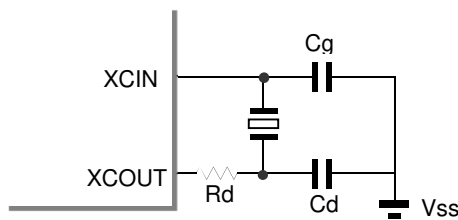


### ◆Circuit matching constant for Oscillation circuit

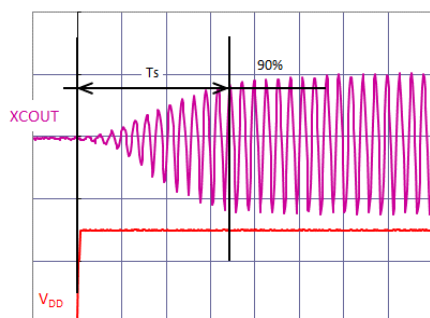
Oscillation mode	32.768kHz quartz crystals			Constants			V <sub>DD</sub> (V)	Characteristics of Oscillation			
	Products	R1Max	CL (pF)	Rd (kΩ)	Cg (pF)	Cd (pF)		RL (kΩ)	M (Times)	D.L (μW)	Ts (sec)
Standard CL	VT-200-F	50	12.5	0	20	20	2.7	-595	11.9	0.02	0.51
							3.0	-595	11.9	0.02	0.50
							3.3	-595	11.9	0.02	0.48
							3.6	-605	12.1	0.02	0.50
	SSP-T7-F	65	12.5	0	18	18	2.7	-699	-10.8	0.02	0.52
							3.0	-699	-10.8	0.02	0.45
							3.3	-699	-10.8	0.02	0.49
							3.6	-699	-10.8	0.02	0.48
	SC-32S	70	12.5	0	22	22	2.7	-485	6.9	0.02	0.36
							3.0	-485	6.9	0.02	0.32
							3.3	-485	6.9	0.02	0.32
							3.6	-485	6.9	0.02	0.36
Low CL	VT-200-F	50	6	0	8	8	2.7	-271	5.4	Less than 0.001	0.79
							3.0	-271	5.4	Less than 0.001	0.77
							3.3	-271	5.4	Less than 0.001	0.79
							3.6	-271	5.4	Less than 0.001	0.84
	SSP-T7-FL	65	4.4	0	6	5	2.7	-349	5.4	Less than 0.001	0.63
							3.0	-349	5.4	Less than 0.001	0.66
							3.3	-349	5.4	Less than 0.001	0.61
							3.6	-349	5.4	Less than 0.001	0.74
	SC-32P	50	6	0	8	8	2.7	-264	5.3	Less than 0.001	0.53
							3.0	-264	5.3	Less than 0.001	0.51
							3.3	-264	5.3	Less than 0.001	0.50
							3.6	-264	5.3	Less than 0.001	0.66

### ◆Qualification item for Oscillation circuit characteristics



No	Item	Symbol	Recommended conditions
1	Negative Resistance	RL	
2	Oscillation allowance	M	more than 5 times of R1Max.
3	Drive Level	D.L	VT-200-F: 1μW SSP-T7-F: 1μW SC-32S/P: 1μW
4	Oscillation Rising Time	Ts	-

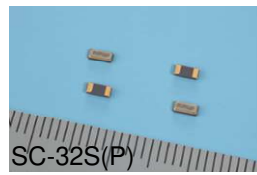
### Oscillation rising time (Ts) measurement conditions



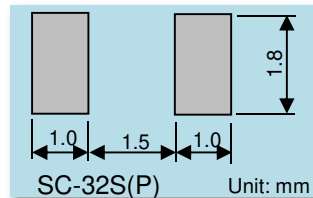
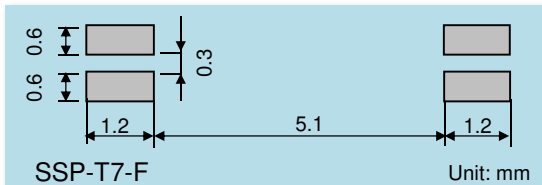
Time from the application of V<sub>DD</sub> until the XCOU amplitude reaches 90%

## ◆Specification for Quartz Crystal

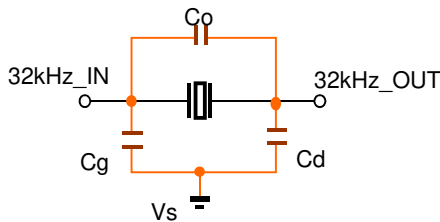
	VT-200-F	SSP-T7-FL/F	SC-32S	SC-32P
Nominal Frequency	32.768kHz	32.768kHz	32.768kHz	32.768kHz
Frequency Tolerance	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>	+/-20x10 <sup>-6</sup>
Load capacitance : CL	6pF/12.5pF	4.4pF/12.5pF	6pF/12.5pF	6pF
Motional Resistance : R1	50KΩmax	65KΩmax	70kΩ max.	50kΩ max.
Maximum Drive Level	1.0μW max	1.0μW max	1.0μW max	1.0μW max
Dimensions(Max.Value)	Φ2.0mm	7.0×1.5×1.4mm	3.2×1.5×0.85mm	3.2×1.5×0.85mm



## RECOMMENDED SOLDERING PATTERN



## ◆Approximate expression for Circuit load capacitance



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

Cos : 32kHz\_IN-32kHz\_OUT Stray capacitance

Cgs : 32kHz\_IN-Vss Stray capacitance

Cds : 32kHz\_OUT-Vss Stray capacitance

## ◆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).

## ◆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.