Freescale Semiconductor
Application Note

Recommendation for NC Pins
(Devices: 33912G5, 33911G5 & 33910G5)

1 Purpose

The application note purpose is to specify the connection of the "not connected" (NC) pins for the SBCLIN2.5G devices family which is composed of three devices:

- • 33912G5: SBCLIN with DC Motor Pre Driver and Current Sense
- • 33911G5: SBCLIN with DC Motor Pre Driver
- • 33910G5: SBCLIN with High Side Driver

In this document, the developer can find for each three devices the voltage level connection for the pins labelled "nc" in the Data Sheet. A typical application schematic will be also described. The transgression of the "nc" pins connections especially for the 33911G5 and 33910G5 devices could generate a device failure.

Contents

2 33912G5 Device

2.1 Pins Connections

The 33912G5 device is packaged in a LQFP-32 pins.
Figure 1 illustrates the pin connections.

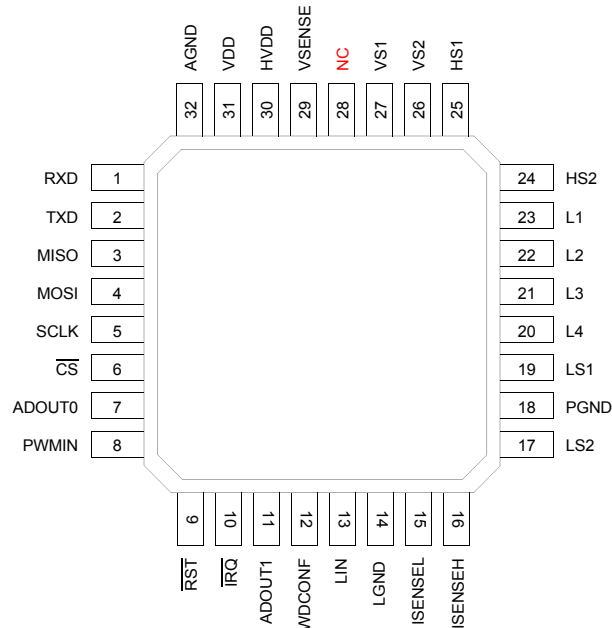**Figure 1. 33912G5 pin connections**

The table below shows the pins functions.

Pin	Pin Name	Formal Name	Definition
1	RXD	Receiver Output	This pin is the receiver output of the LIN interface which reports the state of the bus voltage to the MCU interface.
2	TXD	Transmitter Input	This pin is the transmitter input of the LIN interface which controls the state of the bus output.
3	MISO	SPI Output	SPI (Serial Peripheral Interface) data output. When $\overline{CS}$ is high, pin is in the high-impedance state.
4	MOSI	SPI Input	SPI (Serial Peripheral Interface) data input.
5	SCLK	SPI Clock	SPI (Serial Peripheral Interface) clock Input.
6	$\overline{CS}$	SPI Chip Select	SPI (Serial Peripheral Interface) chip select input pin. $\overline{CS}$ is active low.
7	ADOUT0	Analog Output Pin 0	Analog Multiplexer Output.
8	PWMIN	PWM Input	High Side and Low Side Pulse Width Modulation Input.
9	$\overline{RST}$	Internal Reset I/O	Bidirectional Reset I/O pin - driven low when any internal reset source is asserted. $\overline{RST}$ is active low.
10	$\overline{IRQ}$	Internal Interrupt Output	Interrupt output pin, indicating wake-up events from Stop Mode or events from Normal and Normal request modes. $\overline{IRQ}$ is active low.
11	ADOUT1	Analog Output Pin 1	Current sense analog output.
12	WDCONF	Watchdog Configuration Pin	This input pin is for configuration of the watchdog period and allows the disabling of the watchdog.
13	LIN	LIN Bus	This pin represents the single-wire bus transmitter and receiver.

Pin	Pin Name	Formal Name	Definition
14	LGND	LIN Ground Pin	This pin is the device LIN ground connection. It is internally connected to the PGND pin.
15 16	ISENSEL ISENSEH	Current Sense Pins	Current Sense differential inputs.
17 19	LS2 LS1	Low Side Outputs	Relay drivers low side outputs.
18	PGND	Power Ground Pin	This pin is the device low side ground connection. It is internally connected to the LGND pin.
20 21 22 23	L4 L3 L2 L1	Wake-up Inputs	These pins are the wake-up capable digital inputs[1]. In addition, all Lx inputs can be sensed analog via the analog multiplexer.
24 25	HS2 HS1	High Side Outputs	High side switch outputs.
26 27	VS2 VS1	Power Supply Pin	These pins are device battery level power supply pins. VS2 is supplying the HSx drivers while VS1 supplies the remaining blocks.[2]
29	VSENSE	Voltage Sense Pin	Battery voltage sense input.[3]
30	HVDD	Hall Sensor Supply Output	+5.0 V switchable supply output pin.[4]
31	VDD	Voltage Regulator Output	+5.0 V main voltage regulator output pin.[5]
32	AGND	Analog Ground Pin	This pin is the device analog ground connection.

Notes
1. When used as digital input, a series 33kΩ resistor must be used to protect against automotive transients.
2. Reverse battery protection series diodes must be used externally to protect the internal circuitry.
3. This pin can be connected directly to the battery line for voltage measurements. The pin is self protected against reverse battery connections. It is strongly recommended to connect a 10kΩ resistor in series with this pin for protection purposes.
4. External capacitor ($1.0\ \mu F < C < 10\ \mu F$; $0.1\ \Omega < ESR < 5.0\ \Omega$) required.
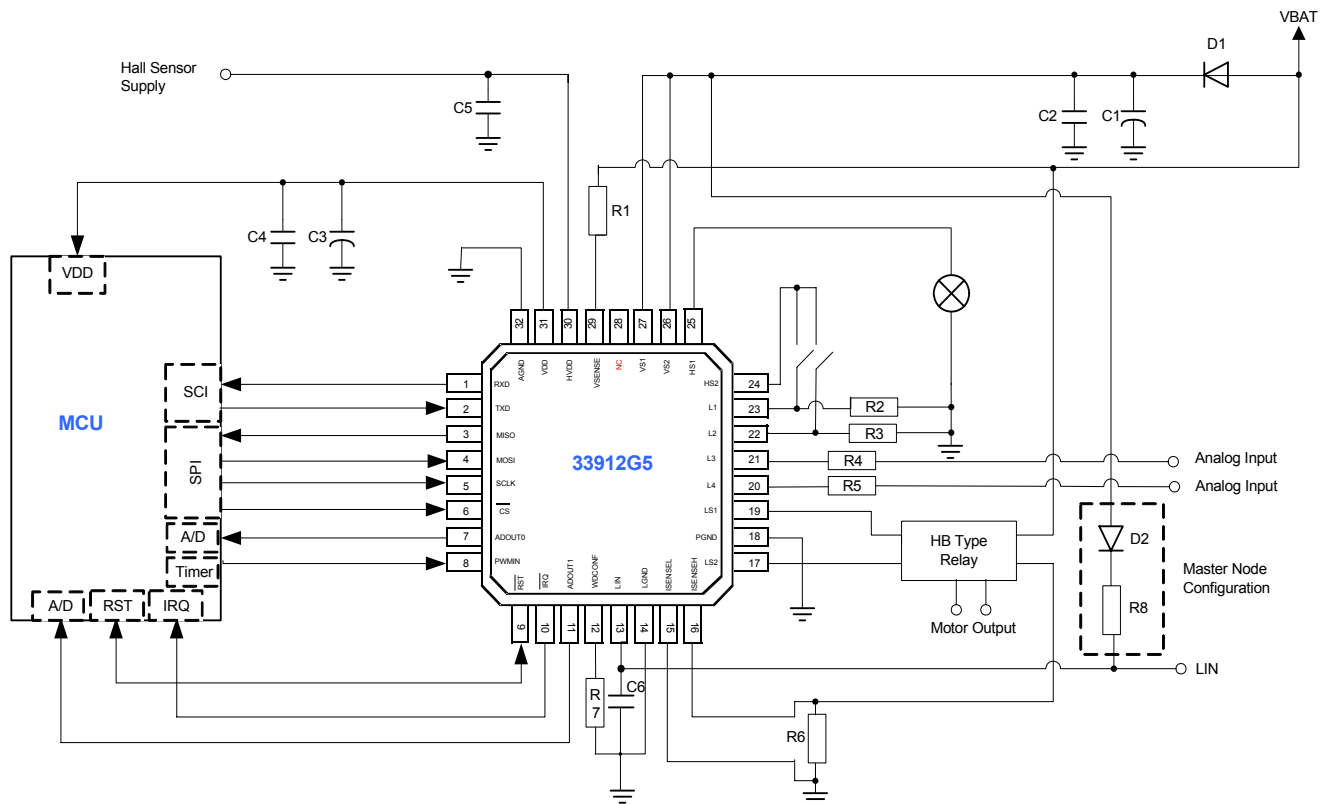5. External capacitor ($2.0\ \mu F < C < 100\ \mu F$; $0.1\ \Omega < ESR < 10\ \Omega$) required.

2.2   Recommendation of NC Pin

This device presents one "NC" pin which is the pin number 28.
This pin is not connected internally and can be left opening/floating or connected to any potential (ground, power supply).

2.3   Typical Application Schematic

The Figure 2, page 4 illustrates a typical application schematic.

Typical Component Values:
  C1 = 47 µF; C2 = C4 = 100 nF; C3 = 10 µF; C5 = 4.7 µF; C6 = 68pF or 0pF
  R1 = 10 kΩ; R2 = R3 = 10 kΩ; R4 = R5 = 33 kΩ; R6 = 20 Ω; R7 = 20 kΩ-200 kΩ; R8 = 1 kΩ

Recommended Configuration of the not Connected Pins (NC):
  Pin 28 = this pin is not internally connected and may be used for PCB routing optimization.

Figure 2. 33912G5 Typical application schematic

3 33911G5 Device

3.1 Pins Connections

The 33911G5 device is packaged in a LQFP-32 pins.
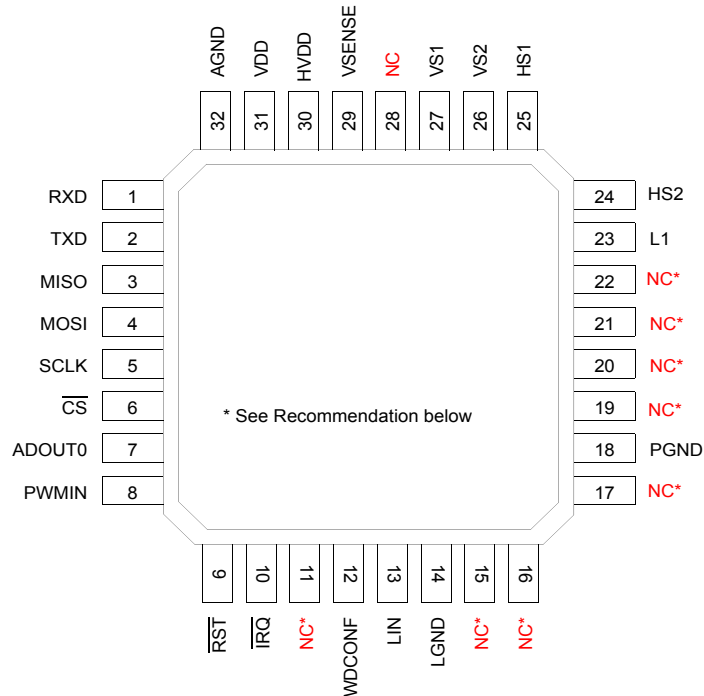Figure 3 illustrates the pin connections.
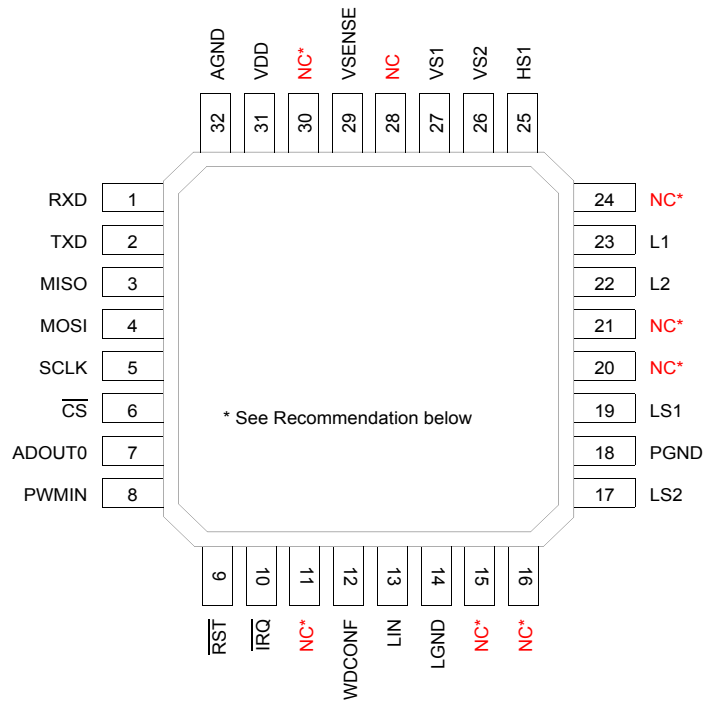
Figure 3. 33911G5 pin connections

3.2 Recommendation of NC Pins

The 33911G5 device has eight "nc" pins. The table below describes following each pins number the recommended connections. The user must respect them in order to not damage the device.

Table 1. 33911G5 Not Connected Pins Connections

Pins Numbers	Connections recommendation
11	not connected
15	not connected or connected to the Ground
16	not connected or connected to the Ground
20	not connected or connected to the Ground
21	not connected or connected to the Ground
24	not connected or connected to VS2
28	not connected
30	not connected

3.3 Typical Application Schematic

The Figure 4, page 6 illustrates a typical application schematic.
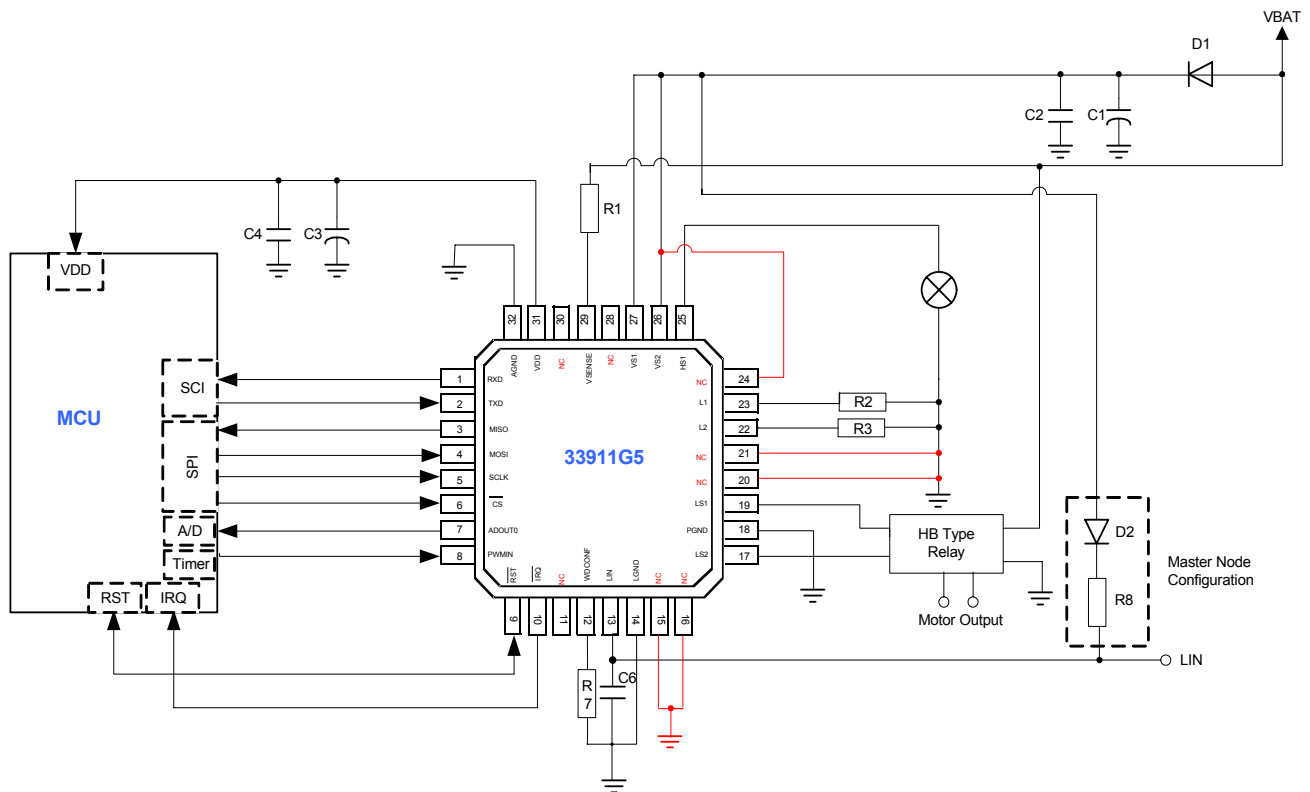
Typical Component Values:
C1 = 47 µF; C2 = C4 = 100 nF; C3 = 10 µF; C6 = 68pF or 0pF
R1 = 10 kΩ; R2 = R3 = 10 kΩ; R7 = 20 kΩ-200 kΩ; R8 = 1 kΩ

Figure 4. 33911G5 Typical Application Schematic

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4 33910G5 Device

4.1   Pins Connections

The 33910G5 device is packaged in a LQFP-32 pins. Figure 5 illustrates the pin connections.

Figure 5. 33910G5 pin connections

4.2   Recommendation of NC Pins

The 33910G5 device has nine "nc" pins. The table below describes following each pins number the recommended connections. The user must respect them in order to not damage the device.

Table 2. 33910G5 Not Connected Pins Connections

Pins Numbers	Connections recommendation
11	not connected
15	not connected or connected to the Ground
16	not connected or connected to the Ground
17	not connected or connected to the Ground
19	not connected or connected to the Ground
20	not connected or connected to the Ground
21	not connected or connected to the Ground
22	not connected or connected to the Ground
28	not connected

4.3   Typical Application Schematic

The Figure 6, page 8 illustrates a typical application schematic.
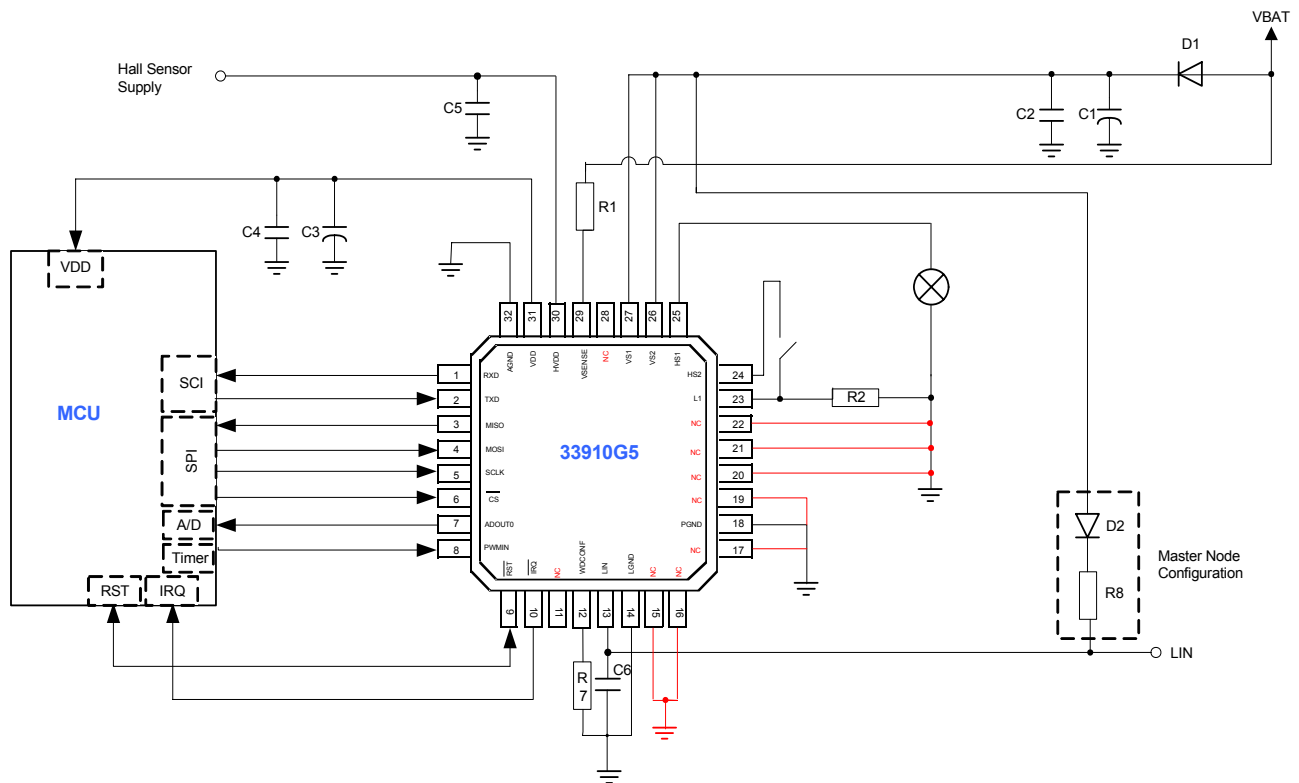
Figure 6. 33910G5 Typical Application Schematic

**Typical
Component Values:**

   C1 = 47 µF; C2 = C4 = 100 nF; C3 = 10 µF; C5 = 4.7 µF; C6 = 68pF or 0pF
   R1 = 10 kΩ; R2 = 10 kΩ; R7 = 20 kΩ-200 kΩ; R8 = 1 kΩ

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