Application Note

Suitable circuit conditions for Murata's crystal on nRF51xxx by Nordic

Issued by

Checked by

All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.

November, 2013

Purpose of this application note

For the customer who is trying to embed low power RF function by nRF51xxx* (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.

* nRF51xxx has been released, and it will be able to use 32MHz xtal as reference clock by next update of IC. Oscillation characteristics in this document is confirmed by existed nRF51xxx, and those results are effective after update of the IC due to oscillation portion in the IC is same.

Index

1. Spec. of crystal by Murata
2. Optimized circuit conditions
3. Oscillation characteristics

All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.

1. Crystal part number for nRF51xxx

XRCGB32M000FAP11R0 (*1)

(*1) Mass production is planned from January 2014.

Spec. of Murata's crystal for **ULP**

Parameter	Spec. of Murata's crystal
Size [mm] (L x W x H)	2.0 x 1.6 x 0.7
Frequency tolerance [ppm]	+/-25
Frequency drift over temp [ppm] (-30 to 85deg.C)	+/-20
ESR [ohm] (*2)	70 max
Load cap CL [pF] (*3)	6
Drive level [uW] (*4)	300 max

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

Nordic and Murata confirmed crystal above can be used with nRF51xxx.

All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.

1. Crystal part number for nRF51xxx

XRCGB32M000F2P10R0 (*1)

(*1) Mass production is planned from January 2014.

Spec. of Murata's crystal for **BLE**

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] (*2)	70 max
Load cap CL [pF] (*3)	6
Drive level [uW] (*4)	300 max

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

Nordic and Murata confirmed crystal above can be used with nRF51xxx.

All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.

2. Optimized circuit conditions

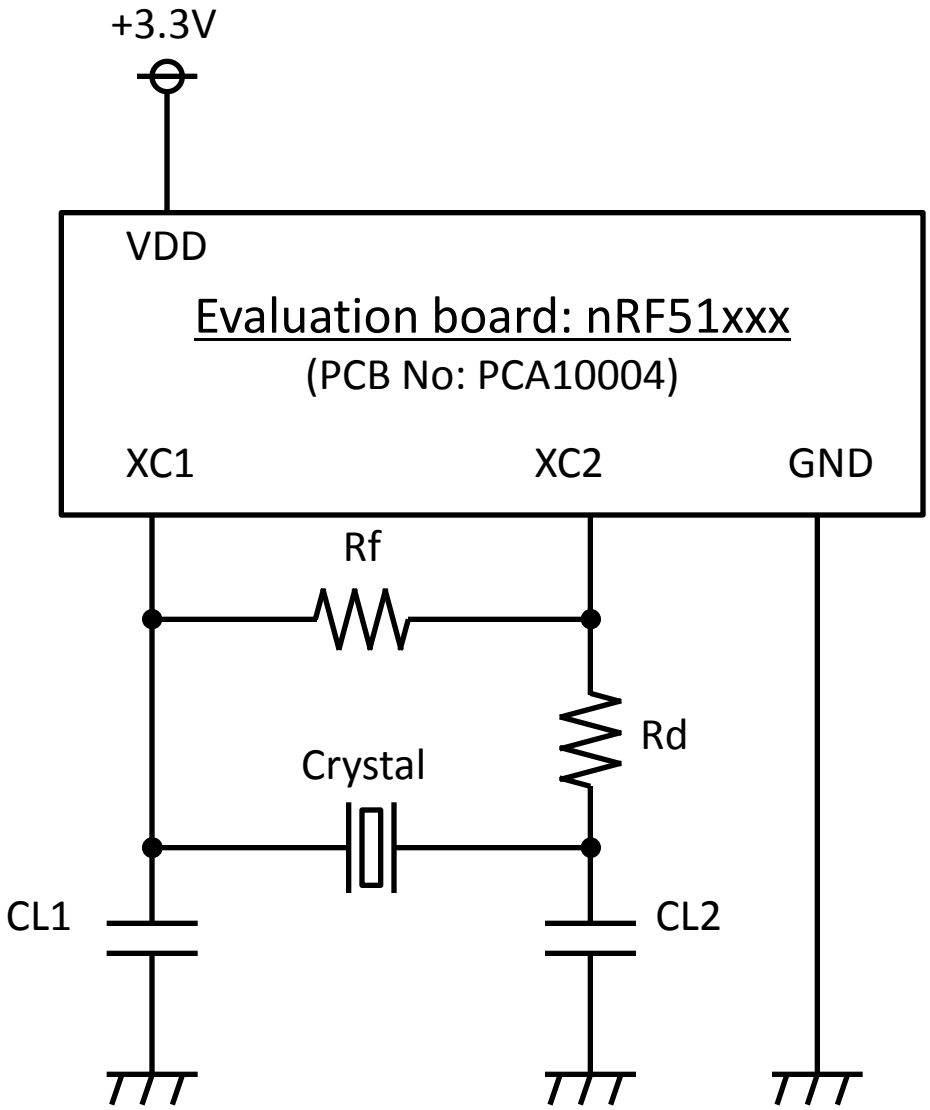


Figure of oscillation circuit

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

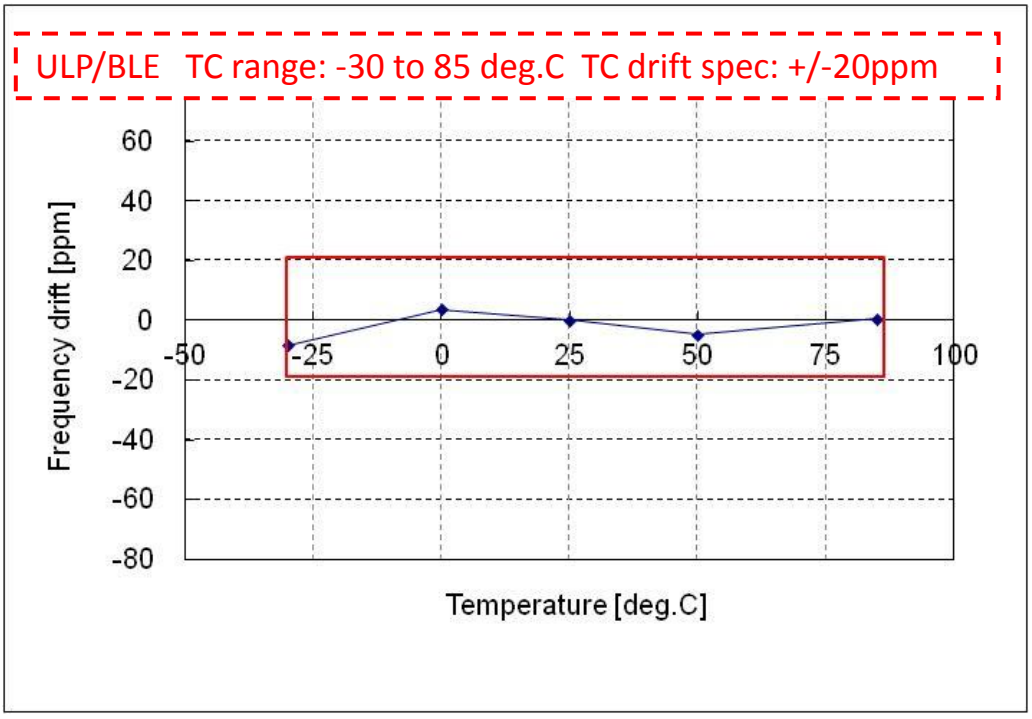
All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.

3. Oscillation characteristics

Measured oscillation characteristics

Parameter	Measured results
Oscillation margin	8.6 [times]
Drive level	14 [uW]
Actual load capacitance	6.2 [pF]
Nominal frequency shift (from 32MHz)	-3 [ppm]
Frequency drift by temperature	See chart below

Measured frequency drift by temperature



All of above results have been measured on evaluation board of nRF51xxx (PCA10004) from Nordic, with optimized circuit conditions for XRCGB32M000F2P00R0. Refer TCD-13-0238, issued by Murata, for more detail.

All Rights Reserved, Copyright© Murata Manufacturing Co., Ltd.