

# Application Note No. 064

Using the BCR410W Bias Controller with BFP405  
in Amplifier Circuits

RF & Protection Devices



Never stop thinking

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<b>Page</b>	<b>Subjects (major changes since last revision)</b>
All	Document layout change

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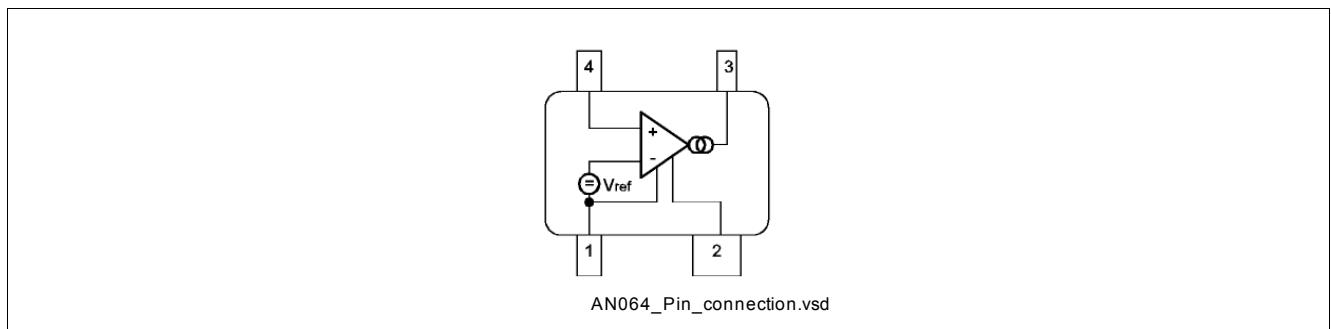
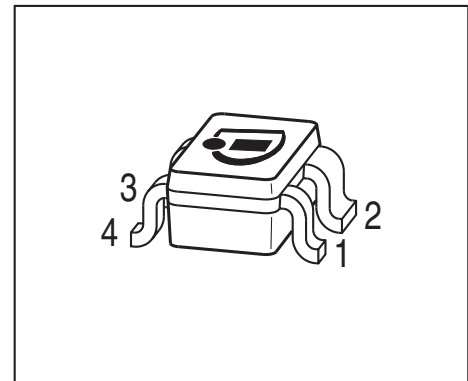
# 1 Using the BCR410W Bias Controller with BFP405 in Amplifier Circuits

## Features

- Bias controller for RF transistors
- Stabilizes collector current
- Low voltage drop (110 mV @  $I_C = 10$  mA)
- Works from 1.8 V supply voltage on
- Unconditionally stable control for many applications
- Small outline SOT343 package

## Applications

Amplifier applications for cellular phones, cordless phones, PCS, DECT, W/LANs, PHS, GMS 1800, RF modems and others.



**Figure 1** PIN configuration

## 1.1 Introduction

Low supply voltages in mobile electronic devices increasingly jeopardize your efforts to supply your RF amplifiers with stable bias current. Most of the commonly known circuits cause a substantial voltage drop and hence reduce the already low supply voltage budget. BCR410W was designed to reduce the voltage drop to a minimum and to avoid control oscillations. This application note describes an amplifier circuit with BFP405, but should be easily applicable to other types of transistors.

## 1.2 Description

The BCR410W homes an internal voltage reference that supplies a voltage of 85 mV. This voltage  $V_{ref}$  is connected to the positive supply voltage. The Input Signal  $V_{in}$  is compared to  $V_{ref}$  and controls the output current  $I_{out}$ . **Figure 2** shows the typical application circuit.

## 1.3 Realisation

Transistor T1 is BFP405.  $R_{ext}$  was dimensioned to 11  $\Omega$ . This results in a collector current of 10 mA in T1. C1 and C2 are dimensioned to be RF-short circuits to block out the RF signals from the DC path. Their value is not critical for DC biasing considerations. Capacitors C3 and C4 are dimensioned to decouple the RF signal. The datasheet of BCR410W gives you the details of how to dimension  $R_{ext}$ . In this application there is a voltage drop of 110 mA in the collector path of the RF transistor. Due to internal feedback, this voltage increases for lower collector currents. **Figure 3** shows the gain versus frequency.

Using the BCR410W Bias Controller with BFP405 in Amplifier Circuits

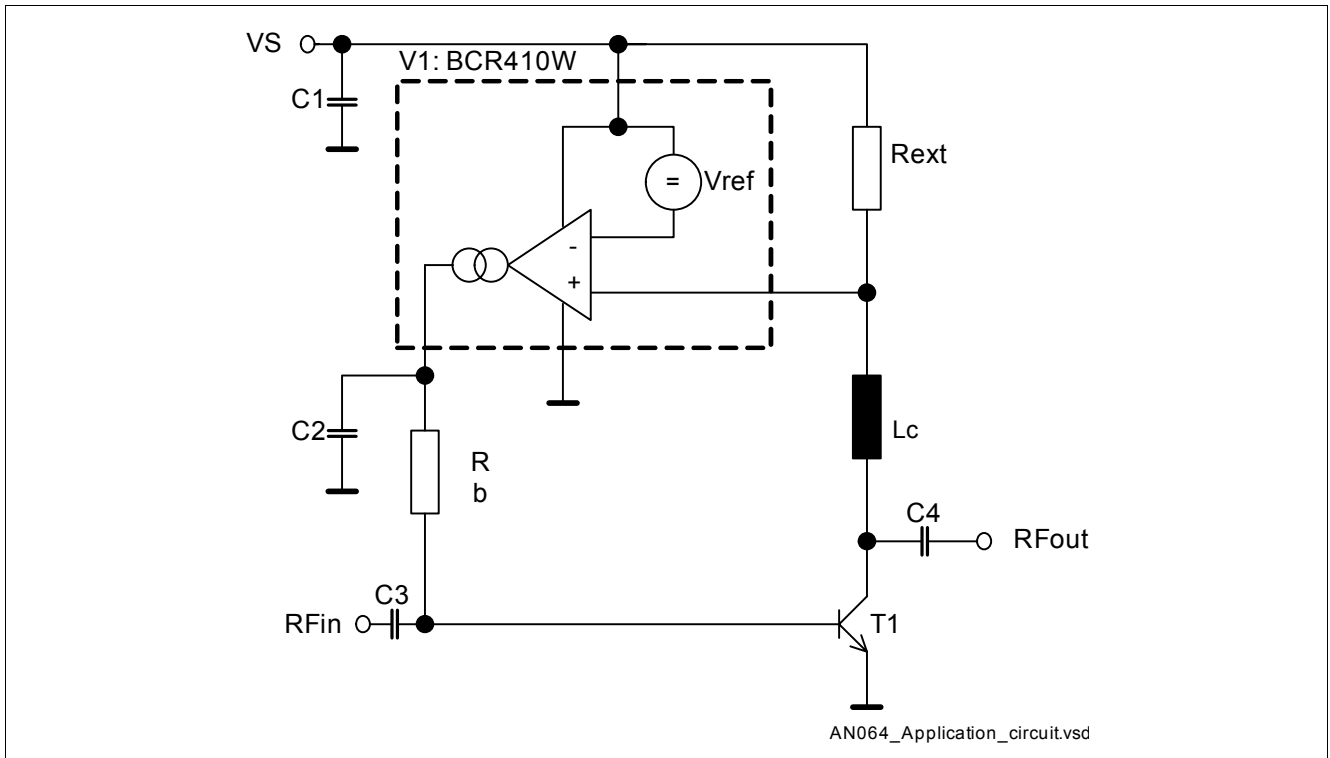


Figure 2 Application circuit diagram

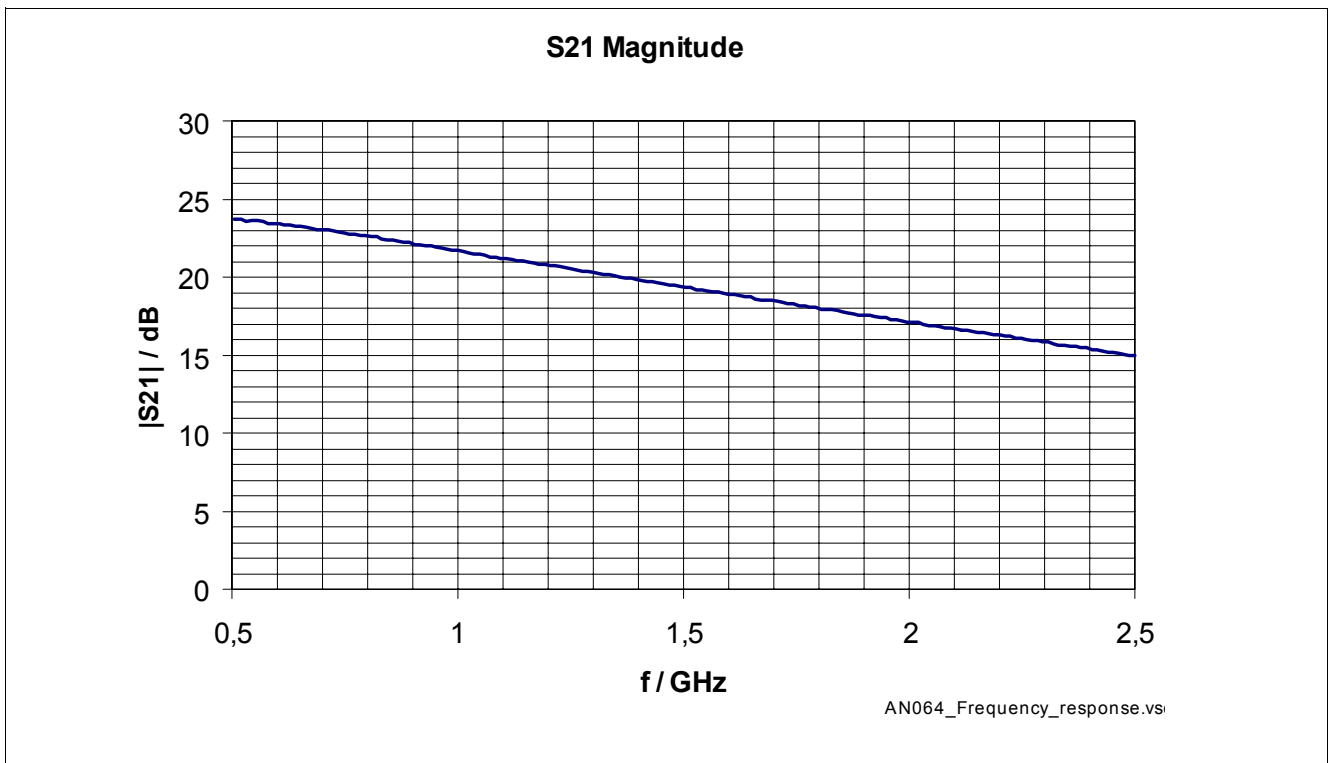


Figure 3 Frequency response

The passive components are 0402 sized standard devices. The PCB is FR4, 0.5 mm. To facilitate measurement, the sense terminal of the BCR410W is connected to a pin near the supply connector. [Figure 5](#) displays the position of the various components.

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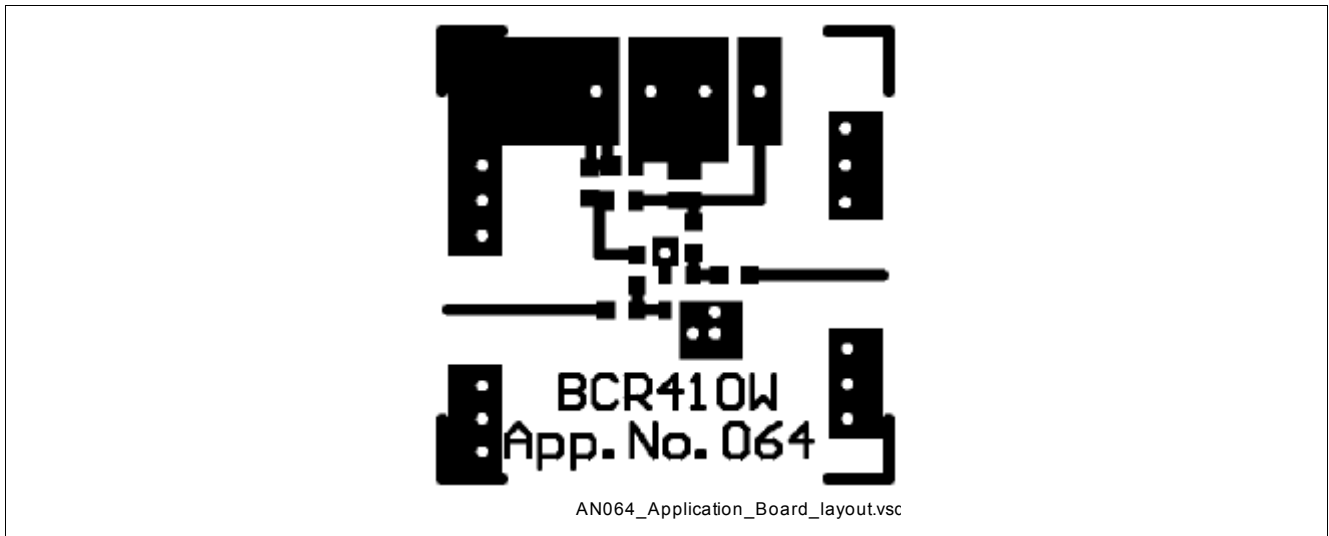


Figure 4 Application Board Layout (actual size: 20 mm x 20 mm)

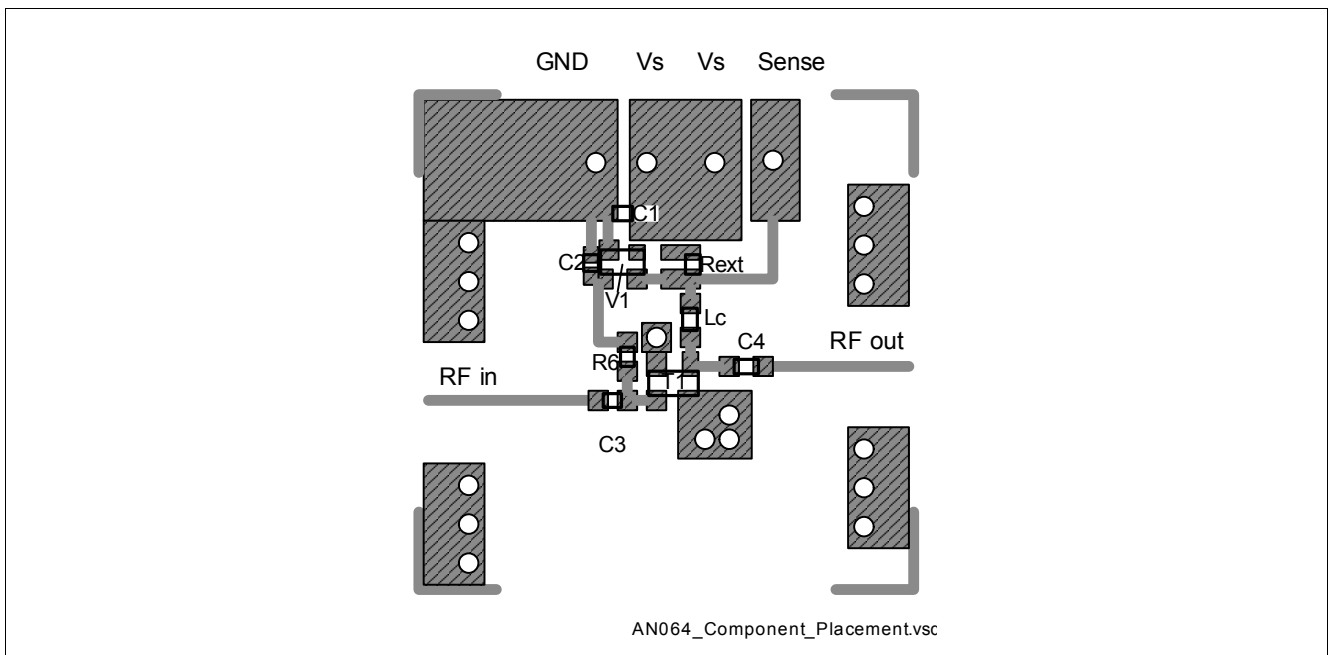


Figure 5 Component Placement

Table 1 List of components

Name	Value	Unit	Package	Function
C1	150	pF	0402	DC block
C2	150	pF	0402	DC block
C3	150	pF	0402	RF decoupling
C4	150	pF	0402	RF decoupling
Lc	100	nH	0402	RF choke
$R_{ext}$	11	$\Omega$	0402	Sense Resistor
Rb	1.0	k $\Omega$	0402	Base Resistor

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**Using the BCR410W Bias Controller with BFP405 in Amplifier Circuits****Table 1** List of components (cont'd)

<b>Name</b>	<b>Value</b>	<b>Unit</b>	<b>Package</b>	<b>Function</b>
T1	BFP405		SOT343	RF Transistor
V1	BCR410W		SOT343	Bias controller