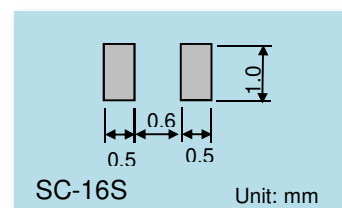
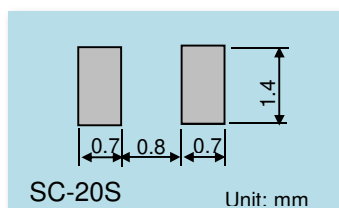
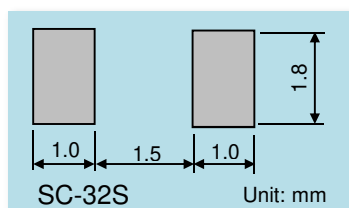


◆ **Specification for Quartz Crystal**

Size (mm)	Products		Load capacitance CL	Motional Resistance R1	Maximum Drive Level DL max.	Shunt Capacitance C0
Φ2.0	VT-200-F		12.5pF	50KΩ max.	1.0μW max.	0.9pF typ.
7.0×1.5×1.4	SSP-T7-F		12.5pF	50KΩ max.	1.0μW max.	0.9pF typ.
3.2×1.5×0.85	SC-32S		12.5pF	70kΩ max.	1.0μW max.	1.0pF typ.
2.0×1.2×0.60	SC-20S		9pF 7pF	70kΩ max.	1.0μW max.	1.3pF typ.
1.6×1.0×0.5	SC-16S		9pF	90kΩ max.	0.5μW max.	1.2pF typ.

Matching data was acquired on the evaluation board with this crystal.
Please contact us for other CL and other products.

◆ **RECOMMENDED SOLDERING PATTERN**



◆Circuit matching constant for Oscillation circuit

Mode TOUGH / STD

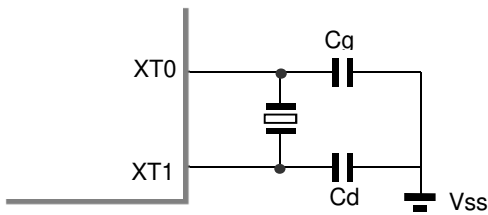
Oscillation mode	32.768kHz quartz crystals			Constants			V _{DD} (V)	Characteristics of Oscillation				
	Size	Products	CL (pF)	Rd (kΩ)	Cg (pF)	Cd (pF)		RL (kΩ)	M (Times)	D.L (μW)	Ts (sec)	
TOUGH	Φ2	VT-200-F	12.5	0	22	22	1.8	-715	14.3	0.06	0.76	
							3.3	-745	14.9	0.06	0.76	
							5.5	-795	15.9	0.06	0.71	
	7.0 x 1.5	SSP-T7-F	12.5	0	27	22	1.8	-605	9.3	0.07	0.59	
							3.3	-625	9.6	0.07	0.59	
							5.5	-665	10.2	0.07	0.62	
	3.2 x 1.5	SC-32S	12.5	0	27	22	1.8	-615	8.8	0.06	0.41	
							3.3	-635	9.1	0.06	0.40	
							5.5	-675	9.6	0.07	0.40	
	2.0 x 1.2	SC-20S	9	0	18	22	1.8	-816	11.7	0.04	0.23	
							3.3	-866	12.4	0.04	0.18	
							5.5	-946	13.5	0.04	0.18	
	1.6 x 1.0	SC-16S	9	0	22	22	1.8	-713	7.9	0.01	0.21	
							3.3	-753	8.4	0.01	0.19	
							5.5	-803	8.9	0.01	0.18	
	STD	Φ2	VT-200-F	12.5	0	22	22	1.8	-415	8.3	0.05	1.00
								3.3	-415	8.3	0.05	0.98
								5.5	-445	8.9	0.05	0.98
7.0 x 1.5		SSP-T7-F	12.5	0	22	22	1.8	-405	6.2	0.045	0.88	
							3.3	-435	6.7	0.045	0.88	
							5.5	-445	6.8	0.045	0.88	
3.2 x 1.5		SC-32S	12.5	0	27	22	1.8	-355	5.1	0.049	0.65	
							3.3	-365	5.2	0.051	0.65	
							5.5	-375	5.4	0.053	0.59	
2.0 x 1.2		SC-20S	9	0	18	18	1.8	-586	8.4	0.03	0.26	
							3.3	-586	8.4	0.03	0.24	
							5.5	-616	8.8	0.03	0.24	
1.6 x 1.0		SC-16S	9	0	18	22	1.8	-453	5.0	0.05	0.28	
							3.3	-463	5.1	0.05	0.28	
							5.5	-493	5.5	0.05	0.27	

◆Circuit matching constant for Oscillation circuit

Mode LP / ULP

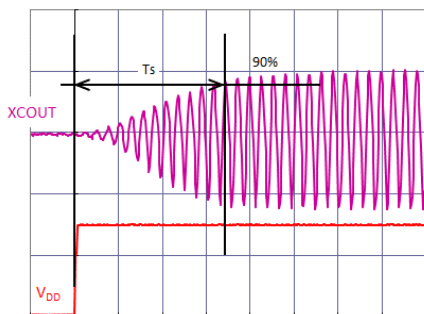
Oscillation mode	32.768kHz quartz crystals			Constants			V _{DD} (V)	Characteristics of Oscillation				
	Size	Products	CL (pF)	Rd (kΩ)	Cg (pF)	Cd (pF)		RL (kΩ)	M (Times)	D.L (μW)	Ts (sec)	
LP	Φ2	VT-200-F	12.5	0	22	22	1.8	-405	8.1	0.03	1.12	
							3.3	-415	8.3	0.03	1.15	
							5.5	-445	8.9	0.03	1.15	
	7.0 x 1.5	SSP-T7-F	12.5	0	22	22	1.8	-405	6.2	0.03	1.11	
							3.3	-425	6.5	0.03	1.11	
							5.5	-445	6.8	0.03	1.11	
	3.2 x 1.5	SC-32S	12.5	0	27	22	1.8	-355	5.1	0.03	0.82	
							3.3	-365	5.2	0.03	0.81	
							5.5	-375	5.4	0.03	0.72	
	2.0 x 1.2	SC-20S	7	0	12	12	1.8	-651	9.3	0.01	0.16	
							3.3	-871	12.4	0.01	0.13	
							5.5	-1,071	15.3	0.01	0.13	
	1.6 x 1.0	SC-16S	9	0	18	18	1.8	-533	5.9	0.03	0.21	
							3.3	-563	6.3	0.03	0.21	
							5.5	-593	6.6	0.03	0.18	
	ULP	Φ2	VT-200-F	12.5	0	18	22	1.8	-475	9.5	0.01	1.23
								3.3	-485	9.7	0.01	1.21
								5.5	-525	10.5	0.01	1.20
7.0 x 1.5		SSP-T7-F	12.5	0	22	22	1.8	-395	6.1	0.01	1.34	
							3.3	-395	6.1	0.01	1.39	
							5.5	-435	6.7	0.01	1.39	
3.2 x 1.5		SC-32S	12.5	0	22	22	1.8	-405	5.8	0.00	0.55	
							3.3	-425	6.1	0.00	0.49	
							5.5	-445	6.4	0.00	0.49	
2.0 x 1.2		SC-20S	7	0	10	10	1.8	-411	5.9	0.01	0.13	
							3.3	-491	7.0	0.01	0.09	
							5.5	-611	8.7	0.01	0.09	
1.6 x 1.0		SC-16S	9	0	18	15	1.8	-613	6.8	0.01	0.16	
							3.3	-633	7.0	0.01	0.14	
							5.5	-683	7.6	0.01	0.12	

◆Qualification item for Oscillation circuit characteristics



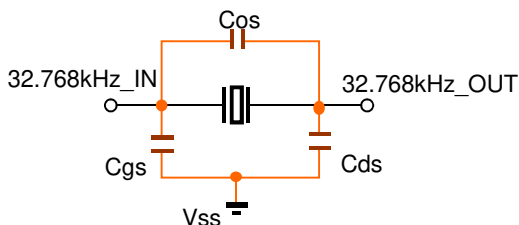
No	Item	Symbol	Recommended conditions
1	Negative Resistance	RL	
2	Oscillation allowance	M	more than 5 times of R1Max.
3	Drive Level	D.L	VT-200-F : 1.0μW SSP-T7-F : 1.0μW SC-32S : 1.0μW SC-20S : 1.0μW SC-16S : 0.5μW

Oscillation rising time (Ts) measurement conditions



Time from the application of VDD until the XT1 amplitude reaches 90%

◆Approximate expression for Circuit load capacitance



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

Cos : 32.768kHz_IN-32.768kHz_OUT Stray capacitance

Cgs : 32.768kHz_IN-Vss Stray capacitance

Cds : 32.768kHz_OUT-Vss Stray capacitance

◆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.

◆Notes for the design of Circuit board

Please keep the wiring short and place Quartz Crystal, Condensior, 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).