



NIHON DEMPA KOGYO CO., LTD.

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NDK Ref. No.: EXC10B-23491
S/No.:EXC03B-14150

Atmel Norway

Written by: Y.Sakurai
Checked by: ***
Attested by: S.Sunaba
Engineering Dept.1

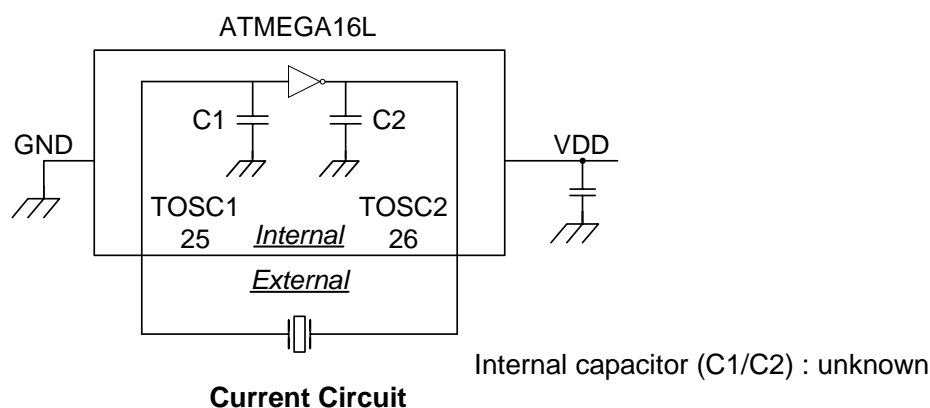
Thank you for your inquiry and we are pleased to report you our circuit analysis report as follows.

Circuit Analysis Report

1. CONDITION

Test IC	ATMEGA16L	
Crystal	Holder	NX3215SA
	Frequency	32.768kHz
	Load capacitance	CL=9pF(Current) CL=12.5pF(Reference)
	NDK Spec. No.	STD-MUA-9
Test Circuit	IC	ATMEGA16L 8AU 0552J
	VDD	+2.7V / +3.7V / +5.5V
	PCB	ATmega16/32 TQFP Characterization top-card

2. CIRCUIT DIAGRAM



3. RESULTS

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

Circuit	VDD	External C	Frequency deviation dF/F		Negative Resistance -R	Drive Level DL	Startup time Tstr
			CL=9pF (Current)	CL=12.5pF (Reference)			
Current	+2.7V	None	-123ppm	-62ppm	360k Ω	0.31uW	0.6s
	+3.7V	None	-121ppm	-60ppm	380k Ω	0.32uW	0.6s
	+5.5V	None	-115ppm	-54ppm	480k Ω	0.34uW	0.6s

- 3) The current circuit has enough Negative Resistance at VDD=+2.7V~+5.5V.
- 4) In the current circuit, dF/F is shifted to minus very much.
- 5) The changing of Internal capacitor(C1/C2) is necessary for frequency matching.

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