BROADCOM®

APPLICATION NOTE

BCM5201/5221 Compatible Board Design

2/23/00

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REVISION HISTORY

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AN200-R	2/23/00	Release

TABLE OF CONTENTS

Cover Page

Revision History

Introduction 1

Schematic Notes 1

BCM5221 Compatible Board Design with a Crystal for Clock (Option-1) 2

BCM5221 Compatible Board Design with a Supplied Clock (Option-2) 3

Magnetic Considerations: No HP Auto-MDIX 4

HP Auto-MDIX Support 4

INTRODUCTION

The BCM5221 is a.22 micron, single 10/100BASE-TX/FX transceiver. This device is a low power and low voltage design. The BCM5221 has an integrated voltage regulator that can be used in applications providing only 3.3 volts supply. It is possible to design a system that can use either the BCM5201 or the BCM5221 if certain design guidelines are observed. This application note applies to the BCM5201/5221 board that can supply only 3.3V for the device.

There are two options in a compatibility board design based on how the BCM5201 clock is generated.

1. The BCM5201 is expected to generate the clock using its internal crystal oscillator by connecting a 25 MHz crystal to the XTALI/XTALO pins.
2. The BCM5201 is supplied with an external 25 MHz clock connected to the XTALI pin.

Refer to Figure 1 for a connection schematic that would support Option-1 where the BCM5201 uses the internal crystal oscillator. Refer to Figure 2 for a connection schematic that would support Option-2 where the BCM5201 is supplied with an external clock.

SCHEMATIC NOTES

1. Only signals that affect the compatible design are shown. Other signals and their connections must be done in accordance with the BCM5201 specifications and recommendations.
2. Name inside parenthesis of a signal is the BCM5221 signal.
3. Resistor value for R1, R2, R5-R10, R12 is 0 (zero) ohm.
4. Capacitor values for C1, C2, C4 and C5 is 1uF ceramic.
5. Capacitor values for C3, C6, C7, C8, C9 is 0.1uF ceramic.
6. Capacitor value for C10 is 10uF Tantalum.
7. Components C1 through C7, C9 and C10 are always loaded.
8. Resistors R5, R6, R11 and C8 are for HP Auto-MDIX option.
9. Refer to Table 1 and Table 2 to determine which other components to load or not to load for the BCM5201 and the BCM5221 for Option-1 and Option-2 respectively.

BCM5221 Compatible Board Design with a Crystal for Clock (Option-1)

The following schematic, in Figure 1, shows the schematic for Option-1. This option assumes that the BCM5201 is expected to use the internal crystal oscillator and the design is using the specified crystal to pin-6 and pin-5 of the BCM5201. The datasheet indicates that the crystal should be a 25 MHz parallel resonant crystal. Also connect a 27 pF capacitor from each pin to ground.

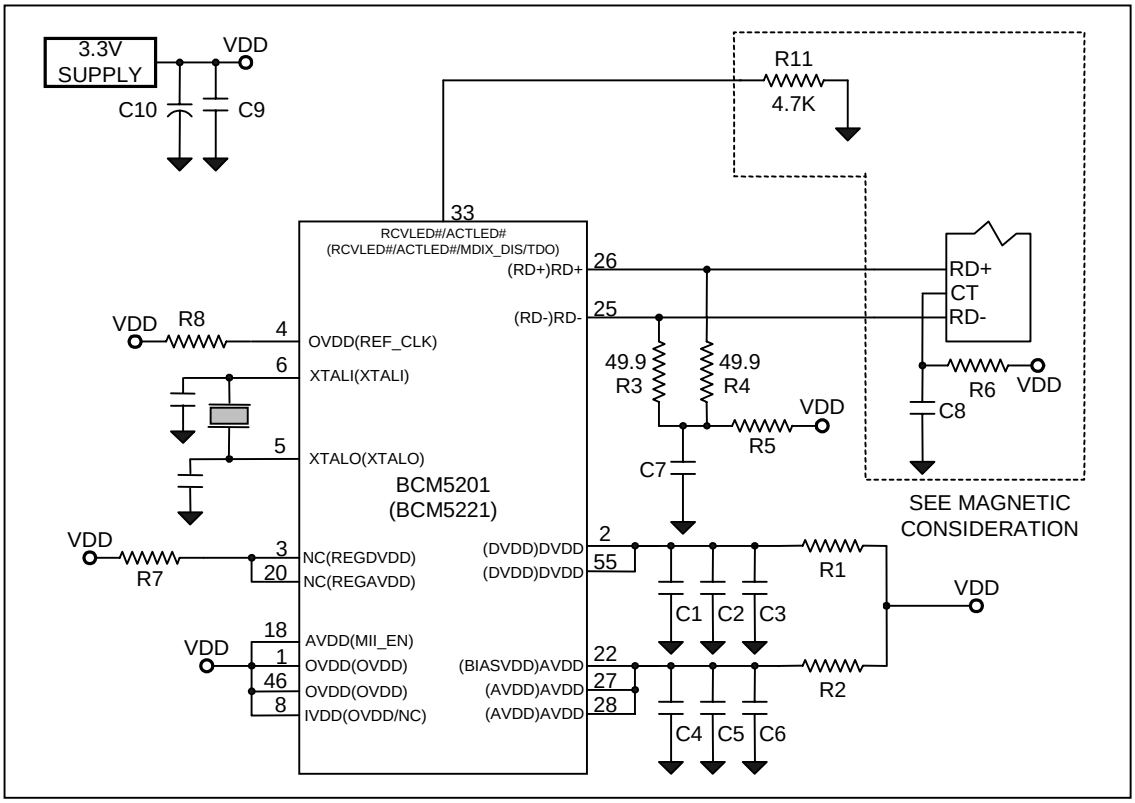

Figure 1: Option-1, BCM5201/5221 Compatible board design (crystal oscillator)

Table 1 shows which of the components to load and to not load for the BCM5201 and the BCM5221 device under option-1.

Table 1: Components Load/Not Load for Option-1

BCM5201 Build		*BCM5221 Build*	
Load	***Do Not Load***	***Load***	***Do Not Load***
R1,R2,R8	R5,R6,R7,R11,C8	R5,R6,R7,R11,C8	R1,R2,R8

BCM5221 Compatible Board Design with a Supplied Clock (Option-2)

Figure 2 shows the schematic for Option-2. This option assumes that the BCM5201 is supplied with an external 25 MHz clock signal to XTALI (pin-6) of the BCM5201. Accuracy of this clock signal shall be +/- 50 ppm, with a duty cycle between 35% and 65% inclusive. XTALO (pin-5) must be unconnected.

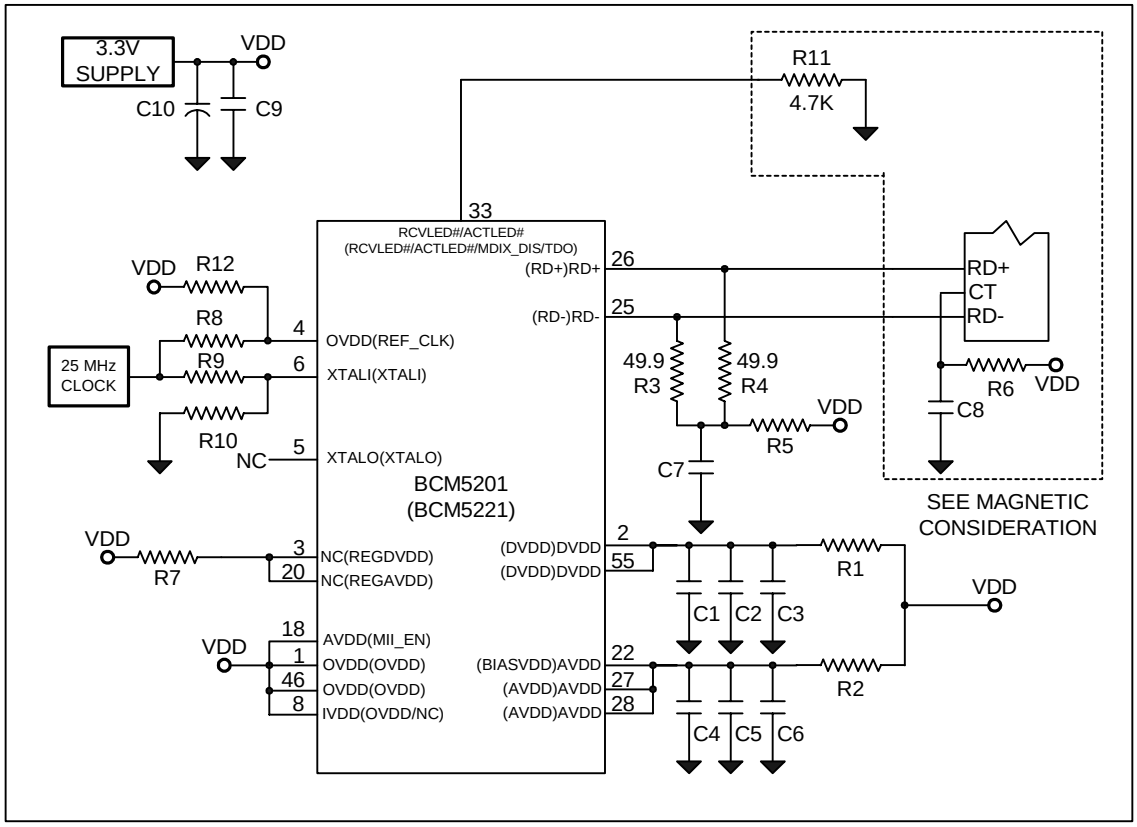

Figure 2: Option-1, BCM5201/5221 Compatible Board Design (External Clock)

Table 2 shows which of the components to load and to not load for the BCM5201 and the BCM5221 device under option-2.

Table 2: Components Load/Not Load for Option-2

BCM5201 Build		*BCM5221 Build*	
Load	***No not load***	***Load***	***Do not load***
R1,R2,R9,R12	R5,R6,R7,R8, R10,R11,C8	R5,R6,R7,R8, R10,R11, C8	R1,R2,R9,R12

MAGNETIC CONSIDERATIONS: NO HP AUTO-MDIX

It is important to note that in all configurations, the BCM5221 requires:

1 Magnetic with common mode choke in transmit and receive paths and both chokes should be in the RJ45 side.

2 Receive pair of the magnetic, in the device side, should be terminated by a 49.9 ohms resistor tied to VDD from each side of the receive pair as shown in the figure 1 and 2 by resistors R3, R4, and R5.

The above two items are true whether or not the BCM5221 is expected to support the HP Auto-MDIX feature.

HP AUTO-MDIX SUPPORT

The BCM5221 supports the HP Auto-MDI/MDIX function. There are two things that the board must accommodate to take advantage of this option.

1 **Magnetic.** In addition to items 1 and 2 stated in the “Magnetic consideration” above, the BCM5221 requires that receive center tap of the magnetic, in the device side, be tied to VDD as well. Therefore when populating the board with the BCM5221 device, it is necessary that you use a magnetic with a center-tap connections on transmit and receive pairs. The schematic shows this option by populating R5, R6, C7 and C8.

2 **MDIX_DIS.** The board design must enable HP Auto-MDIX function by pulling pin 33, RCVLED#/ACTLED#/MDIX_DIS/TDO, to ground through a 4.7K ohm resistor which is shown as R11 in the schematic. This pin, which has an internal pull-up, has dual functions in the BCM5221 under normal operation a) as RCVLED#/ACTLED# output and b) as MDIX_DIS, HP Auto-MDI/MDIX disable input. R11 is required only if HP Auto-MDIX function is required.

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