

TO: Microchip Corporation

Report No.	UKY1C-C3-16834-00(43)N	1/2
Date Issued	25-Nov-16	

## Crystal oscillation circuits report

Dear Sirs,

We are pleased to submit a report on the above subject as follows:

Yours faithfully

Board name	SAME54 Xplained Pro kit
IC name	ATSAME54P20A
Specification	CX3225CA16000D0KPSC1
Specification NO.	--
Crystal unit type	CX3225CA
Frequency	16000 kHz
Frequency tolerance	±30 PPM
Temperature	-40~+85 °C
Temperature characteristic	±50 PPM
Equivalent series resistance	100 Ω
Load capacitance	8 pF
Drive level	200 uW

### Circuit examination history

2016.11.25 First edition UKY1C-C3-16834-00(43)N

Crystal Units design section		Crystal oscillation circuit evaluation section		
Approved by	Checked by	Approved by	Checked by	Prepared
T.Nitobe	-	A.Hisako	Y.Yuki	M.Tanigawa

The reference about the above

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Note:The characteristics of crystal oscillating circuits vary according to a circuit constant, installed condition,etc.

Before use,please conlem matching of the crystal unit with the crystal oscillator circuits.Please also note that the results of reviewing the circuits may not meet the characteristics of your product.

## ○ Measurement Circuit Diagram

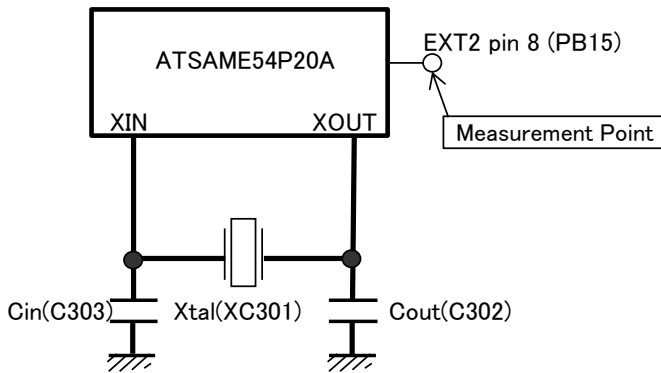
SAME54 Xplained Pro kit

IC: ATSAME54P20A

Vcc: USB (V)

Xtal(XC301): CX3225CA 16000kHz

CL= 8pF



Measurement Item	Instrument
Frequency	Anritsu MS2661C Spectrum Analyzer
Negative Resistance	Anritsu MS2661C Spectrum Analyzer
Drive Level	Tektronix Digital Oscilloscope TDS5052B
	Tektronix AC Current Probe P6022

## ○ Characteristics at Recommended Constants

CL= 8pF

Circuit Constants		Power Voltage (V)	Automatic Loop Control	Negative Resistance (Ω)	Circuit load Capacitance (pF)	Frequency Deviation (PPM)	Drive Level (μ W)	3rd Negative Resistance (Ω)
Cin(C303)	Cout(C302)							
4pF	4pF	USB	Enabled	-5230	6.68	+17.75	0.3	-610
4pF	4pF	USB	Disabled	-5229	8.87	-9.00	125	-610

### • Negative resistance

<Automatic loop control enabled>

The negative resistance for 16000kHz at the present circuit constants is  $-5230\Omega$ , which is enough to assure stable operation of the circuits.

<Automatic loop control disabled>

The negative resistance for 16000kHz at the present circuit constants is  $-5229\Omega$ , which is enough to assure stable operation of the circuits.

### • Circuit load capacitance and Frequency tolerance

<Automatic loop control enabled>

The load capacitance of the oscillator circuit is 6.68pF with a frequency deviation of +17.75PPM. This is based on the fact that this quartz crystal has a frequency deviation of +/-0 by using a load capacitance of 8pF.

<Automatic loop control disabled>

The load capacitance of the oscillator circuit is 8.87pF with a frequency deviation of -9.00PPM. This is based on the fact that this quartz crystal has a frequency deviation of +/-0 by using a load capacitance of 8pF.

### • Drive level

<Automatic loop control enabled>

The drive level of the oscillation circuit is  $0.3\mu W$ .

When a quartz crystal unit with  $24.32\Omega$  equivalent series resistance and  $29.97\Omega$  load resonance resistance is used. This is a good value without the possibility to cause trouble.

<Automatic loop control disabled>

The drive level of the oscillation circuit is  $125\mu W$ .

When a quartz crystal unit with  $24.32\Omega$  equivalent series resistance and  $28.52\Omega$  load resonance resistance is used. This is a good value without the possibility to cause trouble.

### • 3rd Over tone Negative resistance

<Automatic loop control enabled>

The 3rd over tone (= 48000kHz) negative resistance of the oscillation circuit is  $-610\Omega$ .

The value is guaranteed to stable oscillation in the circuit.

<Automatic loop control disabled>

The 3rd over tone (= 48000kHz) negative resistance of the oscillation circuit is  $-610\Omega$ .

The value is guaranteed to stable oscillation in the circuit.

### • Conclusion

We recommend use of the product at the present constants.

However, please check whether it is satisfactory enough in your company.

The results of testing the mounted board we borrowed from you this time are as described above.

Please also check and review them on your side before use.

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