TN1203.02
Technical Note

XE1203 to XE1203 TrueRF™ migration

1 XE1203 TRUERF™ BENEFITS

- Full FCC/ETSI compliancy without a SAW filter
- Unconditional stability even at 15dBm output power
- Improved transmission efficiency if the SAW filter is omitted (no filter insertion loss)

2 XE1203 TRUERF™ PART NUMBERING

The XE1203 TrueRF™ version part number is XE1203FI063 (and on line 3 the lot marking is PH2RT or higher, week code 0406 or higher). The 'non TrueRF™ version part number is XE1203I063.
Please contact XEMICS' technical support if in doubt.

3 PCB MIGRATION

Because the XE1203 TrueRF™ is pin-compatible with the XE1203, PCB layout changes are required only if the SAW filter is omitted (substitution with an L-C filter is required). Clients deciding not to change the PCB layout can use the XE1203TrueRF™ and keep the SAW filter.

3.1 PIN NAME CHANGE

Pin 11, TMOD connected to ground in the previous version of the chip becomes now VSSP (VSS for the power amplifier) connected to ground. No PCB layout modification is necessary for this.

3.2 VCO TANK

The tank of the VCO can be implemented with one inductor in parallel with one capacitor, as in the previous version of the XE1203. The values for these components have to be changed when using XE1203 TrueRF™. The characteristics of the external tank components must be as follows:

Name	Typical Value for 434 MHz	Typical Value for 868 MHz	Typical Value for 915 MHz	Tolerance
CV1	1.0 pF	NC	NC	± 5%
LV1	33 nH	8.2 nH	6.8 nH	± 2%

The values above are typical and may differ for different PCB layouts.
For 915Mhz and 869Mhz frequency bands the use of the external capacitor CV1 should be avoided. The value of the inductor LV1 and its position (between the two footprints) should be changed to centre the VCO tuning range. Depending on the minimum supply voltage available, the VCO tuning voltage, Vlfb, should be centred as follows:

Minimum supply voltage	Typical Vlfb for 434 MHz	Typical Vlfb for 868 MHz	Typical Vlfb for 915 MHz
VDDmin = 2.7V	0.9V	1.2V	1.1V
VDDmin = 2.4V	0.8V	1.1V	1.0V

3.3 LOOP FILTER OF THE FREQUENCY SYNTHESIZER

The loop filter of the frequency synthesizer is shown below:

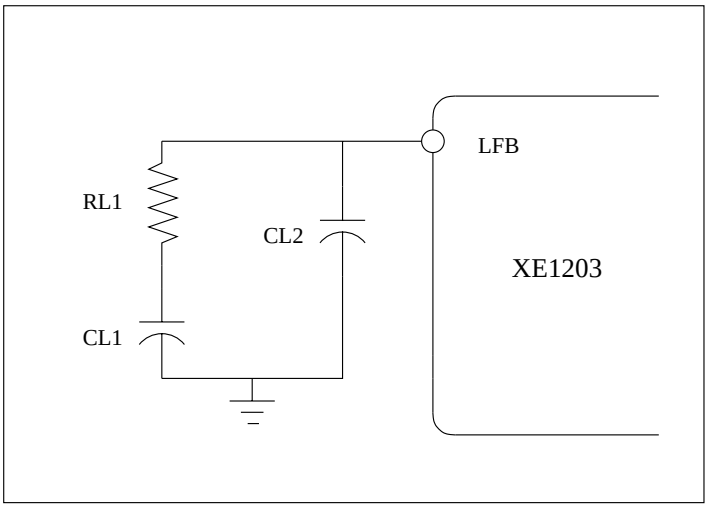

Figure 1. Loop filter of the frequency synthesizer.

The XE1203 TrueRF™ VCO has an increased Kvco. So the loop filter components values should be changed accordingly. The values recommended for applications using bit rates up to 38.4 kbit/s are given in the table below.

Name	Typical Value for 434 MHz	Typical Value for 868 MHz	Typical Value for 915 MHz	Tolerance
CL1	22 nF	22 nF	22 nF	± 5%
CL2	1.2 nF	1.2 nF	1.2 nF	± 5%
RL1	560Ω	470Ω	470Ω	± 5%

The values recommended for applications using bit rates higher than 38.4 kbit/s are given in the table below.

Name	Typical Value for 434 MHz	Typical Value for 868 MHz	Typical Value for 915 MHz	Tolerance
CL1	3.3 nF	4.7 nF	4.7 nF	± 5%
CL2	220 pF	330 pF	330 pF	± 5%
RL1	1.2 kΩ	1 kΩ	1 kΩ	± 5%

3.4 MATCHING NETWORK OF THE TRANSMITTER

The optimum load impedances for 15 dBm at the three main frequencies are given in the following table.

	434 MHz	868 MHz	915 MHz
PA optimum load	102 – 12j	78 + 19j	83 + 18j

The schematic of the recommended matching network at the output of the transmitter is given below. The two Π-sections are used to provide harmonic filtering to pass FCC and ETSI regulations with sufficient margin.

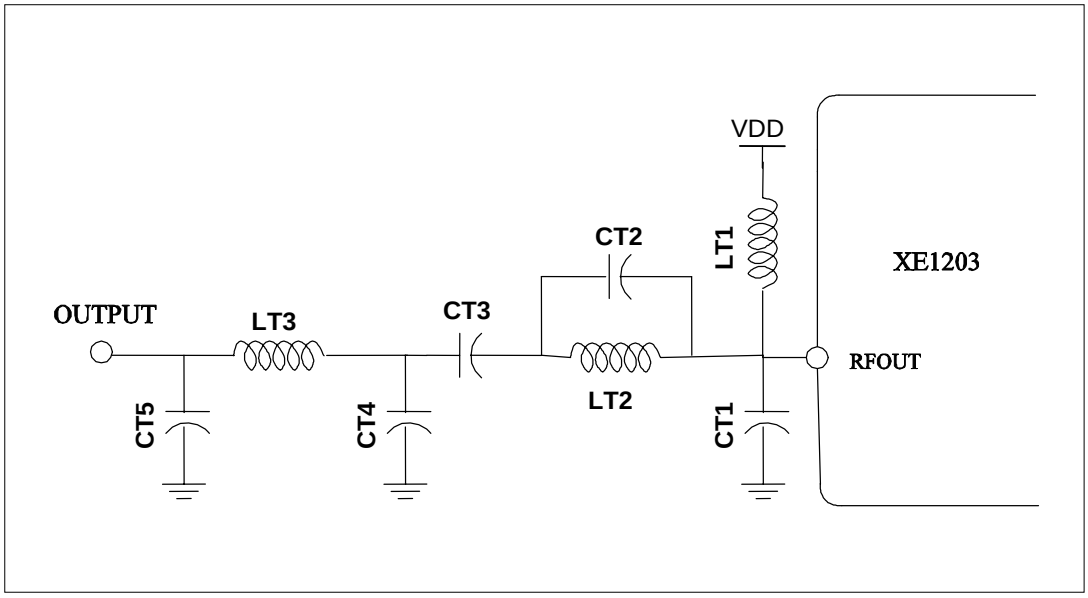

Figure 2. Transmitter output network.

The typical component values of this matching circuit are given below.

Name	Typical Value for 434 MHz	Typical Value for 868 MHz	Typical Value for 915 MHz	Tolerance
CT1	6.8 pF	1.5 pF	1.8 pF	± 5%
CT2	1.0 pF	0.56 pF	NC	± 5%
CT3	22 pF	15 pF	33 pF	± 5%
CT4	6.8 pF	3.3 pF	3.3 pF	± 5%
CT5	4.7 pF	2.2 pF	2.2 pF	± 5%
LT1	33 nH	39 nH	47 nH	± 5%
LT2	22 nH	10 nH	10 nH	± 5%
LT3	22 nH	8.2 nH	8.2 nH	± 5%

4 REGISTER CONFIGURATION

This part of the application note describes the differences in the registers settings between the XE1203 and the XE1203 TrueRF™. .The internally generated power-on reset sets all registers, including the test registers, to the value 00hex. When using the 1203, some peoples may have changed some test registers to improve the bit synchronizer performances. If people change to the 1203 TrueRF™, these test registers must be set with the value 00hex which is the default value at the power-up. The following table indicates the change of configuration in the XE1203 TrueRF™ compared to the XE1203.

Register Address	Register value XE1203	Register value 1203TrueRF™
11101	00011111	00000000
11110	11000000	00000000

5 CONCLUSIONS

This application note describes the necessary changes when migrating from the existing XE1203 to the XE1203TrueRF™. PCB layout changes are necessary only when removing the SAW filter. If the SAW filter is retained then only some component values should be changed, as described above.

Contact Information

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