

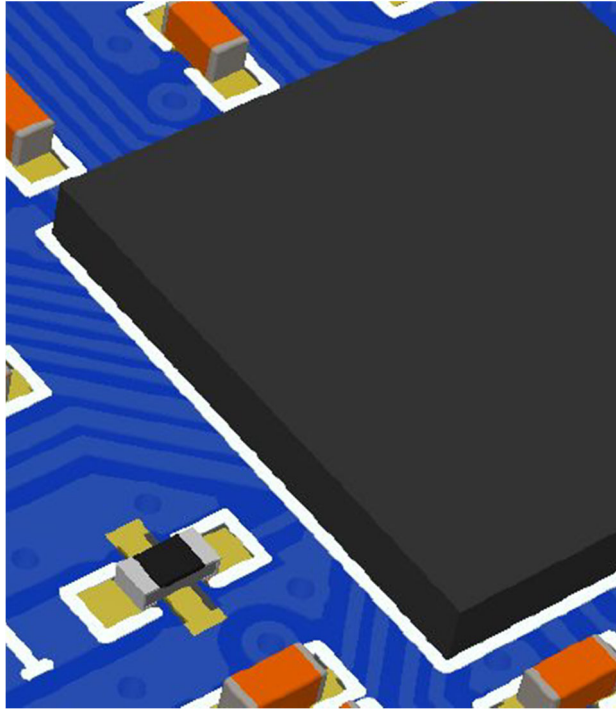
High Frequency Ceramic Solutions

Application Note: AN080

7/27/2020

G.Kuo/M.Carmona/I.Johnson

Application Note for Nordic Semiconductor's nRF52833-QDAA, nRF52833-QIAA, nRF52840-QIAA Integrated RF Front End Solution Using Johanson's 1.0x0.5mm Impedance Matched Filter



Abstract

The nRF52833 is a general-purpose multiprotocol SoC with a Bluetooth Direction Finding capable radio, qualified for operation at an extended temperature range of -40°C to 105°C.

The nRF52840 SoC is the most advanced member of the nRF52 Series SoC family. It is fully multi-protocol capable with full protocol concurrency. It has protocol support for Bluetooth 5, Bluetooth mesh, Thread, Zigbee, 802.15.4, ANT and 2.4 GHz proprietary stacks.

This application note describes the implementation, measurements, schematics, and design files when pairing Nordic Semiconductor's nRF52840 and nRF52833 QFN packages with Johanson Technology's impedance matched filter.

Features

In partnership with Nordic Semiconductor, Johanson Technology Inc. has developed a miniature 4-pin EIA 0402 (1.0mmx0.5mmx0.38mm) ceramic passive filter that provides the following:

- Consolidates Nordic Semiconductor's reference discrete LC filter into a single, 0402 sized component
- Complex impedance matched specifically to the nRF52833-QDAA, nRF52833-QIAA, and nRF52840-QIAA single ended antenna outputs

This front-end filter reduces implementation size area by using smaller effective PCB real estate usage. Also, it reduces component count, increases performance consistency (100% RF tested before T&R), and offers excellent temperature stability (<4ppm). AEC-Q200 qualified part is also available.

Nordic Semiconductor Chipset	Impedance-matched Filter
nRF52833-QDAA	2450FM07B0037
nRF52833-QIAA	
nRF52840-QIAA	
Datasheet	
https://www.johansontechnology.com/datasheets/2450FM07B0037/2450FM07B0037.pdf	



<https://www.johansontechnology.com>

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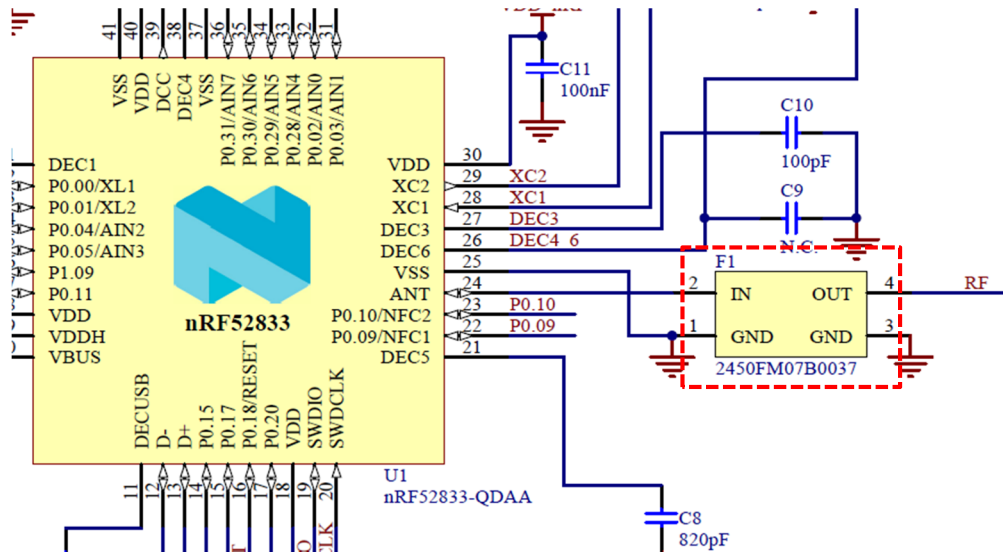
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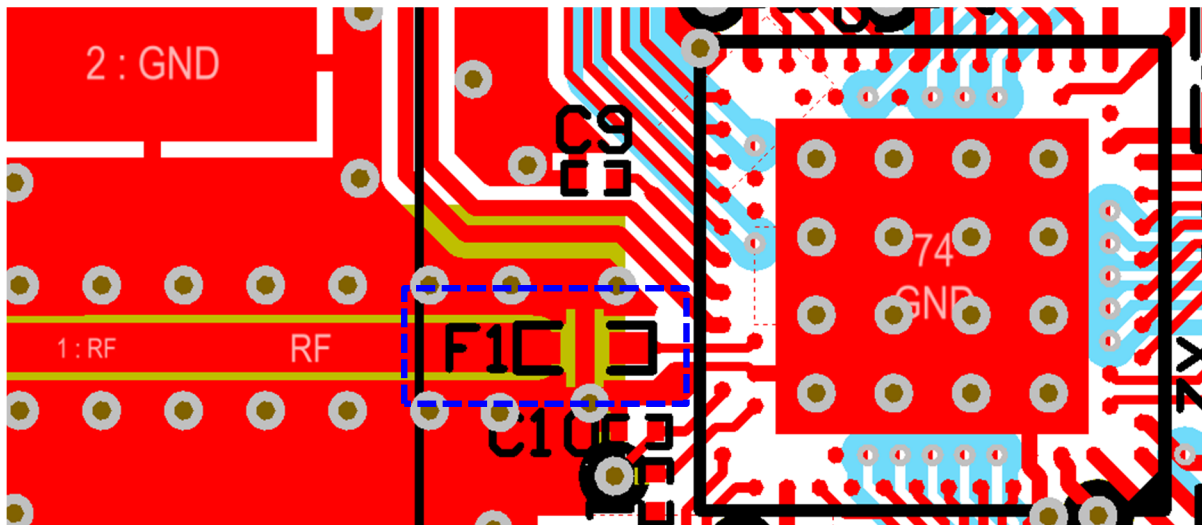
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Schematic nRF52833-QIAA + 2450FM07B0037



PCB Reference Layout RF52833-QIAA + 2450FM07B0037



2450FM07B0037 PCB Footprint

For more schematic examples, download the layout files, BOM, etc. go to: <https://www.johansontechnology.com/nordic>

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Application Note for Nordic Semiconductor's nRF52833-QDAA, nRF52833-QIAA, nRF52840-QIAA Integrated RF Front End Solution Using Johanson's 1.0x0.5mm Impedance Matched Filter

TX Power Measurements on Reference PCB (nRF52833-QDAA)

nRF52833-QDAA + 2450FM07B0037				
	Frequency	+0 dBm	+4dBm	+8dBm
Fundamental Low	2,402.00	-1.72	4.69	6.85
2nd harmonic	4,804.00	-71.18	-65.69	-60.12
3rd harmonic	7,206.00	-57.38	-58.59	-54.98
4th harmonic	9,608.00	-71.87	-69.98	-68.35
5th harmonic	12,010.00	-70.41	-69.04	-66.3
Fundamental Mid	2,440.00	-1.64	4.88	7.14
2nd harmonic	4,880.00	-71.26	-66.8	-61.02
3rd harmonic	7,320.00	-59.48	-59.42	-55.8
4th harmonic	9,760.00	-71.54	-69.56	-67.95
5th harmonic	12,200.00	-70.26	-68.89	-66.37
Fundamental Hi	2,480.00	-1.83	4.82	7.09
2nd harmonic	4,960.00	-71.07	-67.94	-63.07
3rd harmonic	7,440.00	-60.58	-59.61	-55.91
4th harmonic	9,920.00	-71.91	-69.78	-68.46
5th harmonic	12,400.00	-70.41	-69.05	-66.53

Contact our RF Applications Engineers to review your layout at: <https://www.johansontechnology.com/ask-a-question>



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TX Power Measurements on Reference PCB (nRF52833-QIAA)

nRF52833-QIAA + 2450FM07B0037				
	Frequency	+0 dBm	+4dBm	+8dBm
Fundamental Low	2,402.00	0.29	4.35	7.81
2nd harmonic	4,804.00	-72.12	-62.1	-62.88
3rd harmonic	7,206.00	-43.85	-41.72	-40.09
4th harmonic	9,608.00	-71.31	-59.93	-60.89
5th harmonic	12,010.00	-70.97	-70.72	-69.45
Fundamental Mid	2,440.00	0.04	4.43	7.8
2nd harmonic	4,880.00	-73.16	-65.54	-66.57
3rd harmonic	7,320.00	-43.02	-40.17	-39.03
4th harmonic	9,760.00	-70.24	-58.81	-59.54
5th harmonic	12,200.00	-70.44	-70.64	-69.61
Fundamental Hi	2,480.00	-0.3	4.16	7.56
2nd harmonic	4,960.00	-71.26	-66.02	-67.12
3rd harmonic	7,440.00	-44.89	-42.35	-40.87
4th harmonic	9,920.00	-70.9	60.43	-60.69
5th harmonic	12,400.00	-70.3	-70.69	-69.74

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TX Power Measurements on Reference PCB (nRF52840-QIAA)

nRF52840-QIAA + 2450FM07B0037				
	Frequency	+0 dBm	+4dBm	+8dBm
Fundamental Low	2,402.00	0.79	4.25	7.77
2nd harmonic	4,804.00	-64.95	-52.64	-48.67
3rd harmonic	7,206.00	-53.31	-47.88	-42.75
4th harmonic	9,608.00	-80.12	-67.95	-67.06
5th harmonic	12,010.00	-79.99	-77.69	-72.39
Fundamental Mid	2,440.00	0.67	4.24	7.27
2nd harmonic	4,880.00	-61.31	-48.81	-45.01
3rd harmonic	7,320.00	-55.03	-49.99	-45.14
4th harmonic	9,760.00	-80.52	-66.88	-66.22
5th harmonic	12,200.00	-80.86	-78.65	-73.27
Fundamental Hi	2,480.00	0.55	4.28	7.71
2nd harmonic	4,960.00	-58.74	-46.61	-44.9
3rd harmonic	7,440.00	-56.18	-49.83	-45.27
4th harmonic	9,920.00	-81.36	-65.93	-64.67
5th harmonic	12,400.00	-80.46	-78.87	-73.16

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Application Notes, Layout Files, and more

<https://www.johansontechnology.com/nordic>

Packaging information

<https://www.johansontechnology.com/tape-reel-packaging>

Soldering Information

<https://www.johansontechnology.com/ipcsoldering-profile>

MSL Info

<https://www.johansontechnology.com/msl-rating>

Recommended Storage Condition and Max Shelf Life

<https://www.johansontechnology.com/recommended-storage-conditions>

RoHS Compliance

<https://www.johansontechnology.com/rohs-compliance>

Antenna layout and tuning techniques

<https://www.johansontechnology.com/tuning>

Antenna layout review, tuning, and characterization services

<https://www.johansontechnology.com/ipc-antenna-services>

Johanson uses 6/6 RoHS Green Low-Temperature-Co-fired-Ceramic (LTCC) integrated passive technology in a 4-pin (Sn plated) monolithic structure. This component is 100% RF Tested, making it a more reliable system, impedance controlled environment, consistent-guaranteed RF performance in a very small RF front end-solution compared to the L/C discrete solution.

Johanson Technology, Inc. reserves the right to make design changes without notice.

All sales are subject to Johanson Technology, Inc. terms and conditions.



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