CMY 91 - Down-Converter Application Circuit for PHP Systems

Application Note No. 040

The PHP cordless telephone standard operates in the 1900 MHz band. This application note describes the use of the CMY 91 as a first down conversion mixer of a PHP receiver. The CMY 91 is packaged in a SOT-23 sized package, operates from a single positive 3 V supply and has a low power consumption.

Application Circuit

The CMY 91 consists of a mixer (GaAs-FET), followed by a IF amplifier in series with the signal path. The resulting IF signal is then amplified by a selfbiased amplifier to give an overall conversion gain of typically 7 dB.

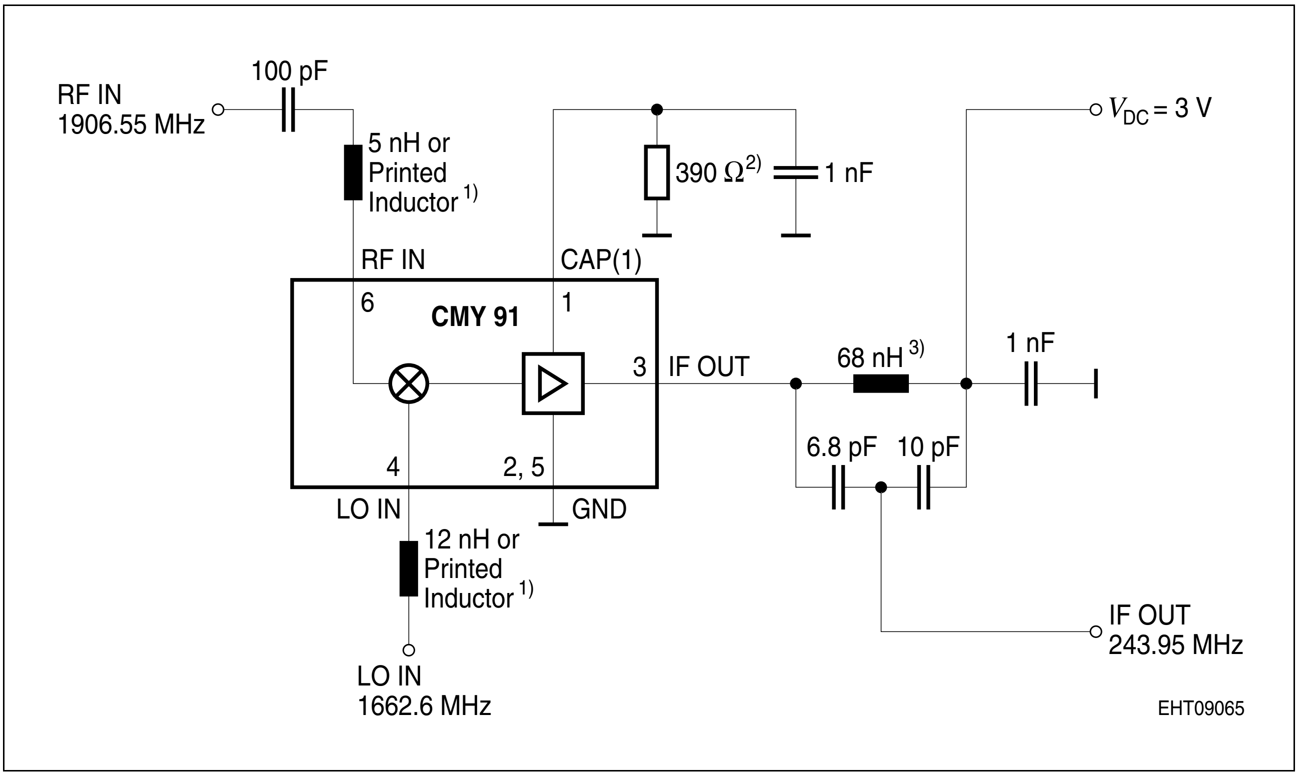

Figure 1

1) Serial resonance circuits: Tune for optimum input return loss.
2) Optional resistor. This increases the IF-amplifier operating current, improving conversion gain and intermodulation performance
3) SIMID 01-coil; Ordering code: B82412-A3680-M

Setup

1. The input RF filter consists of a serial resonance circuit made up of a capacitor and a printed inductor. Matching to the RF input frequency can be performed by changing the layout of the printed inductor or by changing the capacitor value.
2. For the IF port the resonance transformer has to be matched for IF frequency either by modifying the inductor or the ratio of capacitances.
3. The LO port can be used broadband or can be matched to the LO-frequency by adjusting the length of the printed inductor depending on the particular application.
4. As described in annotation 2 above, an optional resistor at pin 1 can be used to increase the IF-amplifier operating current to improve conversion gain and intermodulation performance.

PHP - Application Board

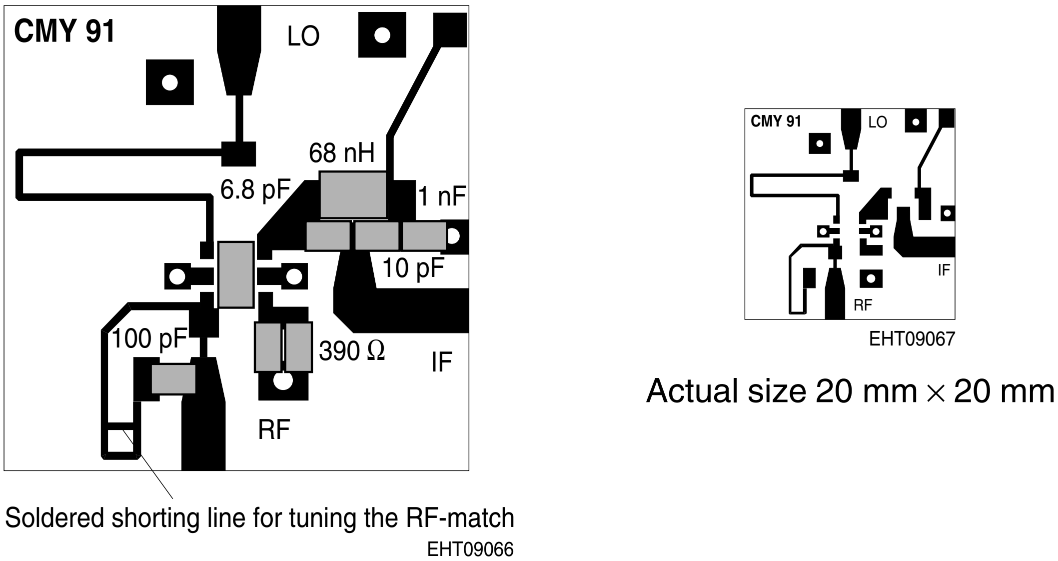

Figure 2 Layout of Application Board CMY 91

PCB-data: Glass fiber epoxy board; ε_r = 4.8; thickness = 1 mm

Characteristics of PHP - Application Board

(f_{RF} = 1.90655 GHz; f_{LO} = 1.6626 GHz; f_{IF} = 243.95 MHz; T_A = 25 °C; I_D = 2.7 mA, R = 390 Ω)

Conversion Gain G_C

P_{LO}	G_C @ V_D = 3.0 V	G_C @ V_D = 2.7 V
– 13 dBm	0.7 dB	0.4 dB
– 10 dBm	2.8 dB	2.5 dB
– 7 dBm	4.2 dB	3.9 dB
– 3 dBm	5.2 dB	4.9 dB
0 dBm	5.4 dB	5.3 dB
3 dBm	5.7 dB	5.4 dB
7 dBm	6.4 dB	5.9 dB
10 dBm	5.0 dB	2.0 dB

3rd Order Input Intercept Point IP_{3IN}

P_{LO}	IP_{3IN} @ V_D = 3.0 V	IP_{3IN} @ V_D = 2.7 V
– 13 dBm	– 2.4 dBm	– 2.3 dBm
– 10 dBm	– 1.2 dBm	– 1.2 dBm
– 7 dBm	1.5 dBm	1.4 dBm
– 3 dBm	5.5 dBm	5.8 dBm
0 dBm	7.3 dBm	6.9 dBm
3 dBm	5.1 dBm	5.3 dBm
7 dBm	3.5 dBm	3 dBm
10 dBm	– 0.5 dBm	– 3.95 dBm

Single Sideband Noise Figure F_{SSB}

P_{LO}	F_{SSB} @ V_D = 3.0 V	F_{SSB} @ V_D = 2.7 V
– 13 dBm	13.6 dB	13.6 dB
– 10 dBm	11.3 dB	11.3 dB
– 7 dBm	9.7 dB	9.9 dB
– 3 dBm	9.0 dB	8.9 dB
0 dBm	8.5 dB	8.5 dB
3 dBm	8.5 dB	8.5 dB
7 dBm	9.4 dB	9.0 dB
10 dBm	10.6 dB	10.7 dB

Characteristics of PHP - Application Board (cont'd)

(f_{RF} = 1.90655 GHz; f_{LO} = 1.6626 GHz; f_{IF} = 243.95 MHz; T_A = 25 °C; I_D = 2.7 mA, R = 390 Ω)

LO - RF Isolation

P_{LO}	ISO @ V_D = 3.0 V	ISO @ V_D = 2.7 V
– 13 dBm	13.2 dB	13.3 dB
– 10 dBm	13.7 dB	13.4 dB
– 7 dBm	13.9 dB	13.5 dB
– 3 dBm	14.3 dB	13.7 dB
0 dBm	14.5 dB	13.9 dB
3 dBm	14.8 dB	14.2 dB
7 dBm	14.6 dB	14.3 dB
10 dBm	14.3 dB	14.1 dB