

TO: Microchip Corporation

Report No.	UKY1C-C3-16835-00(43)N	1/3
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	KSZ8091RNACA
Specification	CX3225SB25000D0KPSC1
Specification NO.	--
Crystal unit type	CX3225SB
Frequency	25000 kHz
Frequency tolerance	±30 PPM
Temperature	-40~+85 °C
Temperature characteristic	±50 PPM
Equivalent series resistance	50 Ω
Load capacitance	8 pF
Drive level	200 uW

Circuit examination history

2016.11.25 First edition UKY1C-C3-16835-00(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

KYOCERA Crystal Device Corporation Marketing Division
5850 Higashine-koh , Higashine-shi , Yamagata 999-3701

Tel:+81-237-43-5747 Fax:+81-237-43-5651

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

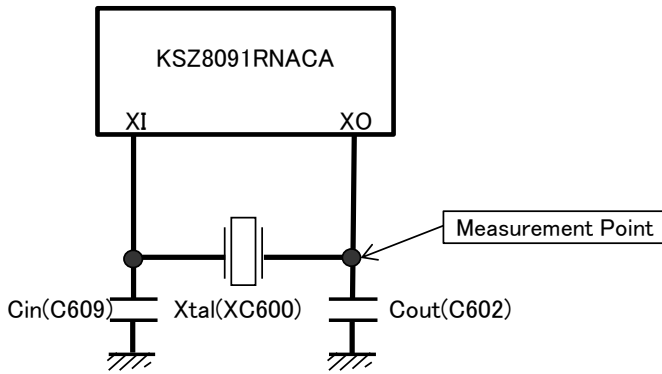
SAME54 Xplained Pro kit

IC: KSZ8091RNACA

Vcc: USB (V)

Xtal(XC600): CX3225SB 25000kHz

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 Present Constants

CL= 8pF

Circuit Constants		Power Voltage (V)	Negative Resistance (Ω)	Circuit load Capacitance (pF)	Frequency Deviation (PPM)	Drive Level (μ W)	3rd Negative Resistance (Ω)
Cin(C609)	Cout(C602)						
18pF	18pF	USB	-784	10.15	-29.36	274	-110

• Negative resistance

The negative resistance for 25000kHz at the present circuit constants is -784Ω , which is enough to assure stable operation of the circuits.

• Circuit load capacitance and Frequency tolerance

The load capacitance of the oscillator circuit is 10.15pF with a frequency deviation of -29.36PPM . 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

The drive level of the oscillation circuit is $274\mu\text{W}$.

When a quartz crystal unit with 11.60Ω equivalent series resistance and 13.8Ω load resonance resistance is used. This value is large. This may become the problem.

• 3rd Over tone Negative resistance

The 3rd over tone (= 75000kHz) negative resistance of the oscillation circuit is -110Ω . The value is guaranteed to stable oscillation in the circuit.

• Conclusion

Constant and Load Capacitance change is needed because center frequency is at minus side and drive level is large.

KYOCERA Crystal Device Corporation	Date Issued 2016.11.25	Circuit Diagram Present constants	Report No. UKY1C-C3-16835-00(43)N 2/3
------------------------------------	---------------------------	--------------------------------------	--

○ Measurement Circuit Diagram

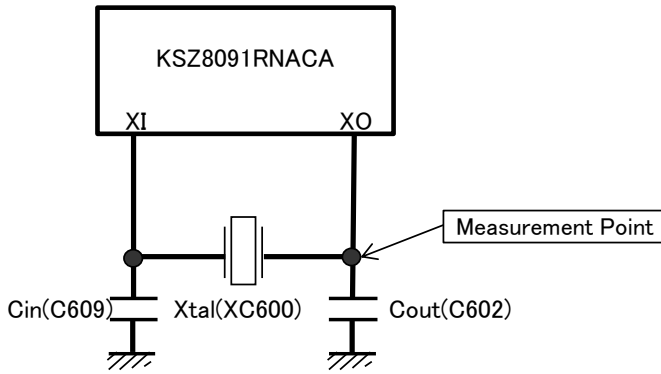
SAME54 Xplained Pro kit

IC: KSZ8091RNACA

Vcc: USB (V)

Xtal(XC600): CX3225SB 25000kHz

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)	Negative Resistance (Ω)	Circuit load Capacitance (pF)	Frequency Deviation (PPM)	Drive Level (μ W)	3rd Negative Resistance (Ω)
Cin(C609)	Cout(C602)						
12pF	12pF	USB	-1414	7.84	+2.84	140	-210

• Negative resistance

The negative resistance for 25000kHz at the present circuit constants is -1414Ω , which is enough to assure stable operation of the circuits.

• Circuit load capacitance and Frequency tolerance

The load capacitance of the oscillator circuit is 7.84pF with a frequency deviation of +2.84PPM. 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

The drive level of the oscillation circuit is $140\mu W$.

When a quartz crystal unit with 11.60Ω equivalent series resistance and 14.49Ω load resonance resistance is used. This is a good value without the possibility to cause trouble.

• 3rd Over tone Negative resistance

The 3rd over tone (= 75000kHz) negative resistance of the oscillation circuit is -210Ω . 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.

○ Temperature Characteristics at Recommended Constants

Circuit Constants		Power Voltage (V)	Temperature (°C)	Negative Resistance (Ω)	Drive Level (μ W)	3rd Negative Resistance (Ω)
Cin(C609)	Cout(C602)					
12pF	12pF	USB	-40	-1614	144	-240
12pF	12pF	USB	+85	-1314	143	-200

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.

KYOCERA Crystal Device Corporation	Date Issued 2016.11.25	Circuit Diagram Recommended constants	Report No. UKY1C-C3-16835-00(43)N 3/3
------------------------------------	---------------------------	--	--