MGA-72543 Demonstration PCB

Assembly and Operating Instructions

Applies to MGA-71, MGA72 PCB and MGA-72543 RFIC

Description

The *MGA-71*, *MGA-72* printed circuit board, illustrated in Figure 1, is designed to demonstration the performance of the MGA-72543 RFIC amplifier / bypass switch for your specific application. The MGA-72543 is a single-stage, low noise amplifier with an integrated bypass switch. For detailed specifications and operation, refer to the MGA-72543 Data Sheet and Application Note.

This circuit board is of a general purpose design and may be used for applications covering a wide range of frequencies. The particular component values listed below have been optimized for use in 1.9 GHz systems. The demonstration circuit is fabricated on 0.031-inch thick GETEK®[1] G200D (ε_r = 4.2) dielectric material.

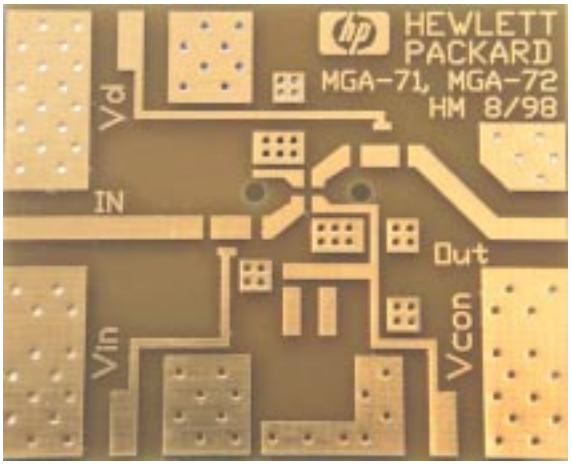

Figure 1. Unassembled Demonstration Board.

Assembly

The amplifier and related components are assembled onto the printed circuit board as shown in Figure 2. This layout is designed to use edge-mounting SMA connectors, such as the EF Johnson 142-0701-881, for the RF connections. This type of connector slips over the edge of the board without the need for drilling holes. The center conductors are soldered to the input and output microstrip lines and the ground pins of the connectors are soldered to the ground plane on the backside of the board and to the ground pads on the topside. The DC terminals and adjacent ground pads are designed to fit a 2-pin, 0.100" centerline flat header of the type commonly used on computer boards (e.g., Waldom-Molex 4030 series) as a convenient means of making connection to the power supply and/or control voltages.

A schematic diagram of the circuit is shown in Figure 3 with component values in Table 1. The values listed have been selected for use at 1900 MHz. Inductor L1 is used with the MGA-72543 to improve the input power match.

DC blocking capacitors (C1 and C2) have been included at the input and output to isolate device voltages from adjacent circuits or test equipment. DC power is supplied to the amplifier through the RF Output pin by means of a bias decoupling network connected to board terminal V_d. The bias decoupling network consists of an RF choke (RFC) and a bypass capacitors.

[1] General Electric Co.

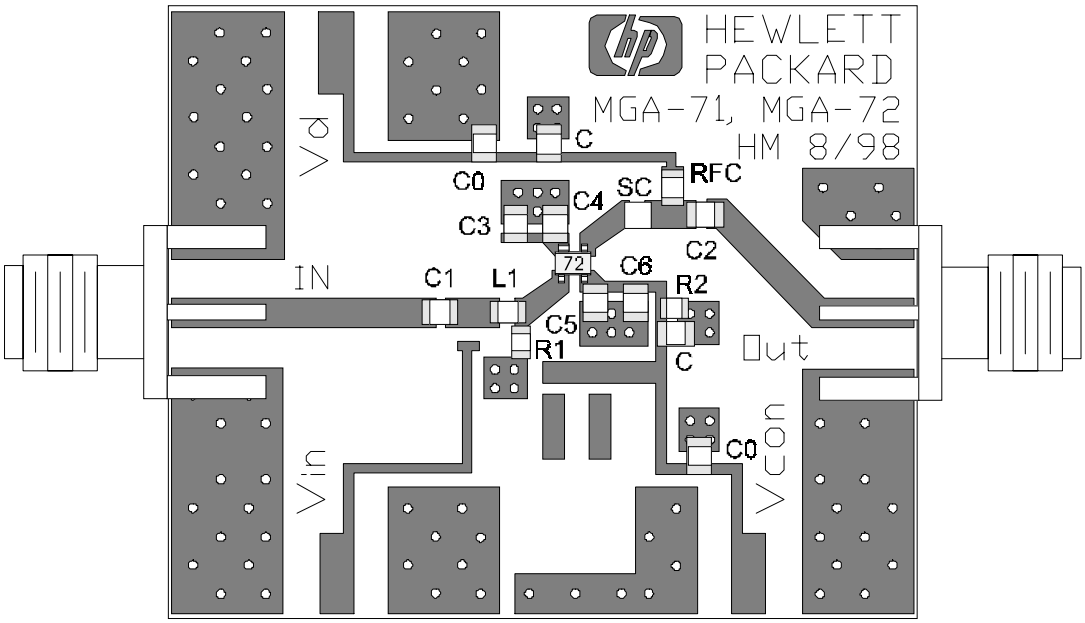

Figure 2. Assembled Demonstration Circuit with Component Reference Designators.

Setting Device Current

The MGA-72543 incorporates an adjustable bias feature. The MGA-72543 is typically operated within a device current range of 10 – 60 mA. A current of 10 – 20 mA is appropriate for LNA applications. Biasing the amplifier at currents of 40 – 60 mA allows it to deliver higher output power levels for use as a transmit driver stage.

Device current is set by the resistance between Pin 4 (or Pin 1) of the MGA-72543 and DC ground. For evaluation purposes, an external resistor is suggested for setting the bias current. The external resistor is connected between the V_{con} terminal and ground. Alternatively, the current can be fixed by installing resistor R2 onto the PCB as indicated Figure 2 and in the schematic diagram in Figure 3. The approximate value of the current-setting resistor is calculated from:

$$R_{bias} = \frac{964}{I_d}(1 - 0.112\sqrt{I_d})$$

R1	= 1 KΩ	C (2 ea)	= 100 pF
R2	= see text	C0 (2 ea)	= 1000 pF
L1	= 3.9 nH	C1, C2	= 47 pF
RFC	= 22 nH	C3, C6	= 30 pF
SC	Short	C4, C5	= 22 pf

Table 1. List of Component Values.

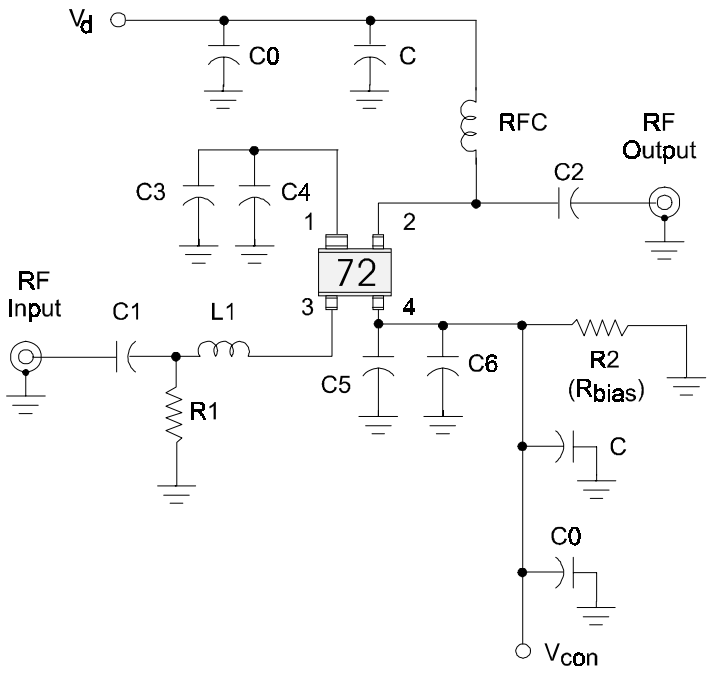

Figure 3. Schematic Diagram of MGA-72543 Demonstration Circuit.

where R_{bias} is in ohms and I_d is the desired device current in mA.

If desired, the MGA-72543 can also be biased by directly grounding device Pins 1 and 4 and applying a negative control voltage to Pin 3. The connection labeled V_{in} is provided for this purpose. (Note: R_{bias} is not used with this method of biasing.)

Operation

To operate the MGA-72543 demonstration amplifier, it is only necessary to apply +3 volts to the $+V_d$ connection. If an on-board resistor is used to set the current, the V_{con} terminal is left open.

Switch Bypass Mode

The MGA-72543 is placed in the switch bypass mode by setting the device current to zero. This is done by open-circuiting the bias resistor, R_{bias}.

A Note on Performance

Actual performance of the MGA-72543 as measured in the demonstration circuit may not exactly match the data sheet specifications. The circuit board material, passive components, RF bypasses, and connectors all introduce losses and parasitics that degrade device performance.

For this demonstration circuit, circuit losses of about 0.3 dB would be expected at both the input an output sides of the RFIC at 2 GHz.

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