

ATMEL

Written by: W.Suemori  
Checked by: \*\*\*  
Attested by: S.Sunaba  
Engineering Dept.1

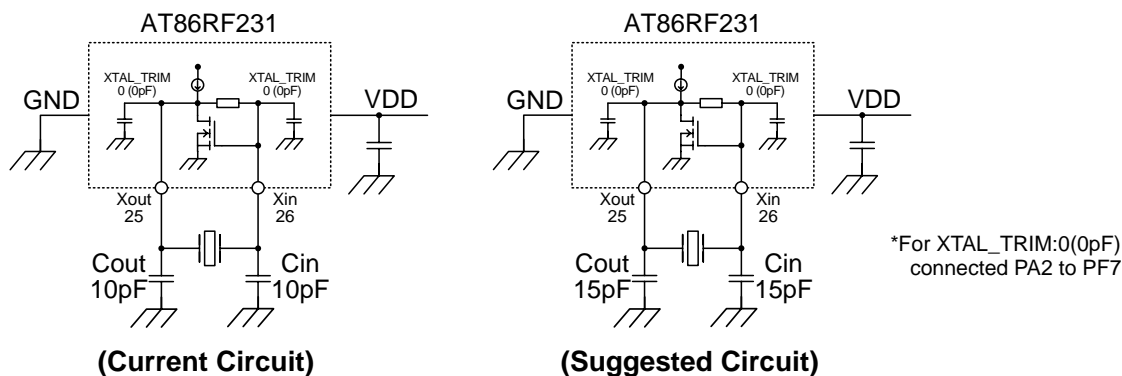
Thank you for your inquiry and we are pleased to report you our circuit analysis report as follows.

## Circuit Analysis Report

### 1. CONDITION

Test IC	AT86RF231	
Crystal	Holder	NX5032GA
	Frequency	16.000MHz
	Load capacitance	CL=8pF (Current) <b>CL=10pF (Suggested)</b>
	NDK Spec. No.	STD-CSK-8(J) (*J:CL=10pF)
Test Circuit	IC	ATRF231 58901-03 1114 PH 0T7966-1
	VDD	+3V / +1.8V
	PCB	TB3_XMEGA_231 AVR2067 - Crystal Characterization for AVR RF

### 2. CIRCUIT DIAGRAM



### 3. RESULTS

- 1) This crystal unit requires negative resistance of  $-R = 700\Omega$  minimum for stable oscillation
- 2) Circuit characteristics

Circuit	Cout/Cin	XTAL_TRIM (Internal Cap)	Frequency deviation dF/F	Negative Resistance -R	Drive Level DL	Startup time Tstr
Current	10pF/10pF	0 (0pF)	+12ppm (CL=8pF)	3170 $\Omega$	Less than 10uW	1ms
Suggested	15pF/15pF	0 (0pF)	<b>+2ppm (CL=10pF)</b> Ref.: -36ppm (CL=8pF)	1890 $\Omega$	Less than 10uW	1.5ms

- 3) Although the negative resistance of the current circuit is over our target, it seems too large.
- 4) In order to improve negative resistance, we recommend changing external capacitance values from Cout/Cin=10pF/10F to **Cout/Cin=15pF/15pF**. Besides, we recommend changing crystal load capacitance value from CL=8pF to **CL=10pF** in order to improve frequency deviation.