
AN1201A.05

Application Note

*Move on from the XE1201 to the
Advanced XE1201A*

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Introduction

The single chip UHF transceiver XE1201A is specially designed for low-power and low-voltage wireless data link applications. With a new integrated Power Amplifier allowing an output power of +5dBm (3.17mW), it meets the need for both low cost and a physically small half-duplex data transceiver.

The XE1201A is pin to pin compatible with the XE1201. The changes to the specifications are in the receiver mode. Nevertheless, some modifications for the transmitter chain need to be implemented in order to obtain maximum chip performance.

1. Performance Evaluation

An Evaluation Kit was used to measure and compare the performance of the XE1201A with the XE1201.

1.1 Direct Replacement

The first measure in implementation is to directly replace the XE1201 with the new one on the reference board. Table 1 shows the result of measures with the XE1201A in comparison with the XE1201.

		XE1201A		XE1201	
C13	C12	P(dBm)	I(mA)	P(dBm)	I(mA)
0	0	-17	5.5	-20	5
0	1	-5	8	-11	6
1	0	0	10.5	-8	7
1	1	+2.5	12.5	-5	8

Table 1: XE1201A vs XE1201

Spectrum waveform

A spectrum analyzer connected to the output RFout allows visualization of the shape of the output spectrum and measures the spurious level. Figure 1 on the right shows the spectrum during the transmission of a "0".

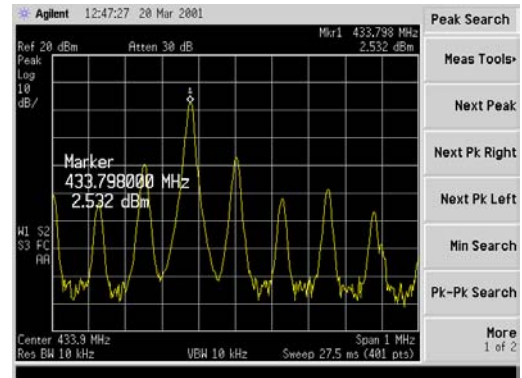


Figure 1: Spectrum of "0" transmission

The second waveform (figure2) shows the spectrum of a FSK. A pseudo-random bit stream is applied to the TXD pin of the transceiver. The frequency deviation is set to 125kHz ($\Delta\text{marker}=2f_{\text{dev}}=250\text{kHz}$). The transmit power is set to the maximum (C13=1 and C12=12).

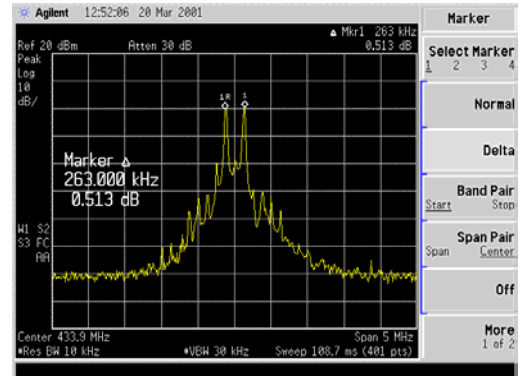


Figure 2: FSK Spectrum

1.2 Board Modification

The Evaluation board was modified to optimize output power performance. Table 2 shows the modification and table 3, the result of this modification. For more information about the XE1201A click here to download the XE1201A datasheet from XEMICS' web site:

<http://www.xemics.com/downloaddata.html>

	XE1201	XE1201A
C14	1.5pF	3.3pF
C16	1 - 3pF	2 - 6pF

Table 2: Hardware modification XE1201A vs XE1201

		XE1201A		XE1201	
C13	C12	P(dBm)	I(mA)	P(dBm)	I(mA)
0	0	-15	5.5	-20	5
0	1	-5	8	-11	6
1	0	+2.5	11	-8	7
1	1	+5	13.5	-5	8

Table 3: XE1201A vs XE1201

Spectrum waveform

Figure 3 shows the RF output (Rf_{out}). The output power is measured at +5dBm.

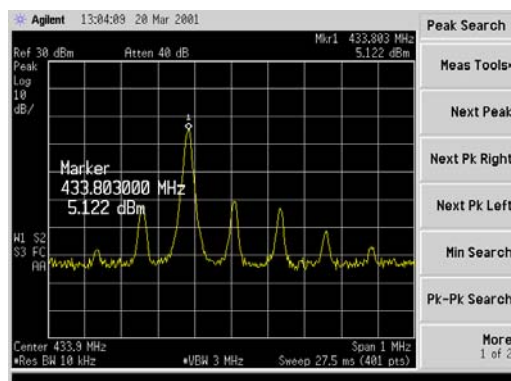


Figure 3: Spectrum of “0” transmission with board modification.

2. XM1201 versus XM1201A

To obtain the best performance, modifications need to be implemented on the XEMICS RF module. In addition, by increasing the output power, the external power amplifier and RF switch is also modified. Table 4 shows the module modification from the XM1201 to the XM1201A.

	XM1201	XM1201A
C11	2.2pF	1.5pF
C12	2.7pF	3.3pF
C17	2.7pF	1.5pF
C18	2.7pF	2.2pF

Table 4: XM1201 vs XM1201A

XM1201A Output Power

Without the loop antenna, the output power is measured at +8.5dBm. The gain of the external power amplifier reduces in order to optimize the current consumption and the sensitivity. Therefore, the gain is now 2.5dB.

XM1201A Sensitivity

The sensitivity of the new RF module (XM1201A) measured without the antenna, is -105dBm.

3. Move to the XE1201A

The XE1201 is now being replaced by the XE1201A which is pin to pin compatible.

As described above, the difference is the internal power amplifier, which has been modified to obtain +5dBm.

To move from the XE1201 to the XE1201A different solutions can be implemented:

- Direct replacement
- Software modification
- Hardware modification.

Direct replacement:

If the main feature of the final application is not the output power or the current consumption, the XE1201 can be directly replaced by the XE1201A. The output power will not be optimized and the current consumption will increase. In this case no modification is required.

Software modification

A software modification can be done if the main feature of the final application is the output power value or the current consumption. For example, with the XE1201 the maximum output power available is -5dBm. The same value can be obtained with the XE1201A by a simple software modification. The 2 bits C13 and C12 need to be set up at 0 and 1 respectively instead of 1 and 1. With this modification, the output power of the XE1201A is set up to be -5dBm and with a current consumption at 8mA, which gives the same result as the XE1201.

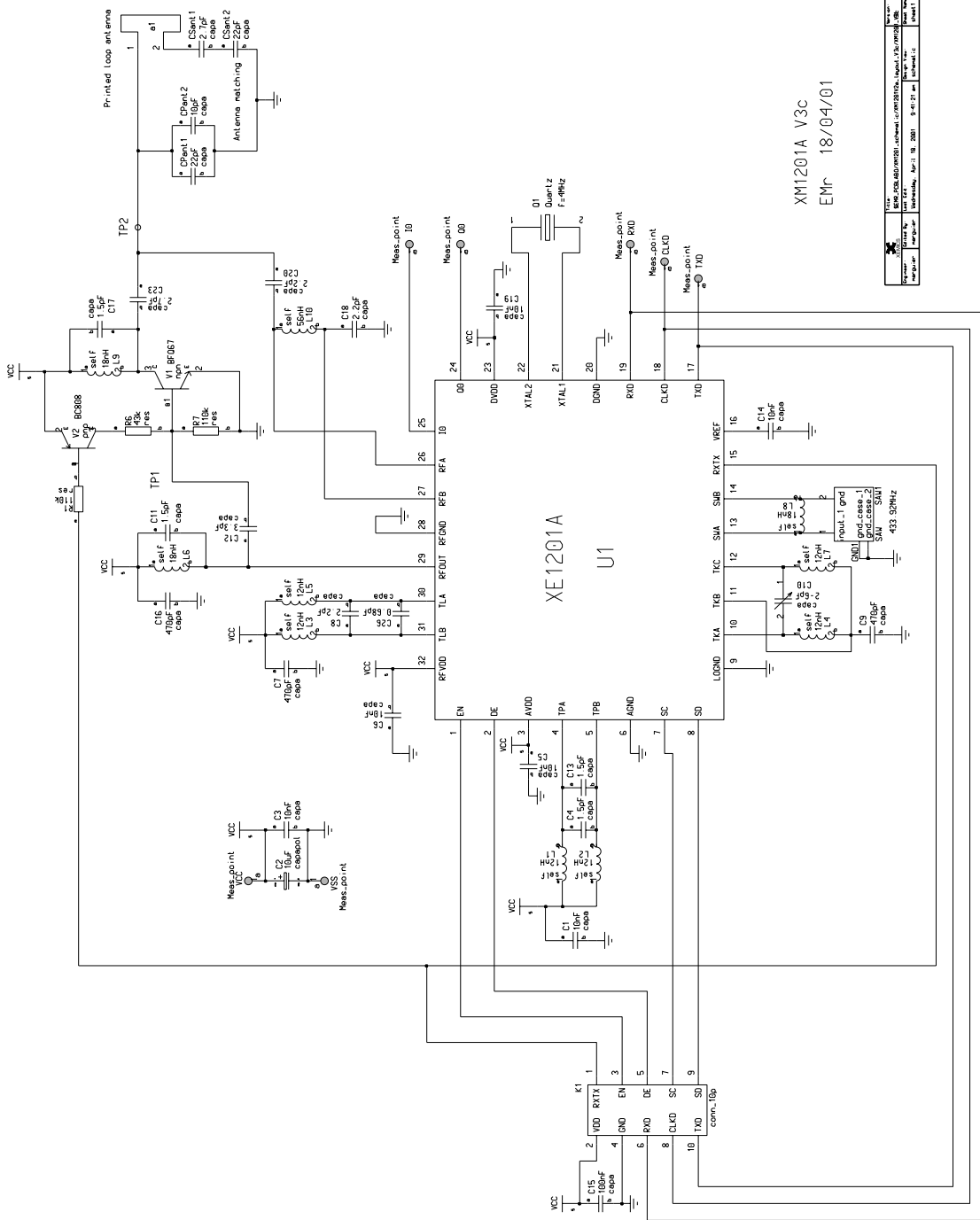
Hardware modification

If the final application requires an optimized solution or the best performance data range (output power and sensitivity), the RF board needs to be modified by following the table 2. The software (microcontroller source code) does not need to be modified, the same configuration (C13=1 and C12=1) will increase the output power from -5dBm to +5dBm with no modification to the RF sensitivity.

Exhibit I: XM1201A Bill Of Material

Denomination	Components	Reference	Value	Manufacturer	Form	Qty
U1	Transceiver circuit	XE1201		XEMICS	TQFP32	1
Q1	XTAL Quartz	S0409745	4.00MHz	-	-	1
V1	Transistor NPN	BFQ67		Philips	Sot23	1
V2	Transistor PNP	BC808		Philips	Sot23	1
SAW1	SAW Resonator	RO-2101A	433.92MHz	RFM	SM-2	1
C2	Decoupling capacitor		10uF			1
C15	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	100nF	Philips	SMD0805	1
C1, C3, C5, C6, C14, C19	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	10nF	Philips	SMD0805	6
C7, C9, C16	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	470pF	Philips	SMD0805	3
C26	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	0.68pF	Philips	SMD0805	1
C4, C11, C13, C17	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	1.5pF	Philips	SMD0805	4
C8, C18, C20	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	2.2pF	Philips	SMD0805	3
C12	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	3.3pF	Philips	SMD0805	1
C10	Trim-Capacitor	TZC03Z060A110	2 to 6pF	Philips	SMD0805	1
C23	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	2.7pF	Philips	SMD0805	1
Cs_ant1	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	2.7pF	Philips	SMD0805	1
Cs_ant2	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	22pF	Philips	SMD0805	1
Cp_ant1	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	22pF	Philips	SMD0805	1
Cp_ant2	Capacitor 0805	805 NPO Ni, +/-0.25pF, 50v	10pF	Philips	SMD0805	1
L1,L2,L3,L4,L5,L7	Self	0805 CS-120-X JBC 5%	12nH	Coilcraft	SMD0805	6
L6,L8,L9	Self	0805 CS-180-X JBC 5%	18nH	Coilcraft	SMD0805	3
L10	Self	0805 CS-560-X JBC 5%	56nH	Coilcraft	SMD0805	1
R6	Pola resistor	any one	43k		SMD1206	1
R1, R7	Pola resistor	any one	110k		SMD1206	2

Exhibit II: XM1201A Schematic



XM1201A V3c
EMr 18/04/01

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