Application Note

Suitable circuit conditions for Murata's crystal Unit (2016size -30 to 85 deg.C) on nRF52xxx by Nordic

Issued by O. Yoshie May, 2016

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Checked by [redacted]

This report has been done by Murata, and Murata has 100% responsibility for the evaluation data. Please ask Murata sales or representative if you have any question.
The application note has been checked by Nordic Semiconductors and based on the data sheet and the result of Murata's testing. Nordic did not see contradiction with nRF52 oscillator requirements. This statement does not engage Nordic Semiconductor ASA responsibility on any Murata tests or documentation.

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Application Note

Purpose of this application note

For the customer who is trying to embed low power RF function by nRF52xxx* (released by Nordic), Murata will provide information of

1. Suitable crystal part number by Murata
2. Optimized circuit conditions for oscillation circuit

to save customer's time and resources for evaluation above.

- nRF52xxx has been released, and it is able to use 32MHz crystal as reference clock. Oscillation characteristics in this document is confirmed by nRF52xxx evaluation board, and those results are effective after update of the IC due to oscillation portion in the IC is same.
- PCB design may cause influence to oscillation characteristics. The evaluation by actual PCB is recommended. Murata can support to do.

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4. Start up time of Crystal Unit

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1. Crystal part number for nRF52xxx

XRCGB32M000F2P10R0

Spec. of Murata's crystal

Parameter	Spec. of Murata's crystal
Size [mm] (L x W x H)	2.0 x 1.6 x 0.7
Frequency tolerance [ppm]	+/-20
Frequency drift over temp. [ppm] (-30 to 85deg.C)	+/-20
ESR [ohm] (*1)	70 max.
Load cap CL [pF] (*2)	6.0
Drive level [uW] (*3)	300 max.

(*1): Equivalent Series Resistance. Resistance of the crystal.
(*2): Specified capacitance for frequency sorting on crystal.
(*3): Withstand-ability for how high power the crystal can use by.
Refer oscillation characteristics data for actual power consumption on crystal.

Murata confirmed crystal above can be used with nRF52xxx.

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2. Optimized circuit conditions

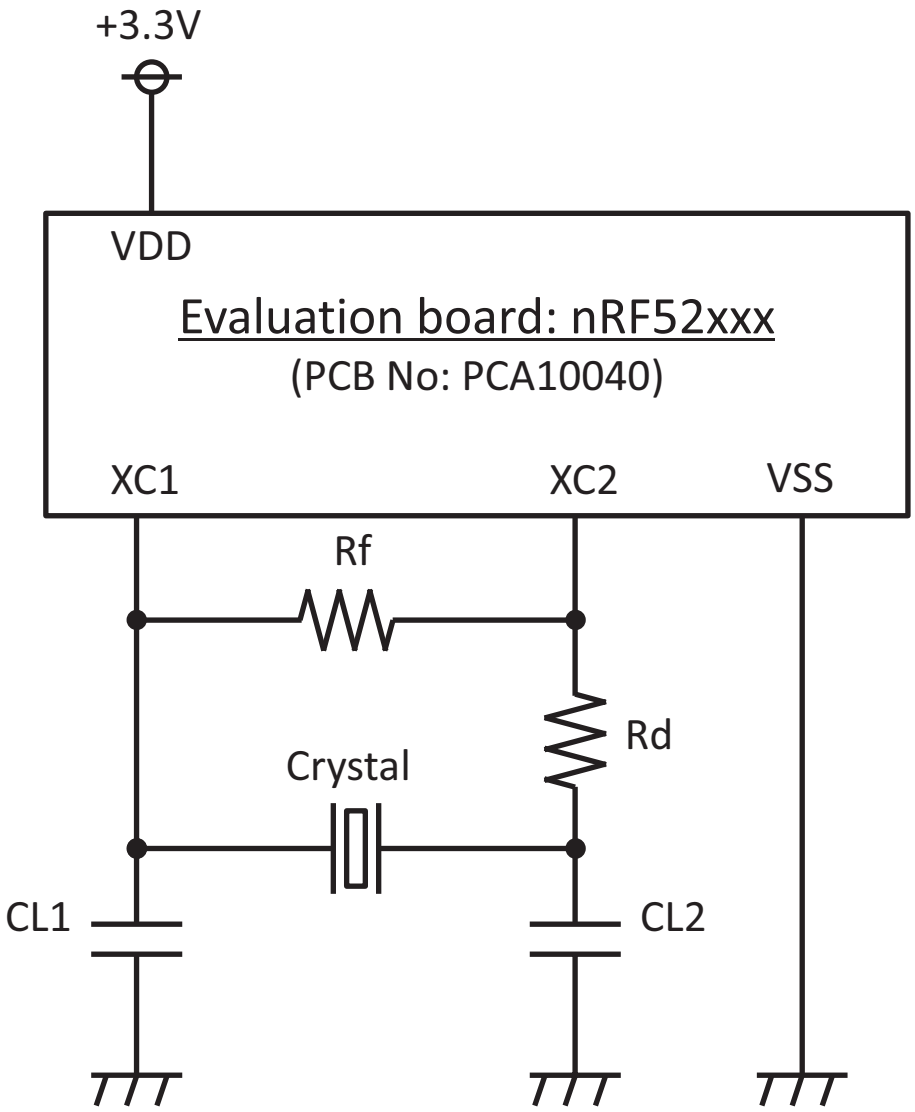

Figure of oscillation circuit

Symbol	Parameter	Optimized value
Rf	Feedback resistor [ohm]	No mount
Rd	Damping resistor [ohm]	0
CL1	External capacitance [pF]	10
CL2	External capacitance [pF]	10

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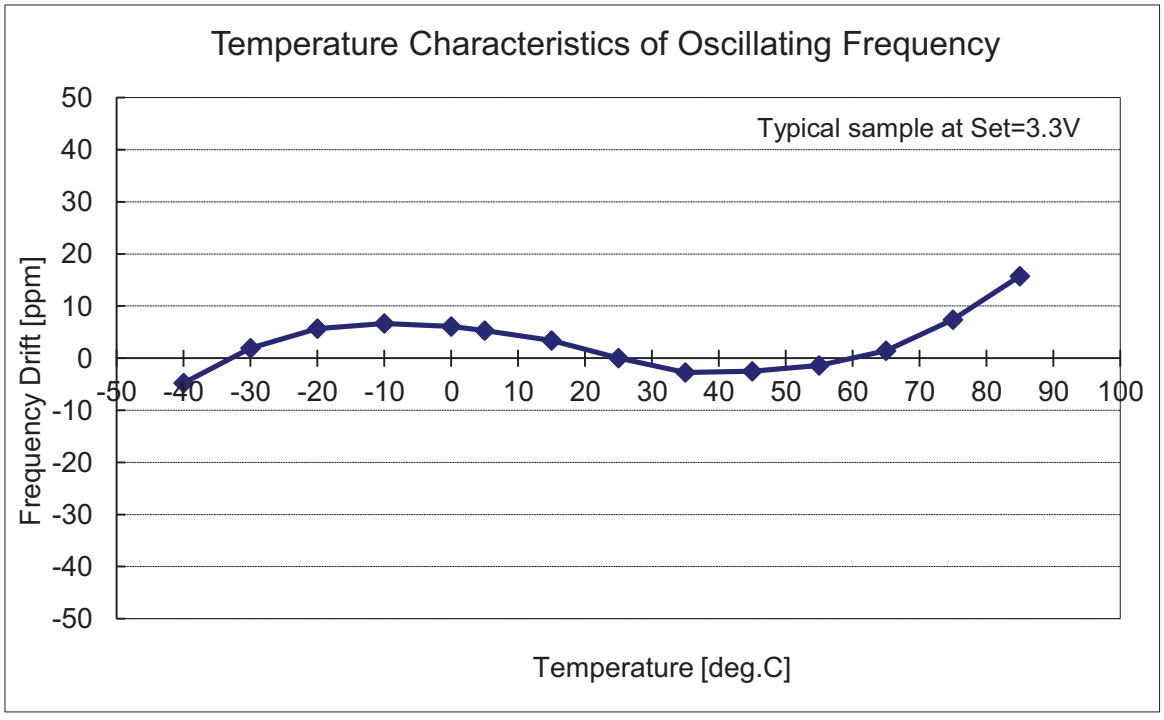
3. Oscillation characteristics

Measured oscillation characteristics

Parameter	Measured results
Oscillation margin	14.8 [times]
Drive level	11 [uW]
Actual load capacitance	6.0 [pF]
Nominal frequency shift (from 32MHz)	0 [ppm]
Frequency drift by temperature	See chart below
Start up time of crystal	0.31 [ms]

Measured frequency drift by temperature



All of above results have been measured on evaluation board of nRF52xxx (PCA10040) from Nordic, with optimized circuit conditions for XRCGB32M000F2P10R0. Refer TCD-16-0017, issued by Murata, for more detail.

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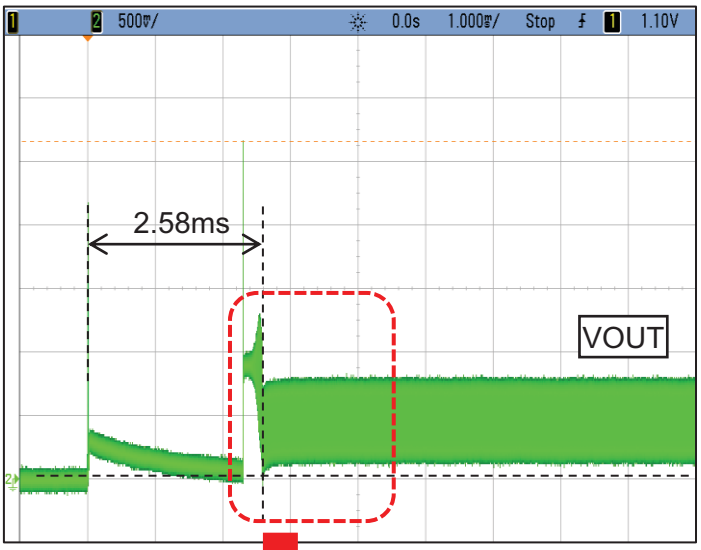
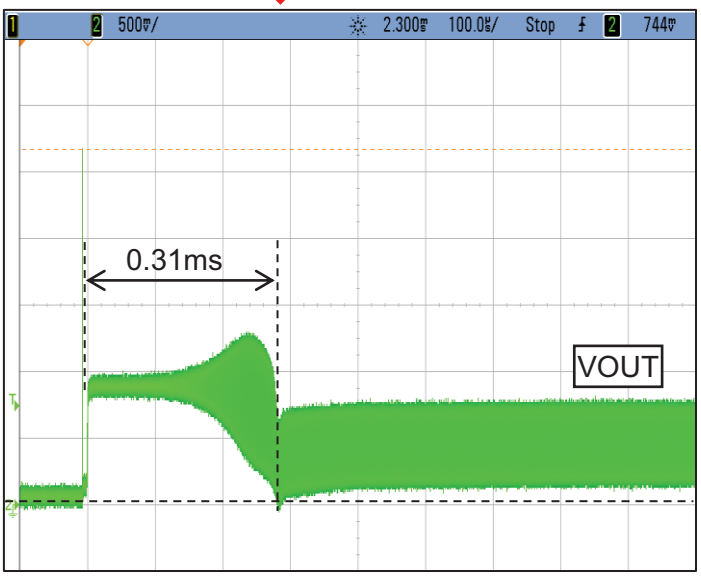
4. Start up time of crystal



Zoom



Typical sample at Set=3.3V, +25deg C

[VOUT] Vertical: 0.5V/div., Horizontal: 1ms/div.
Break line: GND

[VOUT] Vertical: 0.5V/div., Horizontal: 100us/div.
Break line: GND

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