Document Number: MC13192RFCUG
Rev. 1.2, 09/2006

MC13192 RF Daughter Card

User's Guide

1 Introduction

The MC13192 RF Daughter Card (13192RFC-A00) is used in conjunction with a microcontroller development board for RFIC evaluation, code development, and system evaluation. It interfaces directly to the M68EVB908GB60 HCS08 family Microcontroller Development Board but it can be adapted to other boards that offer access to the MCU input/output ports.

The RF Daughter Card is configured with all the off-chip circuitry required for functional performance of the MC13192 RF data modem except the MCU. The MCU interface required by the RFIC is pinned out at the edge of the card using standard header pins. The RF interface is accomplished through SMA connectors for the TX and RX ports. The SMA connectors can be connected to test equipment using coax cables for testing or connected to screw-on antennas (two provided) for testing purposes.

Figure 1-1 shows the RF Daughter Card with the two detachable dipole antennas.

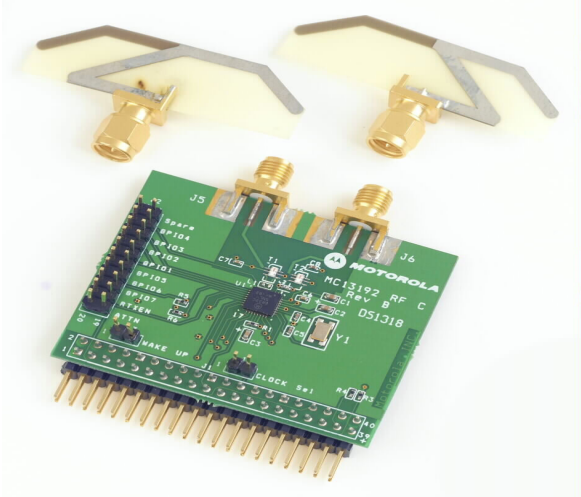

Figure 1-1. MC13192 RF Daughter Card with Antennas

Figure 1-2 shows the RF Daughter Card installed in a GB60 development board.

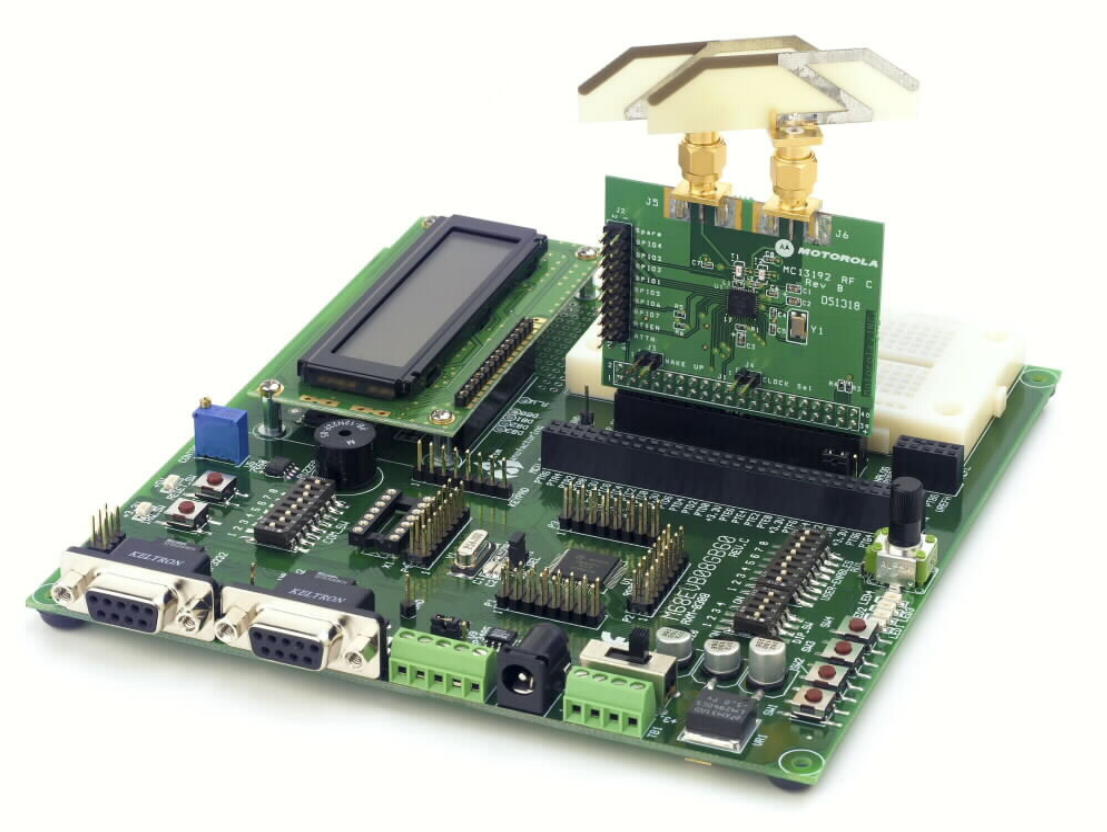

Figure 1-2. RF Daughter Card Installed in the GB60 Development Board

2 MCU Interface

Refer to the *MC13192 Data Sheet* and/or *MC13192 Reference Manual* for interface details.

3 Safety Information

Any modifications to this product may violate the rules of the Federal Communications Commission and make operation of the product unlawful.

47 C.F.R. Sec. 15.21

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

47 C.F.R. Sec.15.105(b)

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this equipment must be installed to provide a separation distance of at least 8 inches (20cm) from all persons.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

4 Daughter Card Description

Figure 4-1 shows the top side and component layout of the RF Daughter Card PCB.

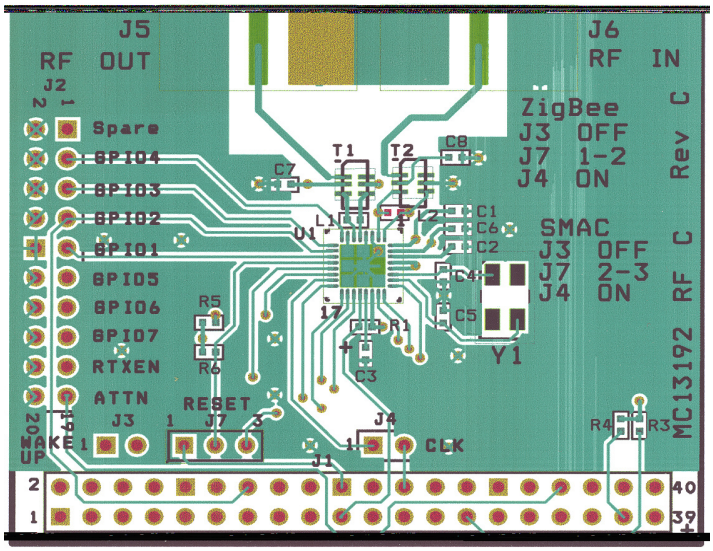

Figure 4-1. RF Daughter Card PCB (Top View)

Figure 4-2 shows the bottom side of the RF Daughter Card PCB.

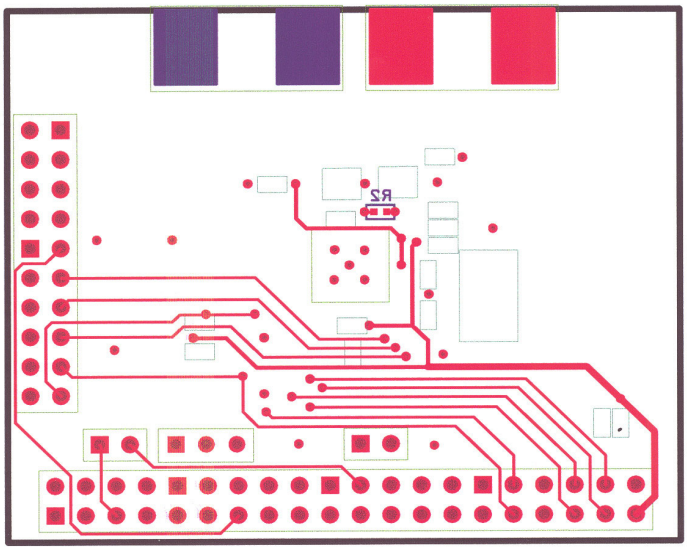

Figure 4-2. RF Daughter Card PCB (Bottom View)

As shown in Figure 1-2 and Figure 4-1 , connector J1 is the main interface to the GB60 Development Board. The interface connections described in Section 4.2, “Connections”, fall under the following three broad categories:

1. Serial Peripheral Interface (SPI)
2. Control
3. Power

4.1 SPI Connections

J1 Pins 35 through 38 provide the following four wire SPI interface:

- MOSI
- SPICLK
- $\overline{\text{CE}}$
- MISO

The MC13192 always functions as a slave device. SPI operation is described in detail in the *MC13192 Data Sheet* and/or *MC13192 Reference Manual*.

4.2 Connections

The following sections describe the interconnects for the GB60 Development Board.

4.2.1 Control Connections

- J1 Pin 19 is the $\overline{\text{IRQ}}$ line from MC13192. Connection to the MCU depends on how the MCU services interrupts.
- J1 Pin 31, RXTXEN, allows the MCU to initiate transceiver functions.
- J1 Pin 34, the $\overline{\text{ATTN}}$ line, allows the MCU to wake up the MC13192 from Doze or Hibernate low power modes.

NOTE

RXTXEN and $\overline{\text{ATTN}}$ are also available at header J2 for manual control.

- J1 Pin 24 provides the MC13192 CLKO to the MCU when a jumper is installed at J4.
- J1 Pin 32 interfaces with the MCU to provide a Reset to the MC13192 and header J7 controls the functionality.
- When Pin 2 and Pin 3 of J7 are shunted, the MC13192 and the MCU can be reset simultaneously.
- When Pin 1 and Pin 2 of J7 are shorted, the MCU will reset the MC13192.
- Pin 5 and Pin 22 of J1 provide a wake up function to the MCU when a shunt is installed at J3.
- Pin 13 and Pin 14 of J1 provide access to MC13192 GPIO1 and GPIO2 ports.

4.2.2 Power Connections

J1 Pin 39 provides the supply voltage to the RF Daughter Card. Voltage on this line should not exceed 3.6 VDC and the nominal supply should not exceed 3.4 VDC. J1 Pin 40 is ground.

4.2.3 Non-MCU connections

Header J2 provides connections to a number of MC13192 contacts for non-MCU connections. As already stated, the RXTXEN and $\overline{\text{ATTN}}$ lines are available at J2 for external control using switches or other hardware. The MC13192 GPIO are also available for interface to external hardware.

5 Software Configuration

As shown in Figure 4-1, the legend printed on the RF Daughter Card PCB shows the jumper settings for ZigBee and SMAC applications. The SMAC jumper settings on the board can now be ignored because as of this release, the SMAC and 802.15.4 MAC use the same settings.

6 Bill of Materials and Schematic

Table 6-1 shows the RF Daughter Card bill of materials (BOM).

Table 6-1. Bill of Materials

Item	Quantity	Reference	Part	Part Number	Source
1	3	C1,C2,C3,C8	100pF /0402		
2	2	C4,C5	9pF /0402		
3	2	C7,C6	1nF /0402		
5	1	J1	MCU Interface Header 20X2		
6	1	J2	Interface HEADER 10X2		
7	1	J3	Wake Up Header 1X2		
8	1	J4	CLK SOURCE Header 1X2		
9	2	J6,J5	Connector SMA	142-0701-881	Johnson
10	1	L1	8.2nH /0402		
11	1	L2	6.8nH /0402		
12	1	R1,R4,R5,R6	47kΩ /0402		
13	1	R2	200Ω /0402		
14	1	R3	10kΩ /0402		
15	2	T1,T2	Balun Transformer	2450BL15B200	Johnson
16	1	U1	IC	MC13192	Freescale Semiconductor
16	1	Y1	Crystal	TSX-10A@16MHz	Toyocom

Figure 6-1 shows the RF Daughter Card schematic.

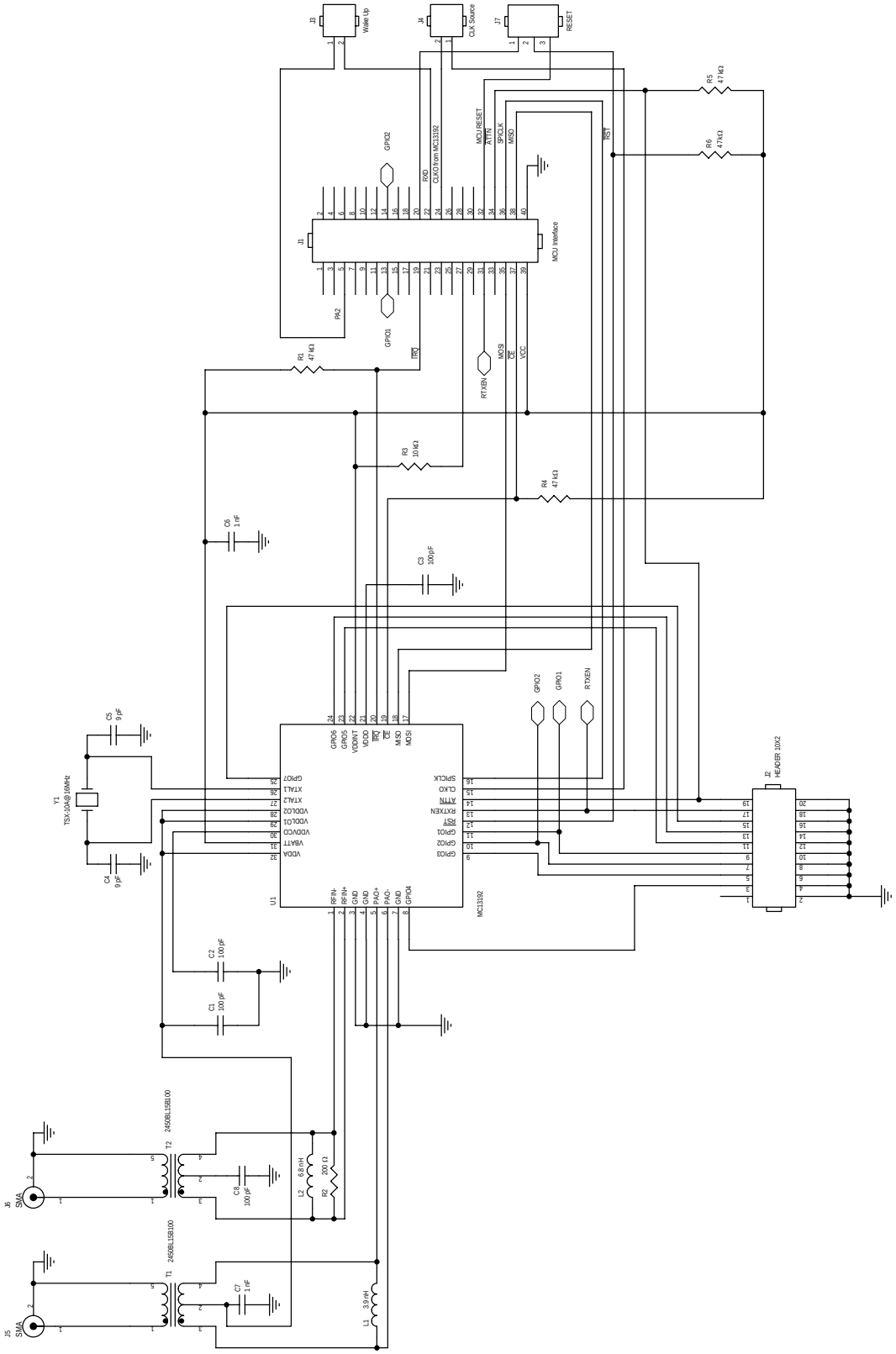

Figure 6-1. RF Daughter Card Schematic

How to Reach Us:

Home Page:
www.freescale.com

E-mail:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
+1-800-521-6274 or +1-480-768-2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064, Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
2 Dai King Street
Tai Po Industrial Estate
Tai Po, N.T., Hong Kong
+800 2666 8080
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor Literature Distribution Center
P.O. Box 5405
Denver, Colorado 80217
1-800-521-6274 or 303-675-2140
Fax: 303-675-2150
LDCForFreescaleSemiconductor@hibbertgroup.com

Document Number: MC13192RFCUG
Rev. 1.2
09/2006

freescale™
semiconductor