



Precaution for use the crystal unit with low CL

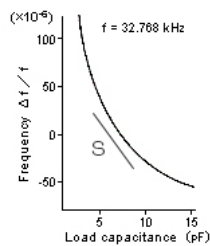
1. Note

A crystal unit with low CL is very sensitive to load capacitance variations of the oscillation circuit, so the environment the crystal is operated in.

(*1)

Consequently, the tolerance of the oscillation frequency in the actual circuit will exceed the tolerance defined in the crystal specification significantly.

1* Pulling sensitivity [ppm/pF] $S = -\frac{C_1}{2(C_n+C_1)^2}$



Please refer to the below page for the detail.

http://www5.epsondevice.com/en/information/technical_info/crystal/circuit.html#2

2.Products

1)For STMicroelectronics

Target MCU: STM32F401

Epson 32kHz crystal unit

Name	CL [pF]	Part number	Pulling Sensitivity *[ppm/pF]	Deviation max* [sec/pF]
FC-135R	6.0	X1A0001410006	34	88
FC-12M	5.0	X1A0000610018	81	210
FC1610AN	5.0	TBD	TBD	TBD

* : absolute value

2)For NXP Semiconductors

Target Real Time Clock: PCF85263

Epson 32kHz crystal unit

Name	CL [pF]	Part number	Pulling Sensitivity *[ppm/pF]	Deviation max* [sec/pF]
FC-135R	6.0	X1A0001410006	34	88
FC-135	6.0	Q13FC13500018	35	91
MC-146	6.0	Q13MC14620006	47	122

Target MCU LPC54xxx

Epson 32kHz crystal unit

Name	CL [pF]	Part number	Pulling Sensitivity *[ppm/pF]	Deviation max* [sec/pF]
FC-135R	6.0	X1A0001410006	34	88

* : absolute value

3)For Texas Instruments

Target MCU: MSP430FR5969

Epson 32kHz crystal unit

Name	CL [pF]	Part number	Pulling Sensitivity *[ppm/pF]	Deviation max* [sec/pF]
MC-146L	3.7	X1A0001520001	47	122

* : absolute value

4)For Renesas Electronics

Target MCU: RX200、RX600、RX700 Series

Epson 32kHz crystal unit

Name	CL [pF]	Part number	Pulling Sensitivity *[ppm/pF]	Deviation max* [sec/pF]
MC-146L	3.7	X1A0001520001	47	122

* : absolute value

3. Notes

CL=5.0[pF] and 6.0[pF] are not our standard specification so if you will use them please contact our sales person.

We would like to check about specification in our company.