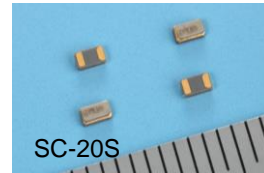
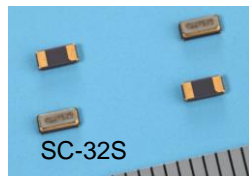
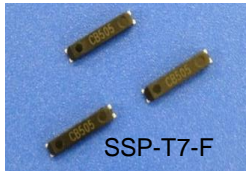
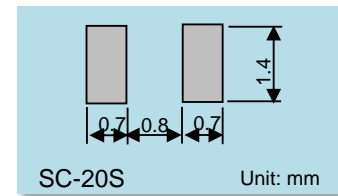
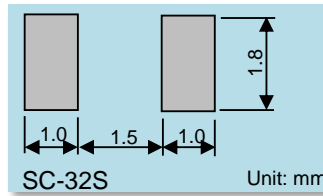
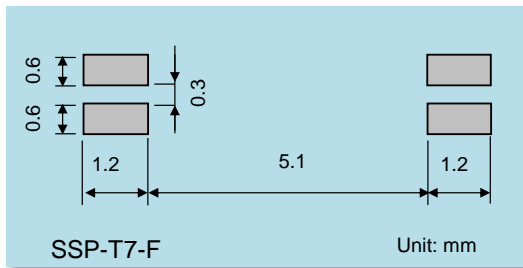


◆ Specification for Quartz Crystal

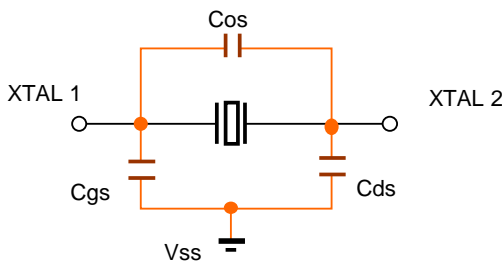
	SSP-T7-F	SC-32S	SC-20S
Nominal Frequency	32.768kHz	32.768kHz	32.768kHz
Frequency Tolerance	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>
Load capacitance : CL	7pF	7pF	7pF
Motional Resistance : R1	65kΩmax	70kΩmax	70kΩmax
Absolute Maximum Drive Level	1.0μW max	1.0μW max	1.0μW max
Dimensions(Thickness: Max.Value)	7.0x1.5x1.4mm	3.2x1.5x0.85mm	2.0x1.2x0.6mm



RECOMMENDED SOLDERING PATTERN



◆ Approximate expression for Circuit load capacitance



$$CL = Cg \times Cd / (Cg + Cd) + Cs \text{ (pF)}$$

- Cos : XTAL 1-XTAL 2 Stray capacitance
- Cgs : XTAL 1-Vss Stray capacitance
- Cds : XTAL 2T-Vss Stray capacitance

The microcontrollers from Microchip Technology Inc. that are tested each represents a set of microcontrollers with the same crystal driver circuits. Please refer to application note <https://www.microchip.com/DS00002648> for an updated list of which crystal driver type each microcontroller uses.

◆Circuit matching constant for Oscillation circuit

	32.768kHz quartz crystals			Power System	Constants		Characteristics of Oscillation	
	Products	R1Max. (kΩ)	CL (pF)		Cg (pF)	Cd (pF)	RL (kΩ)	M (Times)
ATmega128 (CKOPT Disabled)	SSP-T7-F	65	7	2V7	9	9	-1,354	20.8
			7	3V3	9	9	-1,354	20.8
			7	5V5	10	10	-1,754	27.0
	SC-32S	70	7	2V7	9	9	-1,361	19.4
			7	3V3	9	9	-1,361	19.4
			7	5V5	10	10	-1,661	23.7
	SC-20S	70	7	2V7	9	9	-1,271	18.2
			7	3V3	9	9	-1,371	19.6
			7	5V5	10	10	-1,471	21.0
ATtiny817	SSP-T7-F	65	7	1V8	9	9	-654	10.1
			7	2V7	9	9	-654	10.1
			7	3V3	9	9	-661	9.4
			7	5V5	9	9	-724	11.1
	SC-32S	70	7	1V8	9	9	-661	9.4
			7	2V7	9	9	-661	9.4
			7	3V3	9	9	-661	9.4
			7	3V3	9	9	-654	10.1
	SC-20S	70	7	1V8	9	9	-651	9.3
			7	2V7	9	9	-671	9.6
			7	3V3	9	9	-671	9.6
			7	5V5	10	10	-721	10.3
ATtiny85	SSP-T7-F	65	7	2V7	6	6	-2,554	39.3
			7	3V3	4	4	-2,554	39.3
			7	5V5	4	4	-2,554	39.3
	SC-32S	70	7	2V7	4	4	-2,361	33.7
			7	3V3	2	2	-2,261	32.3
			7	5V5	2	2	-2,561	36.6
	SC-20S	70	7	2V7	3	3	-2,171	31.0
			7	3V3	1	1	-2,171	31.0
			7	5V5	1	1	-2,071	29.6
ATxmega128A1	SSP-T7-F	65	7	1V8	5	5	-354	5.5
			7	2V7	5	5	-364	5.6
			7	3V3	5	5	-364	5.6
	SC-32S	70	7	1V8	5	5	-351	5.0
			7	2V7	5	5	-351	5.0
			7	3V3	5	5	-351	5.0
	SC-20S	70	7	1V8	5	5	-691	9.9
			7	2V7	5	5	-721	10.3
			7	3V3	5	5	-721	10.3
ATxmega256A3B	SSP-T7-F	65	7	1V8	9	9	-614	9.5
			7	2V7	9	9	-614	9.5
			7	3V3	9	9	-614	9.5
	SC-32S	70	7	1V8	9	9	-561	8.0
			7	2V7	9	9	-561	8.0
			7	3V3	9	9	-561	8.0
	SC-20S	70	7	1V8	9	9	-631	9.0
			7	2V7	9	9	-614	9.5
			7	3V3	9	9	-631	9.0

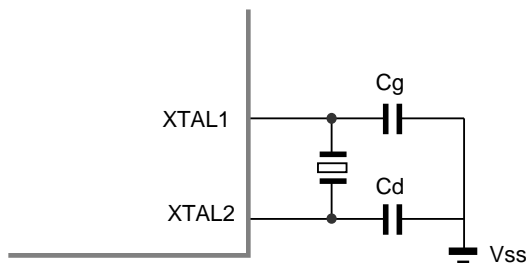
◆Circuit matching constant for Oscillation circuit

	32.768kHz quartz crystals			Power System	Constants		Characteristics of Oscillation	
	Products	R1Max. (kΩ)	CL (pF)		Cg (pF)	Cd (pF)	RL (kΩ)	M (Times)
PIC18F25Q10 Low power mode	SSP-T7-F	65	7	1V8	8	8	-474	7.3
		65	7	2V7	8	8	-474	7.3
		65	7	3V3	8	8	-494	7.6
		65	7	5V5	8	8	-554	8.5
	SC-32S	70	7	1V8	7	7	-511	7.3
		70	7	2V7	7	7	-511	7.3
		70	7	3V3	7	7	-531	7.6
		70	7	5V5	7	7	-591	8.4
	SC-20S	70	7	1V8	8	8	-441	6.3
		70	7	2V7	8	8	-471	6.7
		70	7	3V3	8	8	-471	6.7
		70	7	5V5	8	8	-501	7.2
PIC18F25Q10 High power mode	SSP-T7-F	65	7	1V8	18	18	-699	10.7
		65	7	2V7	18	18	-729	11.2
		65	7	3V3	18	18	-729	11.2
		65	7	5V5	18	18	-749	11.5
	SC-32S	70	7	1V8	18	18	-705	10.1
		70	7	2V7	18	18	-725	10.4
		70	7	3V3	18	18	-725	10.4
		70	7	3V3	18	18	-775	11.1
	SC-20S	70	7	1V8	18	18	-711	10.2
		70	7	2V7	18	18	-741	10.6
		70	7	3V3	18	18	-741	10.6
		70	7	5V5	18	18	-791	11.3

◆Notes

The above evaluation results are reference values evaluated in the specific sample, and the contents are not guaranteed.  
Please note that in the actual circuit board, the value of the external element capacitance and the characteristics may change depending on the difference in stray capacitance and so on.

◆Qualification item for Oscillation circuit characteristics



No	Items	Symbol	Recommendation
1	Negative Resistance	RL	
2	Oscillation allowance	M	more than 5 times of R1Max.

◆Notes for the design of Circuit board

Please keep the wiring short and place Quartz Crystal, Condensor, and Resistance close as possible to Microchip microcontroller. In order to prevent interference with other signal lines, do not provide other signal lines, please do not provide other signal lines on the crystal mounting part (bottom surface).