PTCLK output	
R40	82	O	Output port or #FOUT output *1	
R41	81	O	Output port	
R42	80	O	Output port, #BZ output or FOUT output *1	
R43	79	O	Output port or BZ output *1	
#RESET	85	I	Initial reset input terminal	
#TEST	86	I	Testing input terminal *3	

∗1: Selected by mask option

∗2: Leave the V_{REF} pin unconnected (N.C.).

∗3: The #TEST pin is used when the IC load is being detected. During ordinary operation be certain to connect this pin to V_{DD}.

■ OPTION LIST

1. OSC1 OSCILLATOR
   ☐ 1. Crystal ☐ 2. CR

2. OSC3 OSCILLATOR
   ☐ 1. CR ☐ 2. Ceramic

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

4. INPUT PORTS PULL UP 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. OUTPUT PORT OUTPUT SPECIFICATION
   • R32 ..... ☐ 1. Complementary ☐ 2. Nch-OpenDrain

6. OUTPUT PORT OUTPUT SPECIFICATION
   • R33 ..... ☐ 1. Complementary ☐ 2. Nch-OpenDrain

7. R40 OUTPUT PORT SPECIFICATION
   • OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Nch-OpenDrain
   • OUTPUT TYPE ..... ☐ 1. DC Output
   ☐ 2. /FOUT

8. R41 OUTPUT PORT SPECIFICATION
   • OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Nch-OpenDrain

9. R42 OUTPUT PORT SPECIFICATION
   • OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Nch-OpenDrain
   • OUTPUT TYPE ..... ☐ 1. DC Output
   ☐ 2. FOUT
   ☐ 3. Buzzer Inverted Output (R43 Control)

10. R43 OUTPUT PORT SPECIFICATION
   • OUTPUT SPECIFICATION... ☐ 1. Complementary ☐ 2. Nch-OpenDrain
   • OUTPUT TYPE ..... ☐ 1. DC Output ☐ 2. Buzzer Output

11. FOUT FREQUENCY
   ☐ 1. Don't Use
   ☐ 2. FOUT (OSC3)
   ☐ 3. FOUT (32k)
   ☐ 4. FOUT (16k)
   ☐ 5. FOUT (8k)
   ☐ 6. FOUT (4k)
   ☐ 7. FOUT (2k)
   ☐ 8. FOUT (1k)
   ☐ 9. FOUT (512)
   ☐ 10. FOUT (256)

12. I/O PORTS OUTPUT SPECIFICATION
   • P00–P03 ..... ☐ 1. Complementary ☐ 2. Nch-OpenDrain

13. LCD POWER VOLTAGE MODE
   ☐ 1. Internal Voltage ☐ 2. External Voltage

■ ELECTRICAL CHARACTERISTICS

● Absolute Maximum Ratings

(V_{DD}=0V)

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}	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)	–
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 draw in).
*2: In case of plastic package (QFP15-100pin).

● Recommended Operating Conditions

(Ta=-20 to 70°C)

Condition	Symbol	Remark		Min.	Typ.	Max.	Unit
Supply voltage	V_{SS}	V_{DD}=0V	VSC="0"	-3.8	-3.0	-1.8	V
			VSC="1"	-5.5	-3.0	-2.2	V
			VSC="2"	-5.5	-5.0	-3.5	V
Oscillation frequency (1)	f_{OSC1}			20	32.768	50	kHz
Oscillation frequency (2)	f_{OSC3}	VSC="1"		50	1,000	1,200	kHz
Oscillation frequency (3)	f_{OSC3}	VSC="2"		50	2,000	2,300	kHz
Voltage booster capacitor (1)	C_1				0.1		µF
Voltage booster capacitor (2)	C_2				0.1		µF
Voltage booster capacitor (3)	C_3				0.1		µF
Capacitor between V_{DD} and V_{L1}	C_4				0.1		µF
Capacitor between V_{DD} and V_{L2}	C_5				0.1		µF
Capacitor between V_{DD} and V_{L4}	C_6				0.1		µF
Capacitor between V_{DD} and V_{L5}	C_7				0.1		µF
Capacitor between V_{DD} and V_{S1}	C_8				0.1		µF

● DC Characteristics

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, V_{L1}=-1.0V, V_{L2}=-2.0V, V_{L4}=-3.0V, V_{L5}=-4.0V, f_{OSC1}=32.768kHz, f_{OSC3}=1MHz, Ta=25°C, C_1–C_8=0.047µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
High-level input voltage (1)	V_{IH1}	V_{SS}=-2.2 to -5.5V	K00–03, P00–03	0.2·V_{SS}		0	V
Low-level input voltage (1)	V_{IL1}	Ta=25°C		V_{SS}		0.8·V_{SS}	V
High-level input voltage (2)	V_{IH2}	V_{SS}=-2.2 to -5.5V	#RESET	-0.2		0	V
Low-level input voltage (2)	V_{IL2}	Ta=25°C		V_{SS}		V_{SS}+0.2	V
High-level input current	I_{IH}	V_{SS}=-3.0V, V_{IH}=0V	K00–03, P00–03, #RESET	0		0.5	µA
Low-level input current (1)	I_{IL1}	V_{SS}=-3.0V, V_{IL1}=V_{SS} With Pull-up resistor		-45		-15	µA
Low-level input current (2)	I_{IL2}	V_{SS}=-3.0V, V_{IL2}=V_{SS} No Pull-up resistor		-0.5		0	µA
High-level output current (1)	I_{OH1}	V_{SS}=-2.2V V_{OH1}=-0.5V	P00–03, R32, R33, R40, R41			-1.0	mA
Low-level output current (1)	I_{OL1}	V_{SS}=-2.2V, V_{OL1}=V_{SS}+0.5V		4.0			mA
High-level output current (2)	I_{OH2}	V_{SS}=-2.2V V_{OH2}=-0.5V	R42, R43			-2.0	mA
Low-level output current (2)	I_{OL2}	V_{SS}=-2.2V, V_{OL2}=V_{SS}+0.5V		8.0			mA
Common output current	I_{OH3}	V_{OH3}=-0.05V	COM0–15			-30	µA
	I_{OL3}	V_{OL3}=V_{L5}+0.05V		30			µA
Segment output current	I_{OH4}	V_{OH4}=-0.05V	SEG0–39			-10	µA
	I_{OL4}	V_{OL4}=V_{L5}+0.05V		10			µA

● Analog Circuit Characteristics and Current Consumption

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, V_{L1}=-1.0V, V_{L2}=-2.0V, V_{L4}=-3.0V, V_{L5}=-4.0V, f_{OSC1}=32.768kHz, f_{OSC3}=1MHz, Ta=25°C, C_1–C_8=0.047µF)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
LCD drive voltage (Normal mode)	V_{L1}	Connects a 1MΩ load resistance between V_{DD} and V_{L1} (No panel load)		1/2·V_{L2} -0.1		1/2·V_{L2} ×0.95	V
	V_{L2}	Connects a 1MΩ load resistance between V_{DD} and V_{L2} (No panel load)	LC="0"	Typ. ×1.12	-2.06	Typ. ×0.88	V
			LC="1"		-2.11		
			LC="2"		-2.17		
			LC="3"		-2.22		
			LC="4"		-2.27		
			LC="5"		-2.32		
			LC="6"		-2.38		
			LC="7"		-2.43		
			LC="8"		-2.48		
			LC="9"		-2.53		
			LC="10"		-2.59		
			LC="11"		-2.64		
			LC="12"		-2.69		
			LC="13"		-2.74		
			LC="14"		-2.80		
			LC="15"		-2.85		
	V_{L4}	Connects a 1MΩ load resistance between V_{DD} and V_{L4} (No panel load)		3/2·V_{L2}		3/2·V_{L2} ×0.95	V
	V_{L5}	Connects a 1MΩ load resistance between V_{DD} and V_{L5} (No panel load)		2·V_{L2}		2·V_{L2} ×0.95	V
LCD drive voltage (Heavy load protection mode)	V_{L1}	Connects a 1MΩ load resistance between V_{DD} and V_{L1} (No panel load)	LC="0"	Typ. ×1.12	-1.05	Typ. ×0.88	V
			LC="1"		-1.08		
			LC="2"		-1.11		
			LC="3"		-1.13		
			LC="4"		-1.16		
			LC="5"		-1.19		
			LC="6"		-1.21		
			LC="7"		-1.24		
			LC="8"		-1.26		
			LC="9"		-1.29		
			LC="10"		-1.32		
			LC="11"		-1.34		
			LC="12"		-1.37		
			LC="13"		-1.40		
			LC="14"		-1.42		
			LC="15"		-1.45		
	V_{L2}	Connects a 1MΩ load resistance between V_{DD} and V_{L2} (No panel load)		2·V_{L1}		2·V_{L1} ×0.90	V
	V_{L4}	Connects a 1MΩ load resistance between V_{DD} and V_{L4} (No panel load)		3·V_{L1}		3·V_{L1} ×0.90	V
	V_{L5}	Connects a 1MΩ load resistance between V_{DD} and V_{L5} (No panel load)		4·V_{L1}		4·V_{L1} ×0.90	V
Current consumption *1 (OSC1/crystal oscillation)	I_{Hlt}	During HALT (VSC="0", OSCC="0")			2.5	5.0	µA
	I_{EX1}	During operation at 32kHz (VSC="0", OSCC="0")			6.5	9.0	µA
	I_{EX2}	During operation at 1MHz (VSC="1")			400	600	µA
	I_{EX3}	During operation at 2MHz (VSC="2", V_{SS}=-5.0V)			1,000	1,500	µA
Current consumption *1 (OSC1/CR oscillation)	I_{Hlt}	During HALT (VSC="0"or"1", OSCC="0")			20	70	µA
	I_{EX1}	During operation at f_{OSC1} (VSC="0"or"1", OSCC="0")			25	80	µA
	I_{EX2}	During operation at 1MHz (VSC="1")			420	600	µA
	I_{EX3}	During operation at 2MHz (VSC="2", V_{SS}=-5.0V)			1,000	1,500	µA

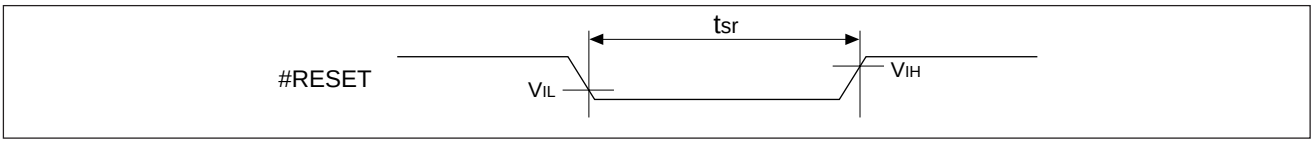
*1: No panel loard.

● AC Characteristics

#RESET Input

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, f_{OSC1}=32.768kHz, Ta=25°C, V_{IH}=0.5V_{SS}, V_{IL}=0.9V_{SS})

Characteristic	Symbol	Min.	Typ.	Max.	Unit
#RESET input time	tsr	2.0			ms



● Oscillation Characteristics

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

OSC1 Crystal Oscillation

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, Crystal: Q13MC146, C_{GX}=25pF, C_{DX}=built-in, Rfx=10MΩ, Ta=25°C, VSC="0")

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start time	tsta	V_{SS}=-2.2 to -5.5V			5	s
Built-in drain capacitance	C_D	Package as assembled		22		pF
		Bare chip		21		pF
Frequency/voltage deviation	∂f/∂V	V_{SS}=-2.2 to -5.5V			5	ppm
Frequency/IC deviation	∂f/∂IC		-10		+10	ppm
Frequency adjustable range	∂f/∂C_G	C_G=5 to 25pF	35	45		ppm
Harmonic oscillation start voltage	V_{hho}	C_G=5pF (V_{SS})			-5.5	V
Permitted leak resistance	R_{leak}	Between OSC1 and V_{DD}, V_{S1}	200			MΩ

OSC1 CR Oscillation

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, Ta=25°C, VSC="0" or "1")

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f_{OSC1}	R_{CR1}=1.6MΩ	Typ. ×70%	32	Typ. ×130%	kHz
Oscillation start time	tsta	V_{SS}=-2.2 to -5.5V			3	ms
Frequency/voltage deviation	∂f/∂V	V_{SS}=-2.2 to -5.5V	-5		+5	%

OSC3 CR Oscillation 1

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, Ta=25°C, VSC="1")

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f_{OSC3}	R_{CR2}=40kΩ	Typ. ×70%	860	Typ. ×130%	kHz
Oscillation start time	tsta	V_{SS}=-2.2 to -5.5V			3	ms
Frequency/voltage deviation	∂f/∂V	V_{SS}=-2.2 to -5.5V	-5		+5	%

OSC3 CR Oscillation 2

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

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f_{OSC3}	R_{CR2}=20kΩ	Typ. ×70%	1.7	Typ. ×130%	MHz
Oscillation start time	tsta	V_{SS}=-3.5 to -5.5V			3	ms
Frequency/voltage deviation	∂f/∂V	V_{SS}=-3.5 to -5.5V	-5		+5	%

OSC3 Ceramic Oscillation 1

(Unless otherwise specified: V_{DD}=0V, V_{SS}=-3.0V, Ta=25°C, VSC="1", Ceramic oscillator: CSB 1000J *1 (1MHz), C_{GC}=C_{DC}=100pF, Rfc=1MΩ)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start time	tsta	V_{SS}=-2.2 to -5.5V			3	ms
Frequency/voltage deviation	∂f/∂V	V_{SS}=-2.2 to -5.5V	-3		+3	%

*1: Made by Murata Mfg. Co.

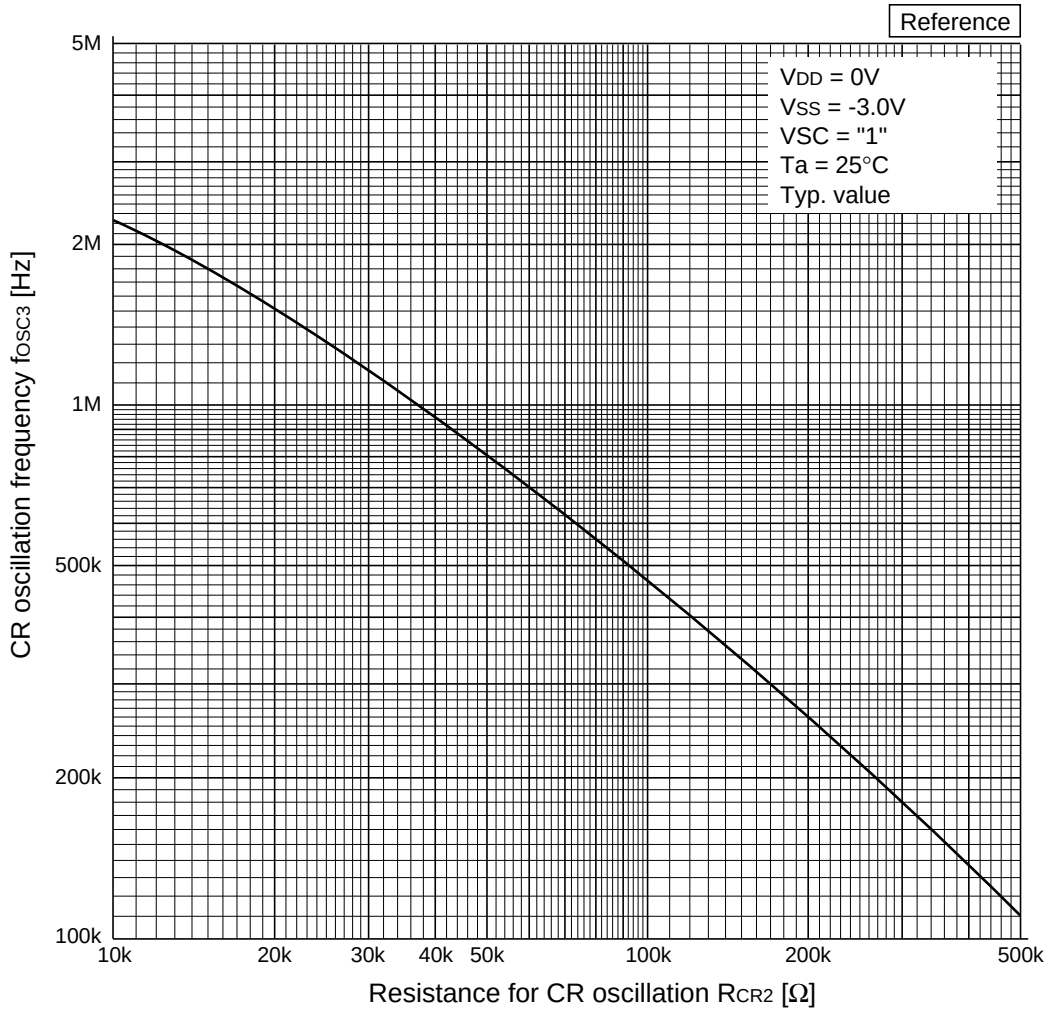
OSC3 Ceramic Oscillation 2

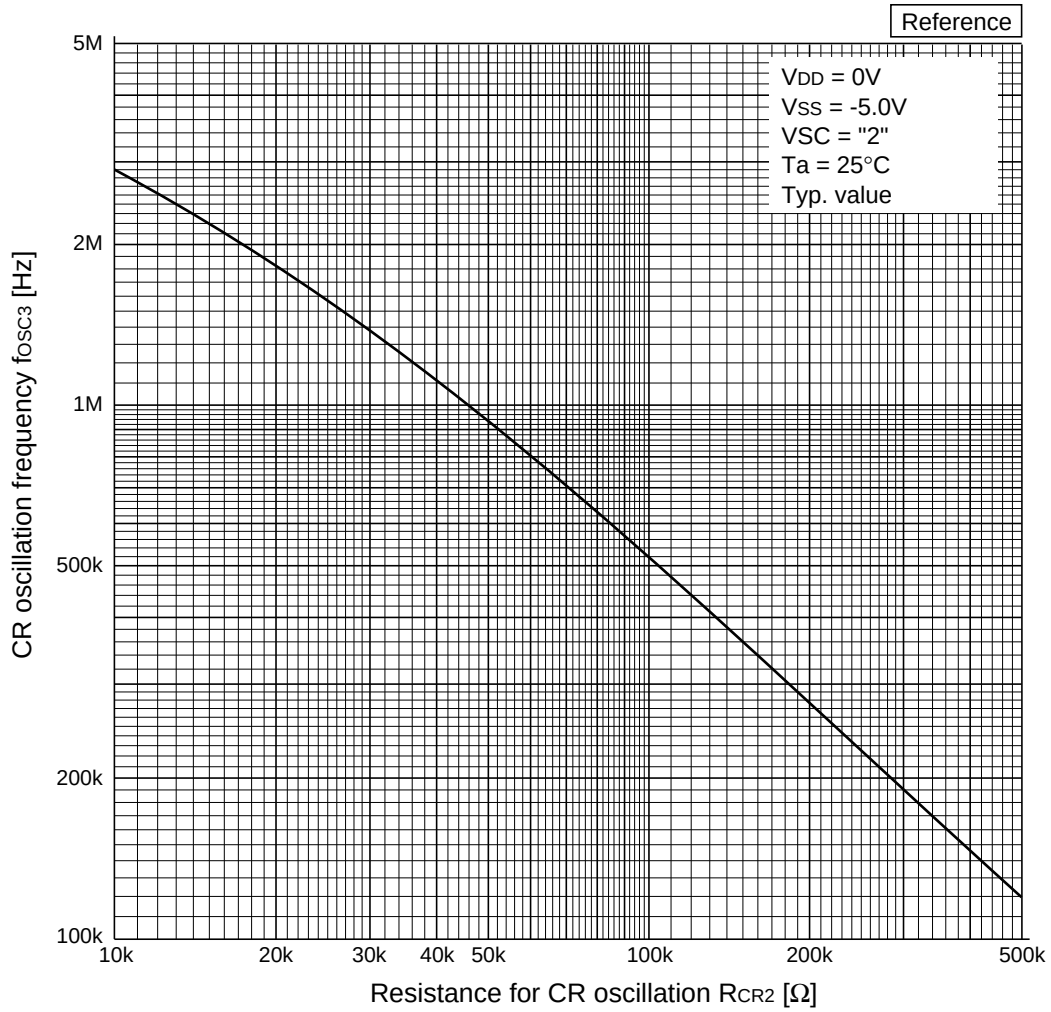
(Unless otherwise specified: V_{DD}=0V, V_{SS}=-5.0V, Ta=25°C, VSC="2", Ceramic oscillator: CSA 2.00MG *1 (2MHz), C_{GC}=C_{DC}=100pF, Rfc=1MΩ)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation start time	tsta	V_{SS}=-3.5 to -5.5V			3	ms
Frequency/voltage deviation	∂f/∂V	V_{SS}=-3.5 to -5.5V	-3		+3	%

*1: Made by Murata Mfg. Co.

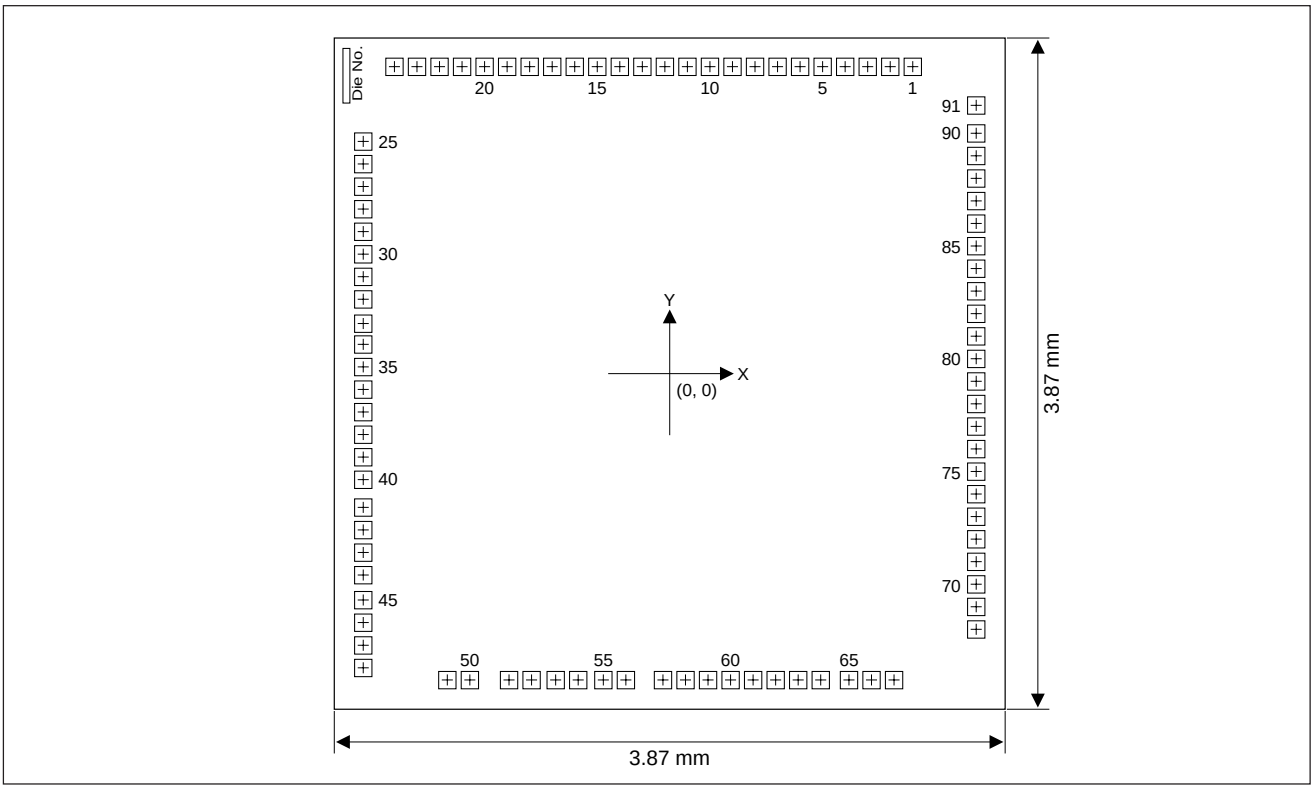
- **OSC3 CR oscillation frequency - resistance characteristic**




Reference
VDD = 0V
VSS = -5.0V
VSC = "2"
Ta = 25°C
Typ. value
5M
2M
1M
500k
200k
100k
10k
20k
30k
40k
50k
100k
200k
500k
CR oscillation frequency fOSC3 [Hz]
Resistance for CR oscillation RCR2 [Ω]

■ PAD LAYOUT

● Diagram of Pad Layout

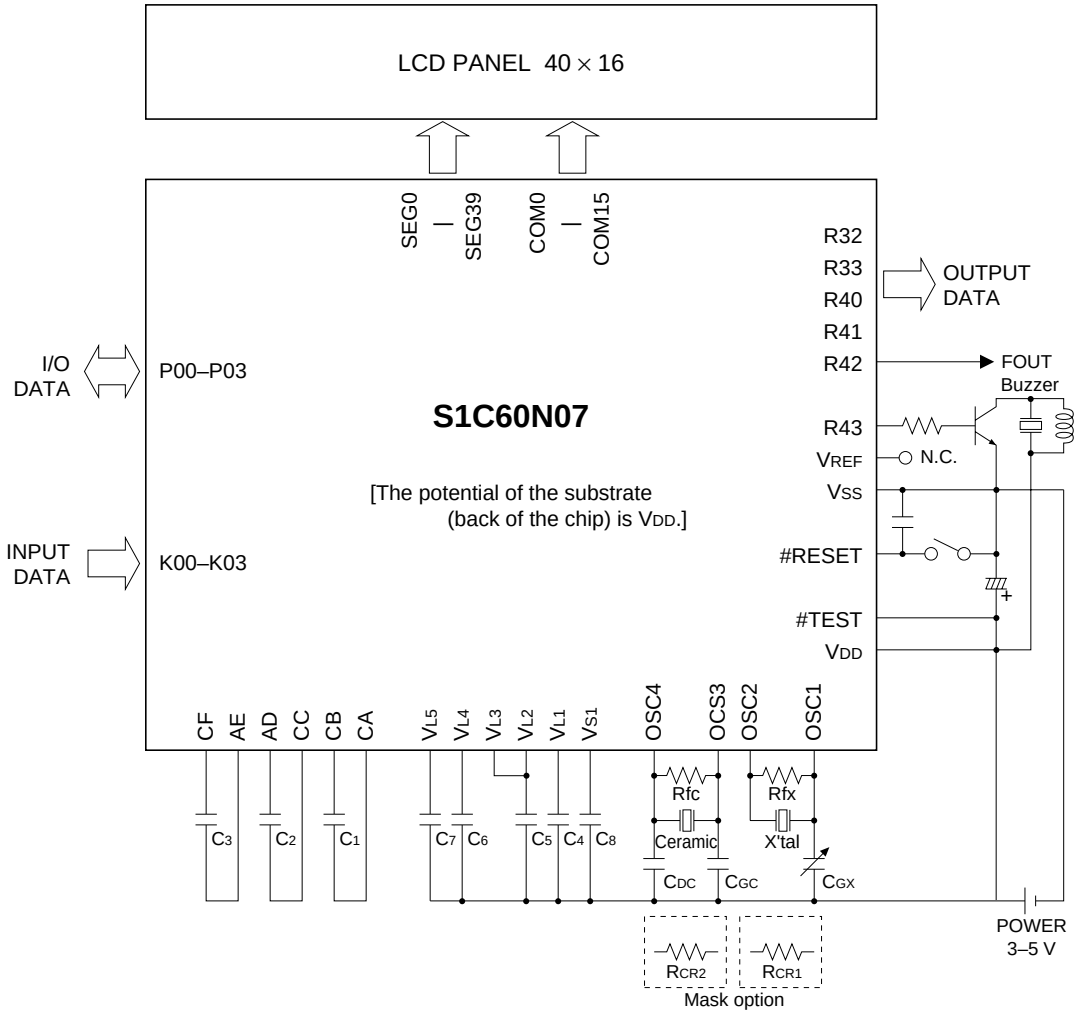


● Pad Coordinates

(Unit: µm)

No.	Pad name	X	Y	No.	Pad name	X	Y	No.	Pad name	X	Y
1	SEG39	1,402	1,768	32	SEG8	-1,768	427	63	V_{DD}	741	-1,768
2	SEG38	1,272	1,768	33	SEG7	-1,768	297	64	V_{REF}	871	-1,768
3	SEG37	1,142	1,768	34	SEG6	-1,768	167	65	V_{L1}	1,034	-1,768
4	SEG36	1,012	1,768	35	SEG5	-1,768	37	66	V_{L2}	1,164	-1,768
5	SEG35	882	1,768	36	SEG4	-1,768	-93	67	V_{L3}	1,294	-1,768
6	SEG34	752	1,768	37	SEG3	-1,768	-223	68	V_{L4}	1,768	-1,476
7	SEG33	622	1,768	38	SEG2	-1,768	-353	69	V_{L5}	1,768	-1,346
8	SEG32	492	1,768	39	SEG1	-1,768	-483	70	CF	1,768	-1,216
9	SEG31	362	1,768	40	SEG0	-1,768	-613	71	CE	1,768	-1,086
10	SEG30	232	1,768	41	K03	-1,768	-773	72	CD	1,768	-956
11	SEG29	102	1,768	42	K02	-1,768	-903	73	CC	1,768	-826
12	SEG28	-28	1,768	43	K01	-1,768	-1,033	74	CB	1,768	-696
13	SEG27	-158	1,768	44	K00	-1,768	-1,163	75	CA	1,768	-566
14	SEG26	-288	1,768	45	P03	-1,768	-1,307	76	COM0	1,768	-436
15	SEG25	-418	1,768	46	P02	-1,768	-1,437	77	COM1	1,768	-306
16	SEG24	-548	1,768	47	P01	-1,768	-1,568	78	COM2	1,768	-176
17	SEG23	-678	1,768	48	P00	-1,768	-1,698	79	COM3	1,768	-46
18	SEG22	-808	1,768	49	R43	-1,283	-1,768	80	COM4	1,768	84
19	SEG21	-938	1,768	50	R42	-1,153	-1,768	81	COM5	1,768	214
20	SEG20	-1,068	1,768	51	R41	-927	-1,768	82	COM6	1,768	344
21	SEG19	-1,198	1,768	52	R40	-797	-1,768	83	COM7	1,768	474
22	SEG18	-1,328	1,768	53	R33	-658	-1,768	84	COM8	1,768	604
23	SEG17	-1,458	1,768	54	R32	-528	-1,768	85	COM9	1,768	734
24	SEG16	-1,588	1,768	55	#RESET	-383	-1,768	86	COM10	1,768	864
25	SEG15	-1,768	1,337	56	#TEST	-253	-1,768	87	COM11	1,768	994
26	SEG14	-1,768	1,207	57	V_{SS}	-39	-1,768	88	COM12	1,768	1,124
27	SEG13	-1,768	1,077	58	OSC4	91	-1,768	89	COM13	1,768	1,254
28	SEG12	-1,768	947	59	OSC3	221	-1,768	90	COM14	1,768	1,384
29	SEG11	-1,768	817	60	V_{S1}	351	-1,768	91	COM15	1,768	1,545
30	SEG10	-1,768	687	61	OSC2	481	-1,768	–	–	–	–
31	SEG9	-1,768	557	62	OSC1	611	-1,768	–	–	–	–

■ BASIC EXTERNAL CONNECTION DIAGRAM



X'tal	Crystal oscillator	32.768 kHz, C_I(Max)=35 kΩ
Rfx	Feedback resistor	10 MΩ
C_{GX}	Trimmer capacitor	5–25 pF
(R_{CR1})	Resistor for OSC1 CR oscillation	1.6 MΩ (32 kHz Typ.)
Ceramic	Ceramic oscillator	500 kHz–2 MHz
Rfc	Feedback resistor	1 MΩ
C_{GC}	Gate capacitor	100 pF
C_{DC}	Drain capacitor	100 pF
(R_{CR2})	Resistor for OSC3 CR oscillation	20 kΩ–100 kΩ (VSC=2) 40 kΩ–100 kΩ (VSC=1)

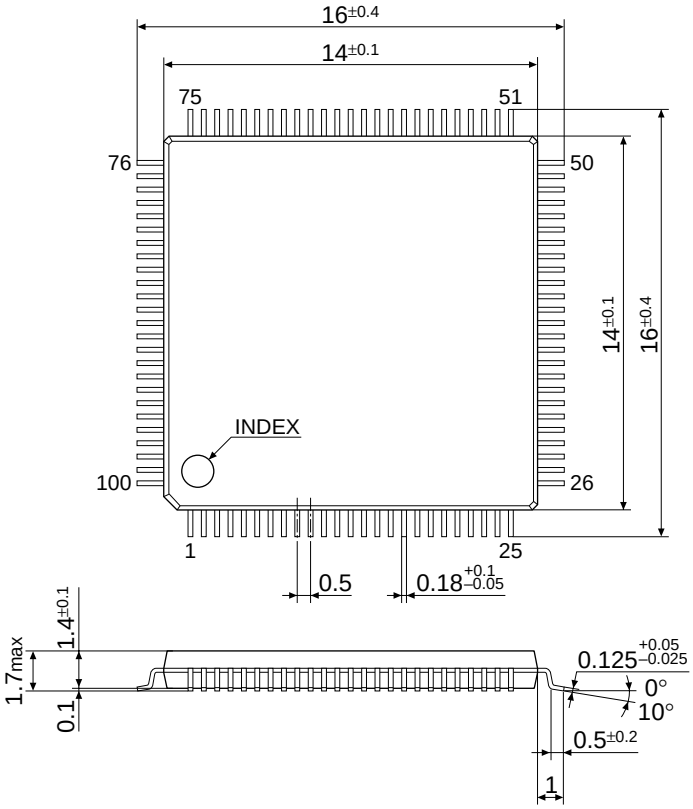
C_1	Booster capacitor (1)	0.1µF ∗1
C_2	Booster capacitor (2)	0.1µF ∗1
C_3	Booster capacitor (3)	0.1µF ∗1
C_4	Capacitor between V_{DD} and V_{L1}	0.1µF ∗1
C_5	Capacitor between V_{DD} and V_{L2}	0.1µF ∗1
C_6	Capacitor between V_{DD} and V_{L4}	0.1µF ∗1
C_7	Capacitor between V_{DD} and V_{L5}	0.1µF ∗1
C_8	Capacitor between V_{DD} and V_{S1}	0.1µF

∗1 When the load on the liquid crystal system is large, increase the capacitance of the voltage booster capacitors (C_1–C_3) and the capacitors between V_{DD} and liquid crystal system power (C_4–C_7).

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

■ PACKAGE

Plastic QFP15-100pin



(Unit: mm)

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