

KW39/38/37/A/Z MINIMUM BOM

MINIMUM COMPONENTS NEEDED TO USE KW3XA/Z AND DCDC CONFIGURATIONS

SE TEAM
MARCH 21

MKW39A512VFT4
MKW38A512VFT4
MKW38Z512VFT4
MKW37A512VFT4
MKW37Z512VFT4



7 x 7 mm
48 "Wettable" HVQFN
7x7 mm Pitch 0.5 mm

HVQFN48 – 7X7



BYPASS

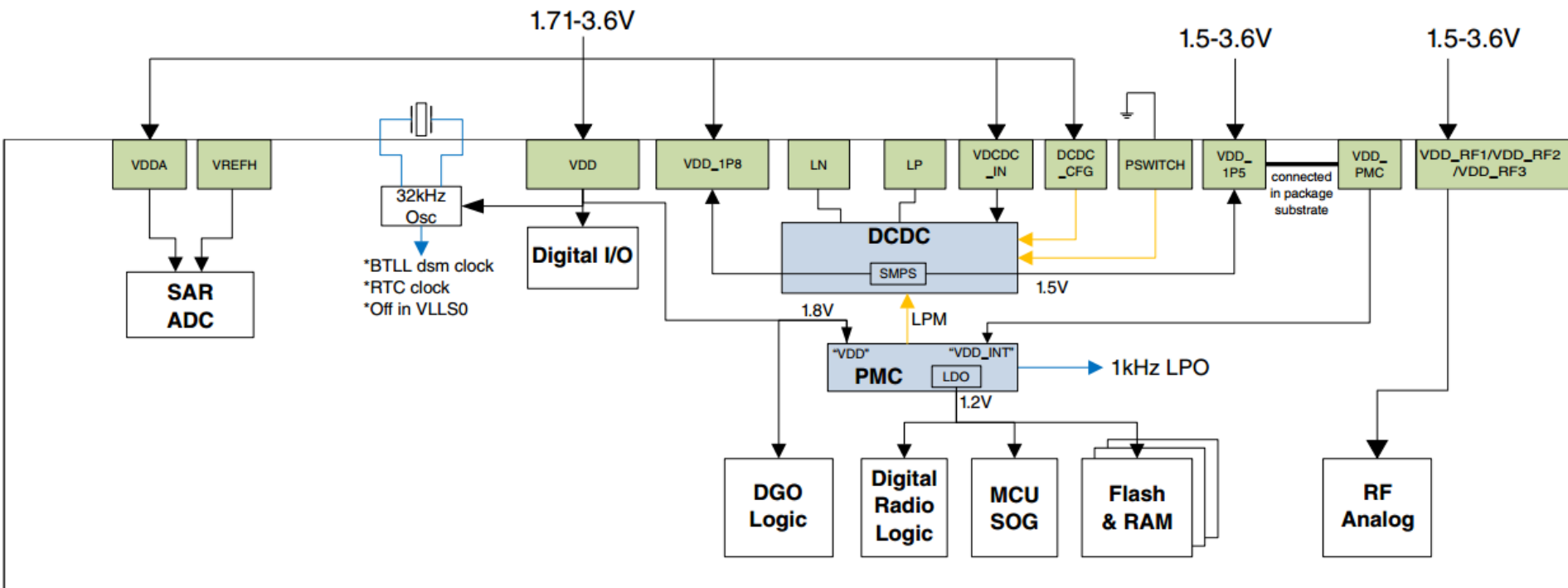


DCDC Bypass Mode Configuration

HVQFN48 – 7x7

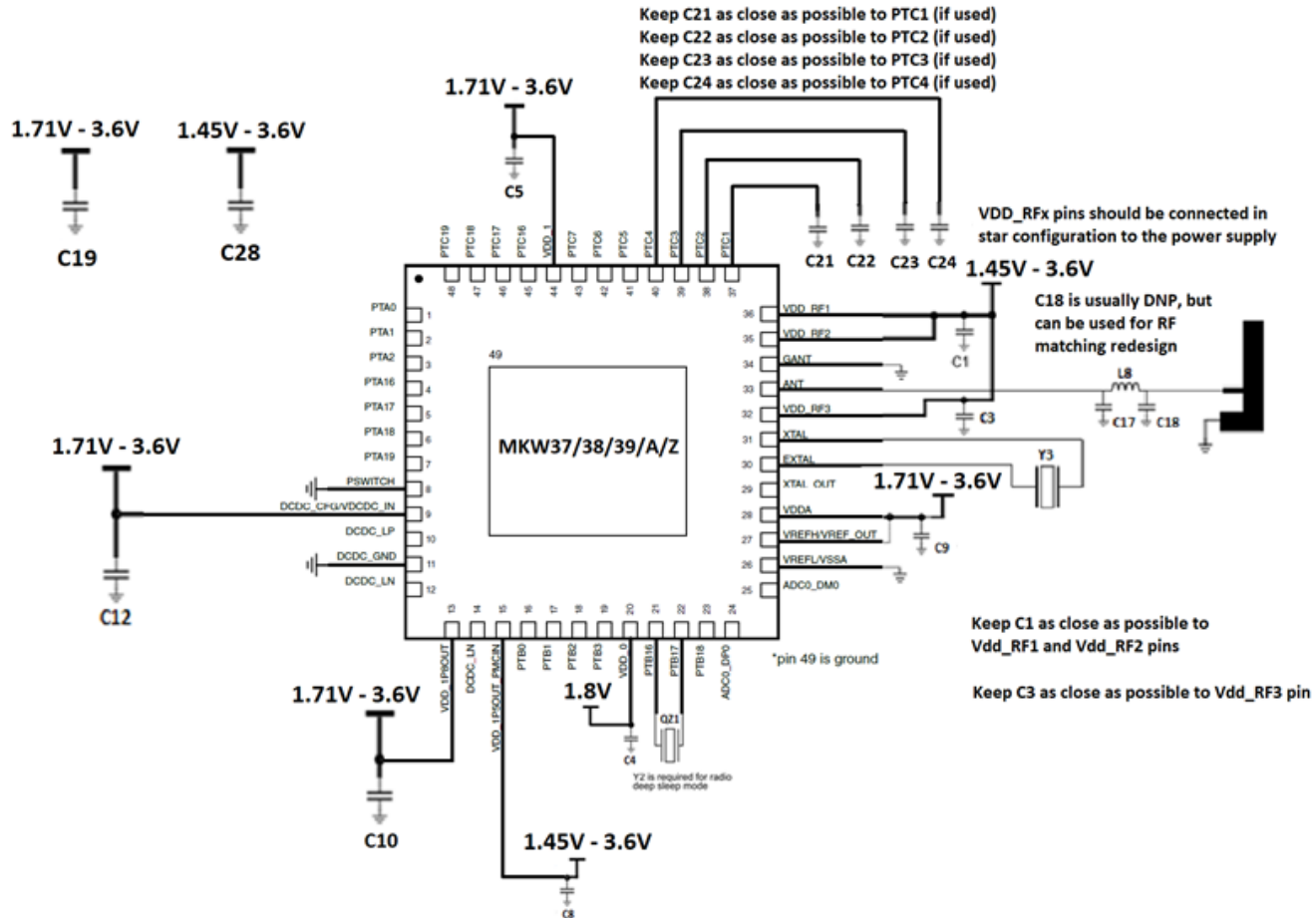
DCDC bypass mode with the possibility of [Bluetooth LE Low Power mode active](#).

Bypass mode



Please, refer to the [AN5025](#) for more details on the DCDC power management

Bluetooth LE Low Power mode option available



DCDC Bypass BOM

LQFN48 – 7x7

Designator	Value	Manufacturer	Part Number	Purpose
L8	4.7nH	MURATA	LQG15HH4N7S02D	RF Matching*
C21	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C22	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C23	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C24	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C1	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C3	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C17	0.6pF	MURATA	GCM1555C1HR60BA16	RF Matching*
C18	0.3pF	MURATA	GCM1555C1HR30BA16	RF Matching*
C12	10μF	AVX	TPSA106M010R0900	
C4	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C5	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C8	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C10	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C9	0.1μF	TDK	C1005X7R1H104K050BE	DC filtering
C19	10μF	AVX	TPSA106M010R0900	Power supply bulk cap
C28	10μF	AVX	TPSA106M010R0900	Power supply bulk cap
Y3	32MHz	NDK	NX2016SA 32MHz EXS00A-CS11775	Main clock**
QZ1	32KHz	NDK	NX3215SA 32,768KHz EXS00A-MU01218	RTC clock

* FRDM-KW39/38/37/A/Z matching

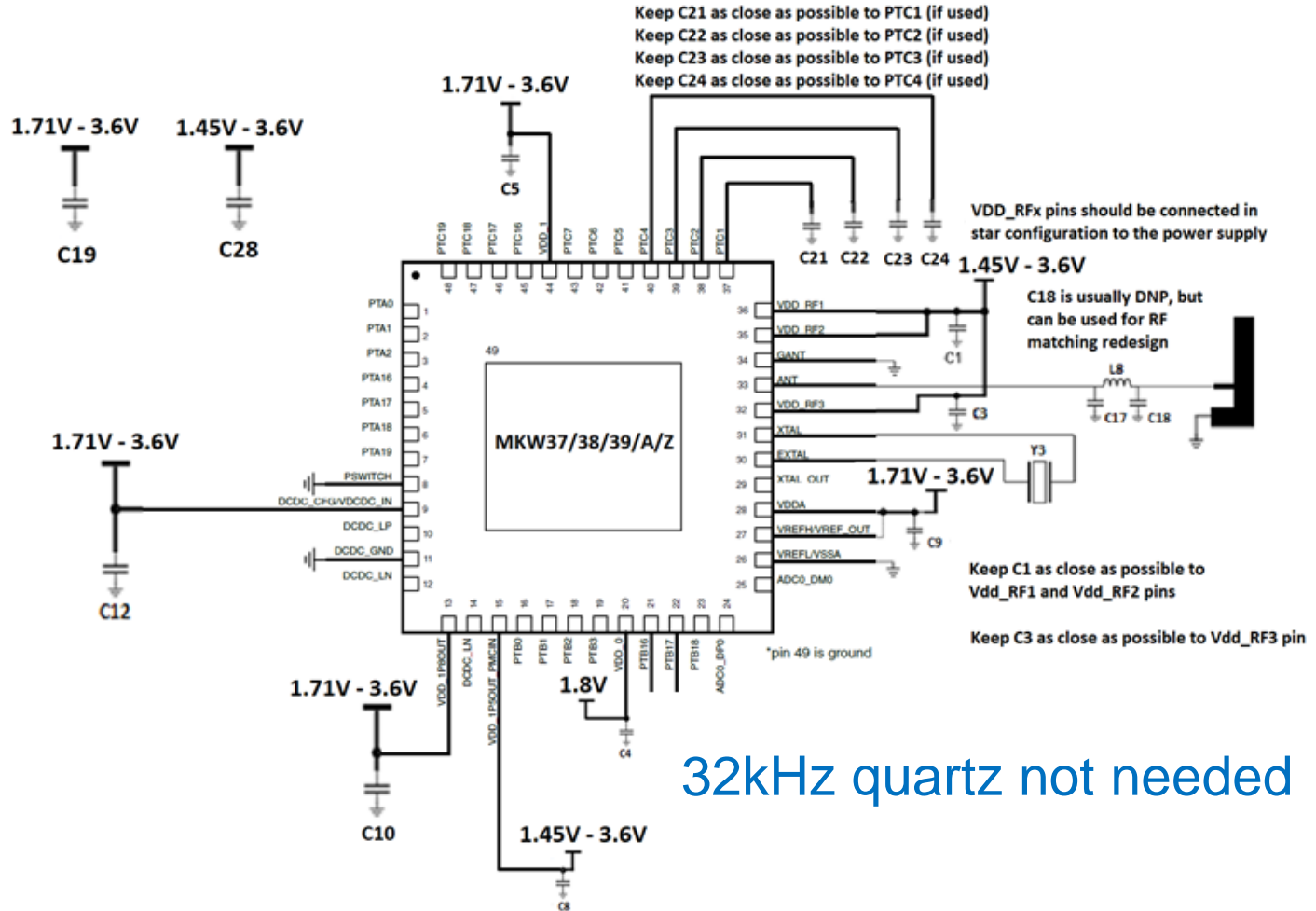
** Refer to slide 20 & 21 for alternate crystal frequencies.

*** Add the decoupling capacitor if the associated pin is used into the application

Bluetooth LE Low Power mode option available (32kHz populated)



No Bluetooth LE Low Power mode



DCDC Bypass BOM

No Bluetooth LE Low Power mode

LQFN48 – 7x7

Designator	Value	Manufacturer	Part Number	Purpose
L8	4.7nH	MURATA	LQG15HH4N7S02D	RF Matching*
C21	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C22	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C23	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C24	3pF	MURATA	GCQ1555C1H3R0CA16	Decoupling Caps***
C1	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C3	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C17	0.6pF	MURATA	GCM1555C1HR60BA16	RF Matching*
C18	0.3pF	MURATA	GCM1555C1HR30BA16	RF Matching*
C12	10μF	AVX	TPSA106M010R0900	
C4	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C5	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C8	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C10	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C9	0.1μF	TDK	C1005X7R1H104K050BE	DC filtering
C19	10μF	AVX	TPSA106M010R0900	Power supply bulk cap
C28	10μF	AVX	TPSA106M010R0900	Power supply bulk cap
Y3	32MHz	NDK	NX2016SA 32MHz EXS00A-CS11775	Main clock**

* FRDM-KW39/38/37/A/Z matching

** Refer to slide 20 for alternate crystal frequencies.

*** Add the decoupling capacitor if the associated pin is used into the application

32kHz quartz not needed

DCDC Bypass Pin configuration

LQFN48 – 7x7

Pin Number	Pin Name	Bypass connection
8	PSWITCH	GND
9	DCDC_CFG/VDCDC_IN	1.71-3.6V
10	DCDC_LP	Floating
11	DCDC_GND	GND
12	DCDC_LN	Floating
13	VDD_1P8OUT	1.71-3.6V
14	DCDC_LN	Floating
15	VDD_1P5OUT_PMCIN	1.45-3.6V
20	VDD_0	1.71-3.6V
27	VREFH	
28	VDDA	1.71-3.6V
32	VDD_RF3	1.45-3.6V
35	VDD_RF2	1.45-3.6V
36	VDD_RF1	1.45-3.6V
44	VDD_1	1.71-3.6V

BUCK

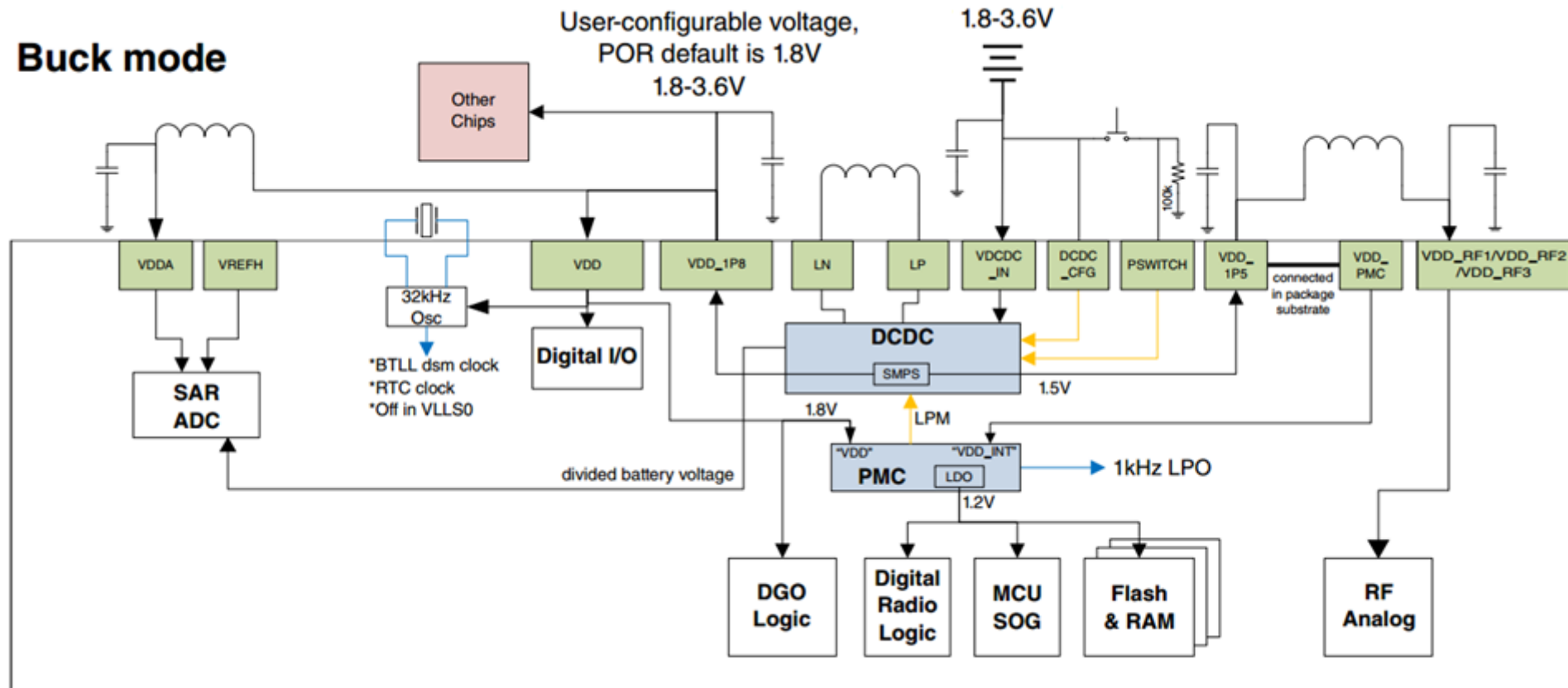


DCDC Buck Mode Configuration

LQFN48 – 7x7

DCDC buck mode with the possibility of Bluetooth LE Low Power mode active.

Buck mode

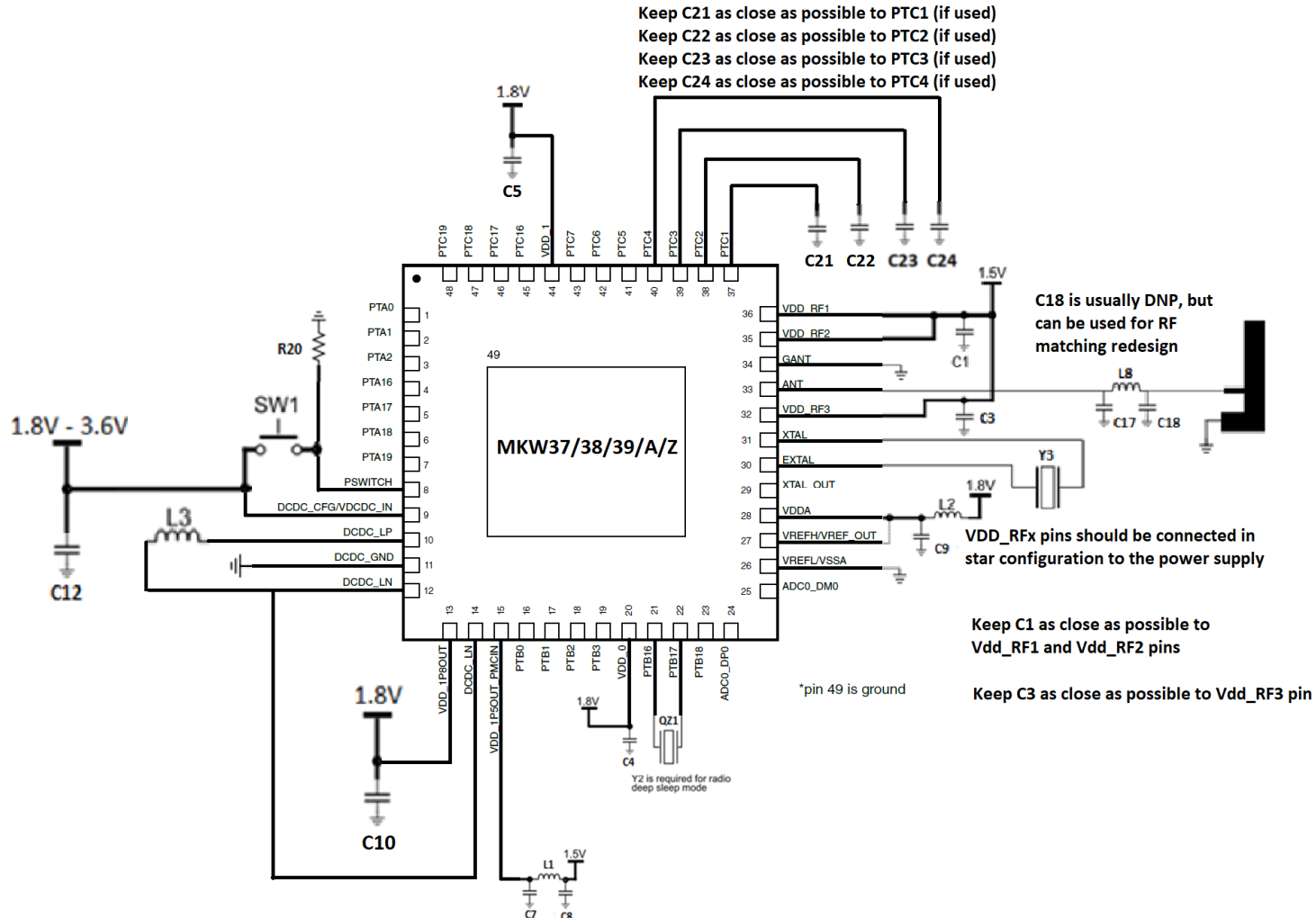


Please, refer to the [AN5025](#) for more details on the DCDC power management

KW39/38/37/A/Z in Buck Manual Start Mode

HVQFN48WF – 7x7

Bluetooth LE Low Power mode option available



DCDC Buck BOM

HVFN48WF – 7x7

Designator	Value	Manufacturer	Part Number	Purpose
L8	4.7nH	MURATA	LQG15HH4N7S02D	RF Matching*
L1	100nH	MURATA	LQW15ANR10J00D	DC filtering
L3	10μH	TDK	VLS4012ET-100M	DC-DC Inductor (TDK MLZ2012N100LTD25 for Keyfob apps)
L2	100nH	MURATA	LQW15ANR10J0Z	DC filtering
C21	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C22	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C23	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C24	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C1	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C3	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C17	0.6pF	MURATA	GCM1555C1HR60BA16	RF Matching*
C18	0.3pF	MURATA	GCM1555C1HR30BA16	RF Matching*
C7	10μF	AVX	TPSA106M010R0900	
C4	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C10	10μF	AVX	TPSA106M010R0900	Decoupling Caps
C5	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C12	10μF	AVX	TPSA106M010R0900	Decoupling Caps
C9	0.1μF	TDK	C1005X7R1H104K050BE	DC filtering
C8	1μF	MURATA	GRT155C81E105KE13D	DC filtering
R20	100KΩ	YAGEO AMERICA	RC0402FR-07102KL	Pswitch pull-down (manual start only)
Y3	32MHz	NDK	NX2016SA 32MHz EXS00A-CS11775	Main clock**
QZ1	32KHz	NDK	NX3215SA 32,768KHz EXS00A-MU01218	RTC clock

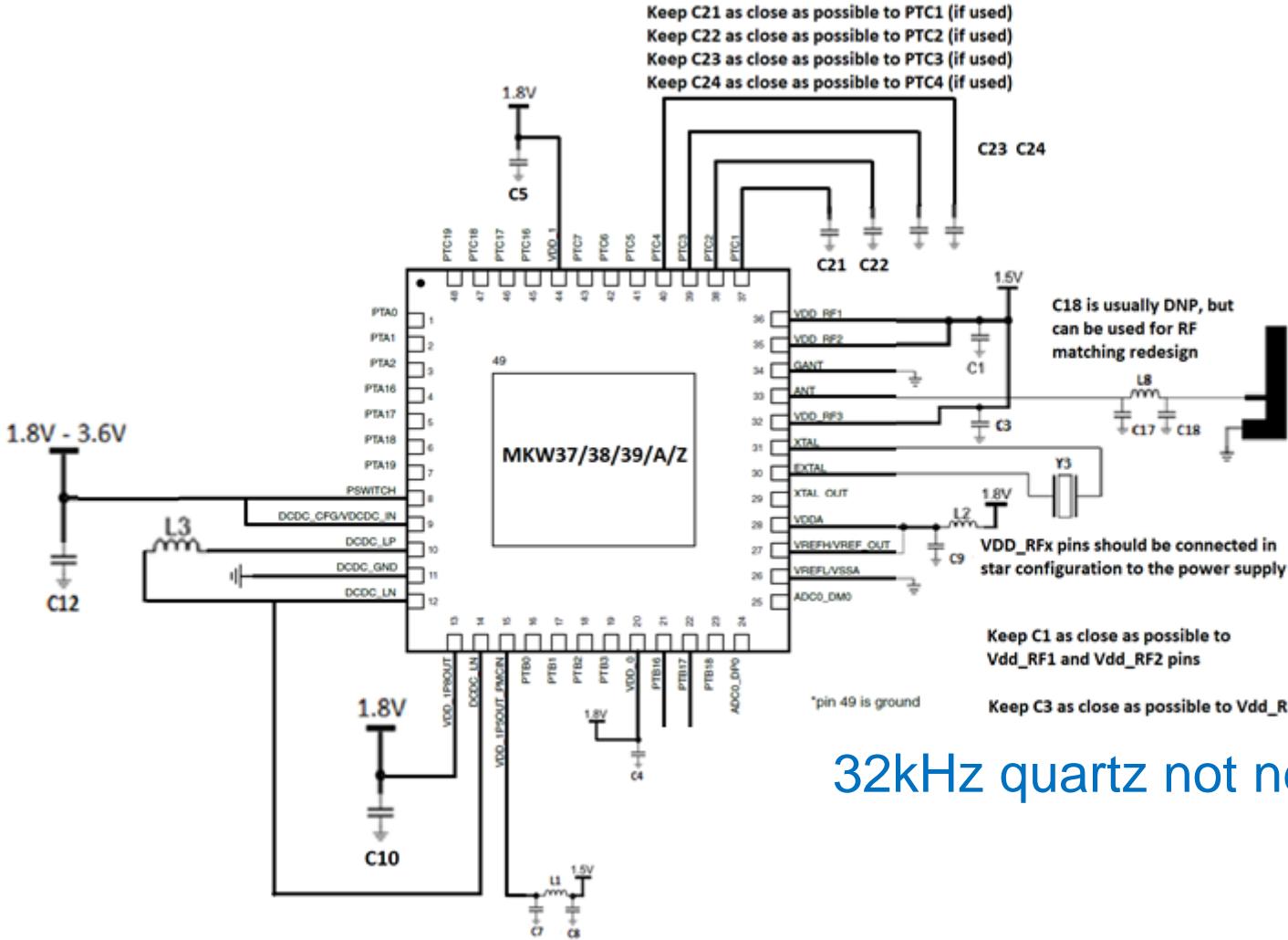
* FRDM-KW38 matching

** Refer to slide 20 & 21 for alternate crystal frequencies.

*** Add the decoupling capacitor if the associated pin is used into the application

KW39/38/37/A/Z in Buck Auto Start Mode, HVQFN48WF – 7x7

No Bluetooth LE Low Power mode



Keep C21 as close as possible to PTC1 (if used)
 Keep C22 as close as possible to PTC2 (if used)
 Keep C23 as close as possible to PTC3 (if used)
 Keep C24 as close as possible to PTC4 (if used)

C18 is usually DNP, but
 can be used for RF
 matching redesign

VDD_RFX pins should be connected in
 star configuration to the power supply

Keep C1 as close as possible to
 Vdd_RF1 and Vdd_RF2 pins

Keep C3 as close as possible to Vdd_RF3 pin

*pin 49 is ground

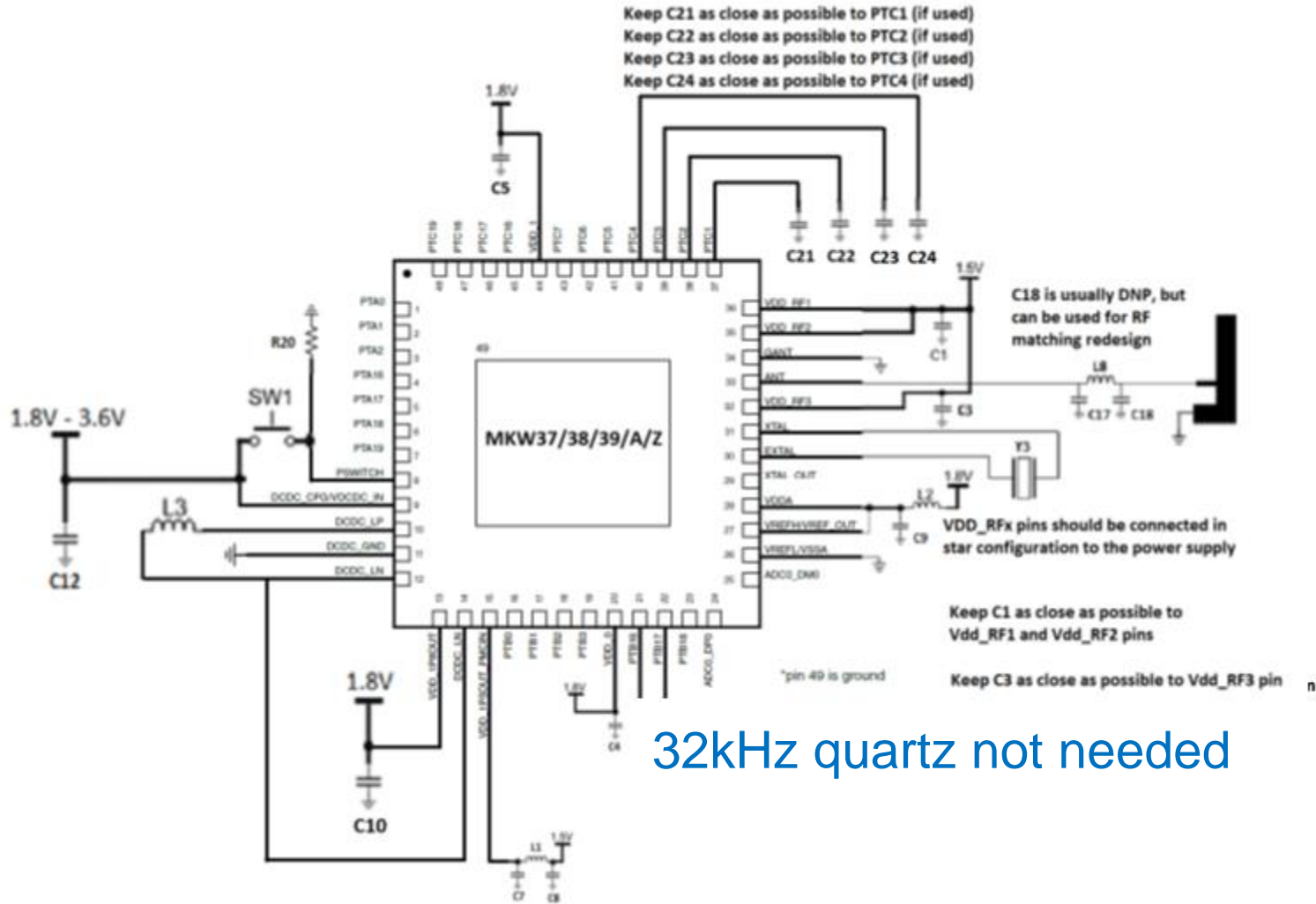
32kHz quartz not needed



KW39/38/37/A/Z in Buck Manual Start Mode

HVQFN48WF – 7x7

No Bluetooth LE Low Power mode



DCDC Buck BOM

HVFN48WF – 7x7

Designator	Value	Manufacturer	Part Number	Purpose
L8	4.7nH	MURATA	LQG15HH4N7S02D	RF Matching*
L1	100nH	MURATA	LQW15ANR10J00D	DC filtering
L3	10μH	TDK	VLS4012ET-100M	DC-DC Inductor (TDK MLZ2012N100LTD25 for Keyfob apps)
L2	100nH	MURATA	LQW15ANR10J0Z	DC filtering
C21	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C22	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C23	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C24	3pF	MURATA	GRM1555C1H3R0CZ01D	Decoupling Caps***
C1	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C3	12pF	MURATA	GRM1555C1H120JZ01D	Decoupling Caps
C17	0.6pF	MURATA	GCM1555C1HR60BA16	RF Matching*
C18	0.3pF	MURATA	GCM1555C1HR30BA16	RF Matching*
C7	10μF	AVX	TPSA106M010R0900	
C4	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C10	10μF	AVX	TPSA106M010R0900	Decoupling Caps
C5	0.1μF	TDK	C1005X7R1H104K050BE	Decoupling Caps
C12	10μF	AVX	TPSA106M010R0900	Decoupling Caps
C9	0.1μF	TDK	C1005X7R1H104K050BE	DC filtering
C8	1μF	MURATA	GRT155C81E105KE13D	DC filtering
R20	100KΩ	YAGEO AMERICA	RC0402FR-07102KL	Pswitch pull-down (manual start only)
Y3	32MHz	NDK	NX2016SA 32MHz EXS00A-CS11775	Main clock**

* FRDM-KW38 matching

** Refer to slide 20 for alternate crystal frequency.

*** Add the decoupling capacitor if the associated pin is used into the application

DCDC Buck Pin configuration

HVQFN48WF – 7x7

No Bluetooth LE Low Power mode

Pin Number	Pin Name	Buck connection
8	PSWITCH	1.8-3.6V and through 100K to GND
9	DCDC_CFG/VDCDC_IN	1.8-3.6V
10	DCDC_LP	DCDC Inductor*
11	DCDC_GND	Ground
12	DCDC_LN	DCDC Inductor*
13	VDD_1P8OUT	Output
14	DCDC_LN	Connected to pin12/DCDC Inductor*
15	VDD_1P5OUT_PMCIN	Output
20	VDD_0	VDD_1P8OUT
27	VREFH	
28	VDDA	VDD_1P8OUT via an Inductor
32	VDD_RF3	VDD_1P5OUT_PMCIN via an inductor**
35	VDD_RF2	VDD_1P5OUT_PMCIN via an inductor**
36	VDD_RF1	VDD_1P5OUT_PMCIN via an inductor**
44	VDD_1	VDD_1P8OUT

* Main inductor

** Filter inductor

32kHz quartz not needed

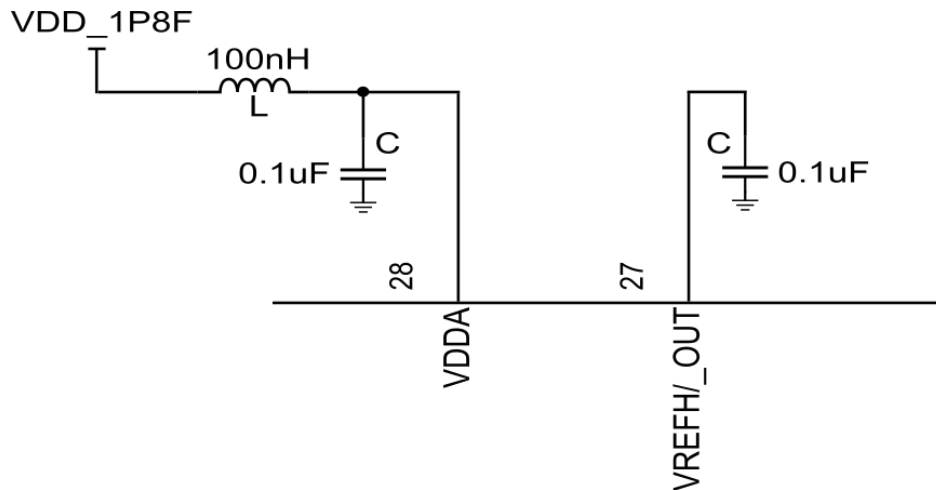
COMPLEMENTARY INFORMATION



VREFH/VREF_OUT

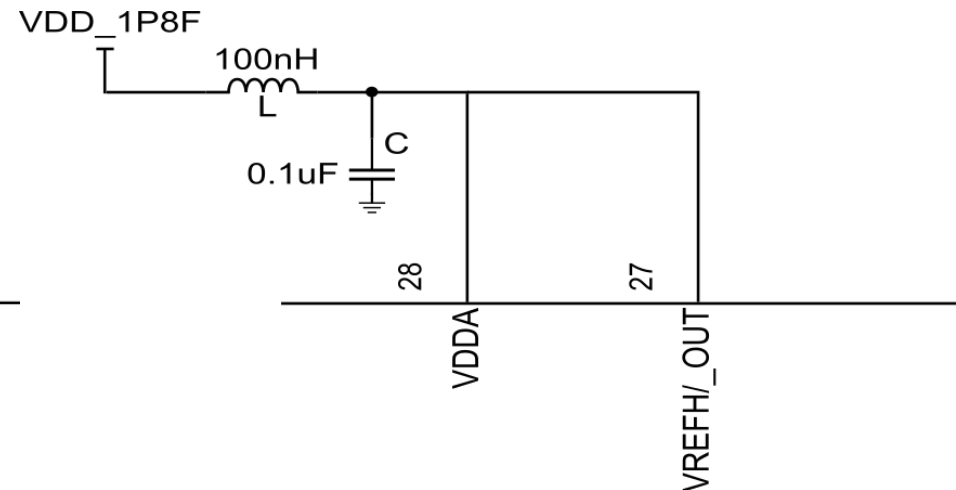
Circuit for VREF_OUT

VREF_OUT provides a 1.2V reference voltage that can be used as VREFH for ADC.



Circuit for VREFH

VREFH is the high reference voltage for the ADC, in this circuit it will have the same values as VDDA (Analog supply voltage)



* The inductor is not needed for bypass mode

Alternate Y3

For Bluetooth LE and GFSK 32MHz quartz references

Manufacturer	Series	Part Number	Frequency
NDK	NX2016SA	EXS00A-CS11775	32MHz
Murata (for consumer)	XRCGB-180085	XRCGE32M000F1H2AR0	32MHz
Murata (for Automotive)	XRCGB-180085	XRCGE32M000FBA2CR0	32MHz

Alternate QZ1

For Bluetooth LE and GFSK 32kHz quartz reference

Manufacturer	Series	Part Number	Frequency
NDK	NX3215SA	EXS00A-MU01218	32,768kHz

Alternate DCDC inductor L3 (buck mode)




For general application (car access for example), NXP recommend to use the 10uH DCDC inductor from TDK (reference VLS4012ET-100M serie) : good performances (ESR, Isat) but quite 'big' size.

It is indeed possible to use a smaller inductor size (WxLxH) but you need to be careful on the following items:

- ESR < 0.3Ohms, Inductor value: 10μH, Saturation current > 300mA

An alternative is the Wurth reference 744 025 100 : Good performances (ESR, Isat), smaller than the TDK VLS reference but more expensive.

For keyfob application, NXP recommend to use the TDK MLZ2012N100LTD25 inductor: small size [SMD] for a better integration on small PCB with a thin design. It will prevent spurious from 100KHz to 200KHz which could interact with another reception device in the same board (ie NXP LF device @125KHz).

Inductor type	Value	Manufacturer	reference	Automotive Qualified AEC-Q200	ESR (ohms)	Isat (mA)	Temperature range	Size (LxWxH)mm	Picture
Wound ferrite	10uH	TDK	VLS4012E	Yes	0.19	890	-40 to +125°C	4x4x1.2	
SMD shielded Multilayer ferrite	10uH	TDK	MLZ2012N100LTD25	Yes	0.3	110	-55 to +125°C	2x1.25x0.85	
Wound shielded	10uH	Wurth	744 025 100	Yes	0.19	1000	-40 to +125°C	2.8x2.8x2.8	



SECURE CONNECTIONS
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