



NIHON DEMPA KOGYO CO., LTD.

Date: Nov.16, 2012
NDK Ref. No.: EXC10B-32307
S/No.:EXC03B-23826

ATMEL

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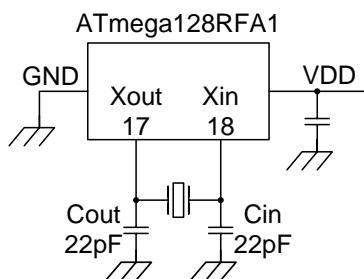
Thank you for your inquiry and we are pleased to report you our circuit analysis report as follows.

Circuit Analysis Report

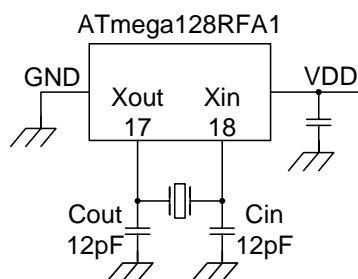
1. CONDITION

Test IC	ATmega128RFA1	
Crystal	Holder	NX2012SA
	Frequency	32.768kHz
	Load capacitance	CL=9pF
	NDK Spec. No.	STD-MUB-2
Test Circuit	IC	MEGA128RFA1-ZU 1105D 0T6227
	VDD	+3V / +1.8V
	PCB	TB1_MEGA_RF AVR2067 - Crystal Characterization for AVR RF

2. CIRCUIT DIAGRAM



(Current Circuit)



(Suggested Circuit)

3. RESULTS

- 1) This crystal unit requires negative resistance of $-R = 240k\Omega$ minimum for stable oscillation
- 2) Circuit characteristics

Circuit	Cout/Cin	Frequency deviation dF/F	Negative Resistance -R	Drive Level DL	Startup time Tstr
Current	22pF/22pF	-88ppm (CL=9pF)	490k Ω	0.03uW	0.5s
Suggested	12pF/12pF	+1ppm (CL=9pF)	1170k Ω	0.01uW	0.3s

- 3) The current circuit has enough negative resistance. However, frequency shifts to minus.
- 4) In order to improve frequency deviation, we recommend changing capacitance values from Cout/Cin=22pF/22pF to **Cout/Cin=12pF/12pF**.