

RIVER ELETEC CORPORATION  
ENGINEERING DEPARTMENT

## Evaluation Report of Crystal Oscillation Circuit

### ● Crystal unit specifications

Nominal Frequency	32.768kHz
Type	TFX-03
Cut (mode of oscillation)	X(Fundamental)
Frequency tolerance	within $\pm 20$ ppm
Temperature characteristic	$(-0.03 \pm 0.01) \times 10^{-6} / ^\circ\text{C}^2$ Turnover temperature $25^\circ\text{C} \pm 5^\circ\text{C}$
Equivalent series resistance	80k $\Omega$ MAX.
Load capacitance	5 pF
Part No.	ST-RIVER-2012-5PF-80K

### ● Oscillation stability condition (At RIVER ELETEC CORPORATION RECOMMENDED)

Negative resistance 240k $\Omega$  MIN.      Drive level      0.5  $\mu$ W MAX.

### ● Evaluation result

The result evaluation in the Figure-1 circuit is shown in Table-1.

In circuit constants ①, negative resistance of the oscillation circuit and the drive level of the oscillation circuit satisfy the oscillation stability condition

Evaluation result will differ depending on the printed wired board, stray capacitance, and other factors

The objective of this examination is to prevent any possible trouble after delivery. However, due to the limited number of sets being investigated, there is possibility that there is hidden trouble in the circuit. Moreover, due to differences in PCB or parts concerned, the end result may vary, thus we look forwards to your kind corporation in feeding back to us.

Table-1 Evaluation result ST-RIVER-2012-5PF-80K

Room Temp : +25°C  
Supply voltage : USB

Evaluation Board	Circuit constants	R34 [Ω]	R36 [Ω]	C31 [pF]	C32 [pF]	Negative resistance [kΩ]	Drive level [μW]	DF [ppm]
STM32L152	circuit constants ①	0	0	5	5	330	0.1 or less	+3.1
STM32F030	circuit constants ①	0	0	2	3	910 or more	0.1 or less	+20.0
STM32F070	circuit constants ①	0	0	3	3	910 or more	0.1 or less	-10.7
STM32F072	circuit constants ①	0	0	2	3	670	0.1 or less	+11.2
STM32F091	circuit constants ①	0	0	2	3	910 or more	0.1 or less	+17.6
STM32F103	circuit constants ①	0	0	1	2	340	0.1 or less	-6.0
STM32F302	circuit constants ①	0	0	2	3	790	0.1 or less	+15.7
STM32F303	circuit constants ①	0	0	2	3	910 or more	0.1 or less	+9.6
STM32F334	circuit constants ①	0	0	2	3	910 or more	0.1 or less	-6.6
STM32F410	circuit constants ①	0	0	4.3	4.3	250	0.1 or less	-4.2
STM32F411	circuit constants ①	0	0	5	5	260	0.1 or less	-8.0
STM32F446	circuit constants ①	0	0	4.3	4.3	250	0.1 or less	+1.2

DF: Difference against frequency on 5pF of load capacitance.

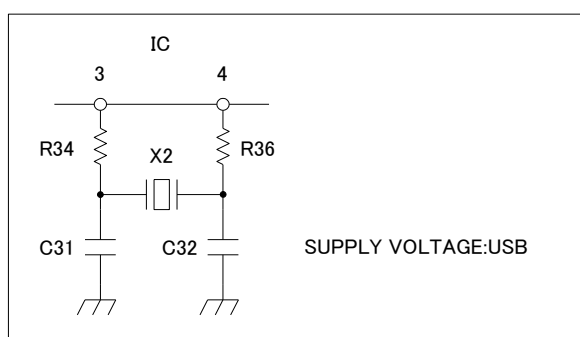


Fig.-1 Evaluation circuit