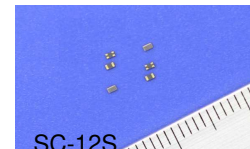
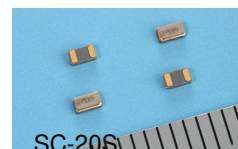
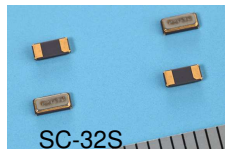
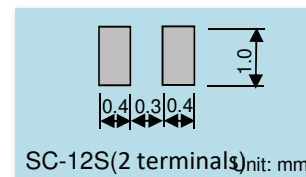
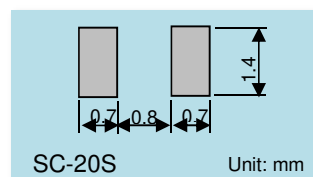
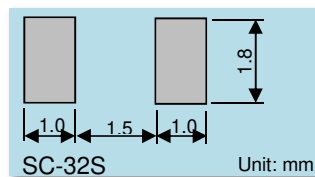
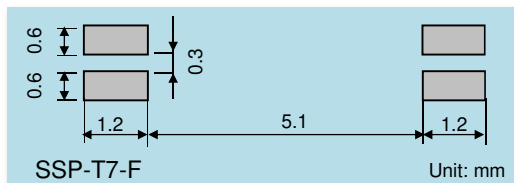


◆Specification for Quartz Crystal

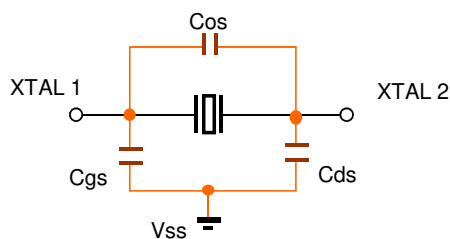
	SSP-T7-F	SC-32S	SC-20S	SC-12S
Nominal Frequency	32.768kHz	32.768kHz	32.768kHz	32.768kHz
Frequency Tolerance	+/-20x10 ⁻⁶	+/-20x10 ⁻⁶	+/-20x10 ⁻⁶	+/-20x10 ⁻⁶
Load capacitance : CL	7pF / 12.5pF	7pF / 12.5pF	7pF / 12.5pF	7pF
Motional Resistance : R1	65kΩmax	70kΩmax	70kΩmax	90kΩmax
Absolute Maximum Drive Level	1.0μW max	1.0μW max	1.0μW max	0.3μW max
Dimensions(Thickness: Max.Value)	7.0x1.5x1.4mm	3.2x1.5x0.85mm	2.0x1.2x0.6mm	1.2x1.0x0.5mm



RECOMMENDED SOLDERING PATTERN



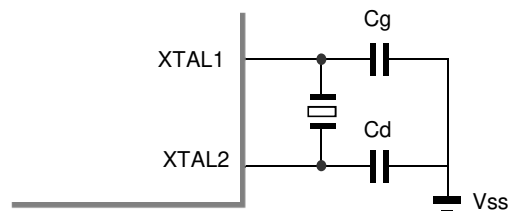
◆Approximate expression for Circuit load capacitance



$$CL = C_g \times C_d / (C_g + C_d) + C_s \text{ (pF)}$$

C_{os} : XTAL 1-XTAL 2 Stray capacitance
 C_{gs} : XTAL 1-Vss Stray capacitance
 C_{ds} : XTAL 2T-Vss Stray capacitance

◆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, Condenser, 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).

◆Circuit matching constant for Oscillation circuit



	Power System	32.768kHz quartz crystals			Constants		Characteristics of Oscillation	
		Products	R1Max. (kΩ)	CL (pF)	Cg (pF)	Cd (pF)	RL (kΩ)	M (Times)
ATtiny817	1V8	SSP-T7-F	65	7	9	9	-654	10.1
	2V7			7	9	9	-654	10.1
	3V3			7	9	9	-661	9.4
	5V5			7	9	9	-724	11.1
	1V8	SC-32S	70	7	9	9	-661	9.4
	2V7			7	9	9	-661	9.4
	3V3			7	9	9	-661	9.4
	3V3			7	9	9	-654	10.1
	1V8	SC-20S	70	7	9	9	-651	9.3
	2V7			7	9	9	-671	9.6
	3V3			7	9	9	-671	9.6
	5V5			7	10	10	-721	10.3
	1V8	SC-12S	90	7	9	9	-603	6.7
	2V7			7	9	9	-573	6.4
	3V3			7	9	9	-573	6.4
	5V5			7	9	9	-683	7.6
ATtiny85	2V7	SSP-T7-F	65	7	6	6	-2,554	39.3
	3V3			7	4	4	-2,554	39.3
	5V5			7	4	4	-2,554	39.3
	2V7	SC-32S	70	7	4	4	-2,361	33.7
	3V3			7	2	2	-2,261	32.3
	5V5			7	2	2	-2,561	36.6
	2V7	SC-20S	70	7	3	3	-2,171	31.0
	3V3			7	1	1	-2,171	31.0
	5V5			7	1	1	-2,071	29.6
	2V7	SC-12S	90	7	2	2	-2,203	24.5
	3V3			7	3	3	-2,303	25.6
	5V5			7	5	5	-2,103	23.4

◆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.

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.