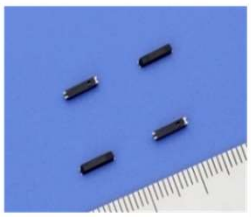
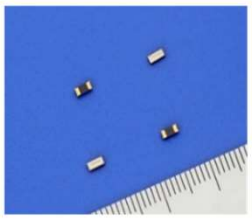
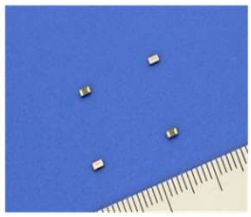
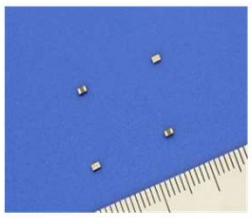
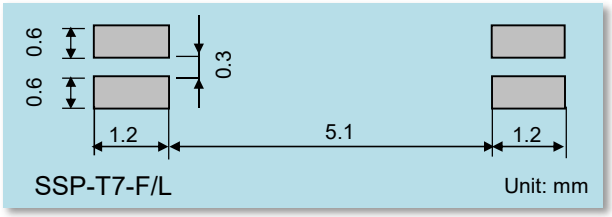
RA8M1 group 32kHz quartz crystal

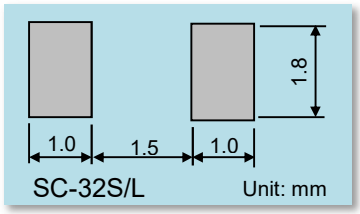
◆Specification for Quartz Crystal

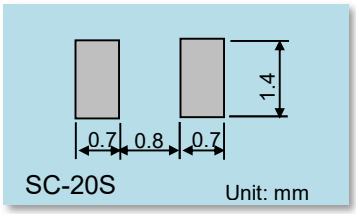
Size (mm)	Products		Load capacitance CL	Motional Resistance R1	Maximum Drive Level DL max.	Shunt Capacitance C0
7.0×1.5×1.4	SSP-T7-FL		4pF	65KΩ max.	1.0μW max.	0.9pF typ.
	SSP-T7-F		12.5pF 9pF 7pF			
3.2×1.5×0.85	SC-32S		12.5pF 9pF 7pF	70kΩ max.	1.0μW max.	1.0pF typ.
	SC-32L		6pF	40KΩ max.		
2.0×1.2×0.60	SC-20S		12.5pF 9pF 7pF 4pF	70kΩ max.	1.0μW max.	1.3pF typ.
1.6×1.0×0.5	SC-16S		9pF 7pF 6pF	90kΩ max.	0.5μW max.	1.2pF typ.

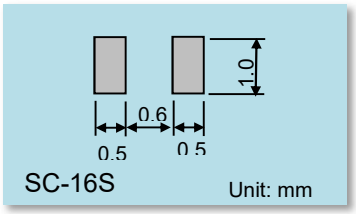
Matching data was acquired on the evaluation board with this crystal.
Please contact us for other CL and other products.

◆RECOMMENDED SOLDERING PATTERN









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RA8M1 group Matching data

◆**Circuit matching constant for Oscillation circuit**

Mode Standard / Lowpower 1

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)
Standard	7.0 x 1.5	SSP-T7-F	12.5	0	22	18	1.65	-395	6.1	0.02	0.37
							3.30	-405	6.2	0.03	0.31
							3.80	-405	6.2	0.03	0.25
	3.2 x 1.5	SC-32S	12.5	0	22	18	1.65	-410	5.9	0.02	0.23
							3.30	-420	6.0	0.03	0.19
							3.80	-430	6.1	0.03	0.15
	2.0 x 1.2	SC-20S	12.5	0	22	18	1.65	-421	6.0	0.03	0.13
							3.30	-441	6.3	0.04	0.12
							3.80	-441	6.3	0.04	0.10
	1.6 x 1.0	SC-16S	9	0	18	15	1.65	-533	5.9	0.01	0.08
							3.30	-533	5.9	0.01	0.05
							3.80	-563	6.3	0.01	0.05
Lowpower mode 1	7.0 x 1.5	SSP-T7-F	9	0	12	12	1.65	-407	6.3	0.01	0.37
							3.30	-407	6.3	0.01	0.30
							3.80	-407	6.3	0.01	0.29
	3.2 x 1.5	SC-32S	9	0	12	12	1.65	-434	6.2	0.01	0.23
							3.30	-444	6.3	0.01	0.19
							3.80	-444	6.3	0.01	0.19
	2.0 x 1.2	SC-20S	9	0	12	12	1.65	-456	6.5	0.01	0.12
							3.30	-456	6.5	0.01	0.09
							3.80	-456	6.5	0.01	0.09
	1.6 x 1.0	SC-16S	7	0	8	8	1.65	-649	7.2	0.01	0.07
							3.30	-689	7.7	0.01	0.05
							3.80	-689	7.7	0.01	0.05

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RA8M1 group Matching data

◆Circuit matching constant for Oscillation circuit

Mode Lowpower 2 / Lowpower 3

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)
Lowpower mode 2	7.0 x 1.5	SSP-T7-F	7	0	8	7	1.65	-450	6.9	0.01	0.43
							3.30	-450	6.9	0.01	0.32
							3.80	-450	6.9	0.01	0.30
	3.2 x 1.5	SC-32S	7	0	8	7	1.65	-467	6.7	0.01	0.28
							3.30	-467	6.7	0.01	0.21
							3.80	-467	6.7	0.01	0.20
	2.0 x 1.2	SC-20S	7	0	8	7	1.65	-501	7.2	0.01	0.16
							3.30	-491	7.0	0.01	0.10
							3.80	-491	7.0	0.01	0.09
	1.6 x 1.0	SC-16S	6	0	6	6	1.65	-573	6.4	0.01	0.10
							3.30	-573	6.4	0.01	0.07
							3.80	-573	6.4	0.01	0.07
Lowpower mode 3	7.0 x 1.5	SSP-T7-FL	4	0	2	2	1.65	-397	6.1	0.01	0.70
							3.30	-397	6.1	0.01	0.61
							3.80	-397	6.1	0.01	0.53
	3.2 x 1.5	SC-32L	6	0	5	5	1.65	-250	6.3	0.01	0.48
							3.30	-250	6.3	0.01	0.46
							3.80	-250	6.3	0.01	0.41
	2.0 x 1.2	SC-20S	4	0	2	1	1.65	-488	7.0	0.01	0.26
							3.30	-468	6.7	0.01	0.25
							3.80	-468	6.7	0.01	0.17

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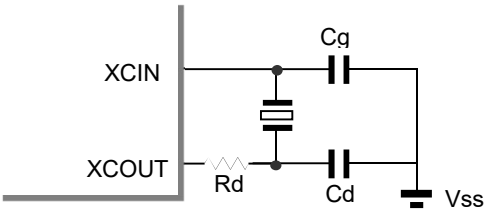
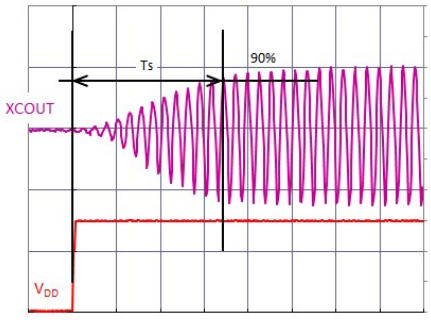
RA8M1 group Evaluation items and notes

◆Qualification item for Oscillation circuit characteristics



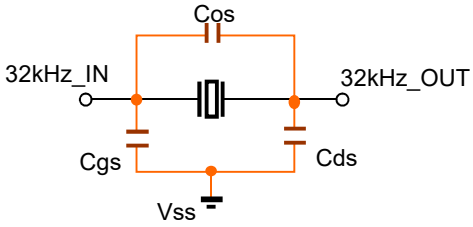
No	Item	Symbol	Recommended conditions
1	Negative Resistance	RL	
2	Oscillation allowance	M	more than 5 times of R1Max.
3	Drive Level	D.L	SSP-T7-F/FL : 1.0μW SC-32S/L : 1.0μW SC-20S : 1.0μW SC-16S : 0.5μW

Oscillation rising time (Ts) measurement conditions



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

◆**Approximate expression for Circuit load capacitance**



$$CL = Cg \times Cd / (Cg + Cd) + Cs \quad (pF)$$

Cos : 32kHz_IN-32kHz_OUT Stray capacitance
Cgs : 32kHz_IN-Vss Stray capacitance
Cds : 32kHz_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, 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).

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