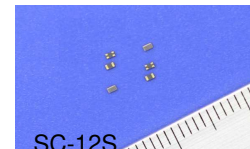
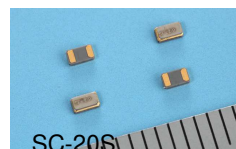
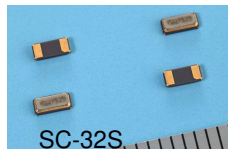
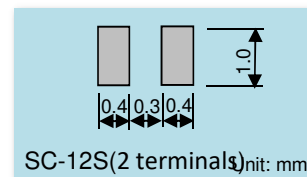
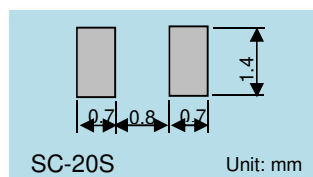
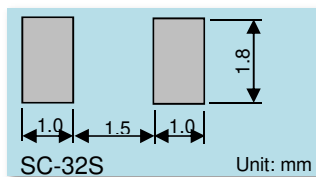
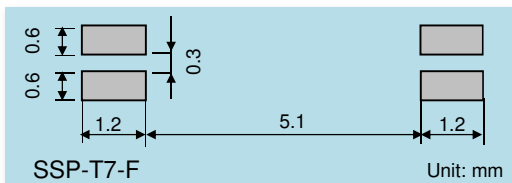


## ◆Specification for Quartz Crystal

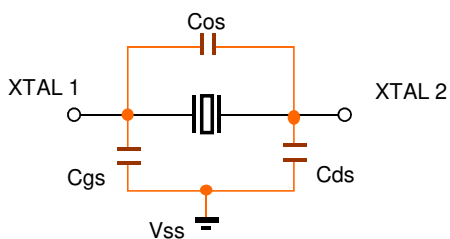
	SSP-T7-F	SC-32S	SC-20S	SC-12S
Nominal Frequency	32.768kHz	32.768kHz	32.768kHz	32.768kHz
Frequency Tolerance	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>
Load capacitance : CL	7pF / 12.5pF	7pF / 12.5pF	7pF / 12.5pF	7pF
Motional Resistance : R1	65kΩmax	70kΩmax	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



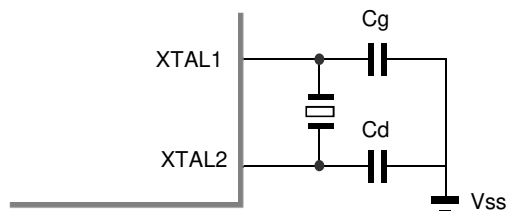
$$CL = C_g \times C_d / (C_g + C_d) + C_s \text{ (pF)}$$

Cos : XTAL 1-XTAL 2 Stray capacitance

Cgs : XTAL 1-Vss Stray capacitance

Cds : 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)
PIC18F25Q10 Low power mode	1V8	SSP-T7-F	65	7	8	8	-474	7.3
	2V7			7	8	8	-474	7.3
	3V3			7	8	8	-494	7.6
	5V5			7	8	8	-554	8.5
	1V8	SC-32S	70	7	7	7	-511	7.3
	2V7			7	7	7	-511	7.3
	3V3			7	7	7	-531	7.6
	5V5			7	7	7	-591	8.4
	1V8	SC-20S	70	7	8	8	-441	6.3
	2V7			7	8	8	-471	6.7
	3V3			7	8	8	-471	6.7
	5V5			7	8	8	-501	7.2
	1V8	SC-12S	90	7	8	8	-453	5.0
	2V7			7	8	8	-463	5.1
	3V3			7	8	8	-473	5.3
	5V5			7	8	8	-523	5.8
PIC18F25Q10 High power mode	1V8	SSP-T7-F	65	12.5	18	18	-699	10.7
	2V7			12.5	18	18	-729	11.2
	3V3			12.5	18	18	-729	11.2
	5V5			12.5	18	18	-749	11.5
	1V8	SC-32S	70	12.5	18	18	-705	10.1
	2V7			12.5	18	18	-725	10.4
	3V3			12.5	18	18	-725	10.4
	3V3			12.5	18	18	-775	11.1
	1V8	SC-20S	70	12.5	18	18	-711	10.2
	2V7			12.5	18	18	-741	10.6
	3V3			12.5	18	18	-741	10.6
	5V5			12.5	18	18	-791	11.3
	1V8	SC-12S	90	7	7	7	-2,703	30.0
	2V7			7	7	7	-2,703	30.0
	3V3			7	7	7	-2,703	30.0
	5V5			7	7	7	-2,903	32.3

◆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.

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.