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AN2167

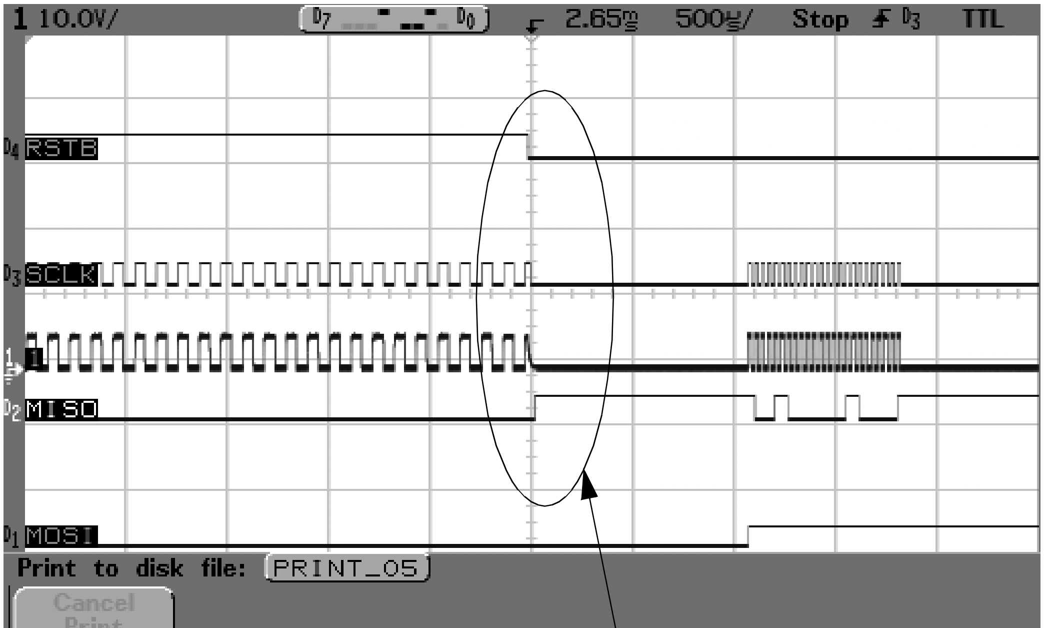
Application Note

Changing Romeo2 Configuration Registers While RF Data Is Being Received

Explanation of the problem

In some applications, it is required to change the Romeo2 configuration registers while RF data is being received. Some care has to be taken so that dummy data is not downloaded into Romeo2 configuration registers. The problem occurs when DME =1 and when clock pulses are shifted out on SCLK. For example, this can happen after a wake-up has been detected (if DME = 1 and HE = 0) or after a header has been detected (DME = 1 and HE = 1).

To change Romeo2 configuration registers, RSTb must be pulled down. A problem occurs if RSTb is forced low when SCLK is high. There is a time when the SCLK line is in a high impedance state (after Romeo2 is set as slave and before the MCU SPI is switched as master). Then, a first unwanted falling edge is generated on SCLK, either because the MCU forces SCLK low when it is set as master or because the SCLK voltage is discharged through device input capacitances (if the time is too long before the MCU is set as master). See Figure 1. This unwanted falling edge is understood by Romeo2 as a clock pulse. Then, Romeo2 starts to read (if MOSI is high at this unwanted edge) or write its configuration registers (if MOSI is low at this unwanted edge).The result is that the Romeo2 configuration registers may be corrupted, that a write is executed instead of a read, that a read is executed instead of a write, or that a read command is not correctly executed because one bit is shifted.



Trace 1 is the analog trace of SCLK.

ZOOM

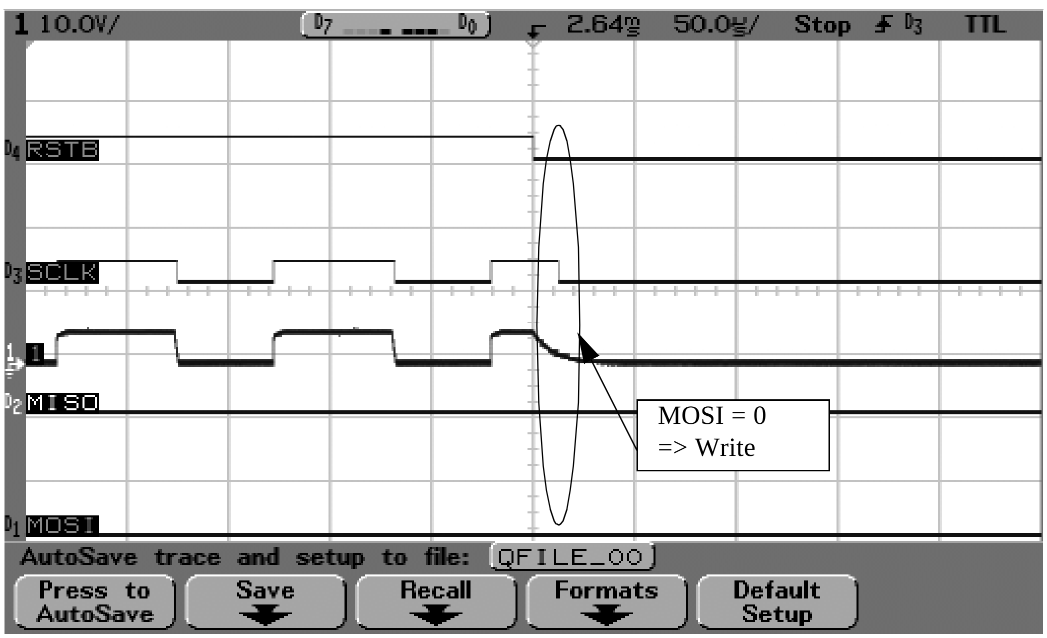


Figure 1

With this example, the command is a read command. However, it is interpreted as a write command because MOSI = 1 at the unwanted falling edge. Since a read command was initially expected, MOSI is held as 1 for the whole command by the MCU. When MOSI = 1 during a write command, Romeo2 configuration registers are written as $FF instead of being interpreted as a read command.

Recommended solutions

Solution 1

Inserting a pull-down on SCLK is a risky solution; as a matter of fact, SCLK is quickly discharged by the pull-down resistor during the time when both Romeo2 and the MCU are slaves. But an unwanted edge occurs and is delayed versus the time when RSTb is pulled down. The Romeo2 state machine resynchronises the RSTb command with its internal 615 kHz sampling clock. If it is set as slave before the time when SCLK is pulled down, it is then considered as a falling edge; the problem still exists. See Figure 2.

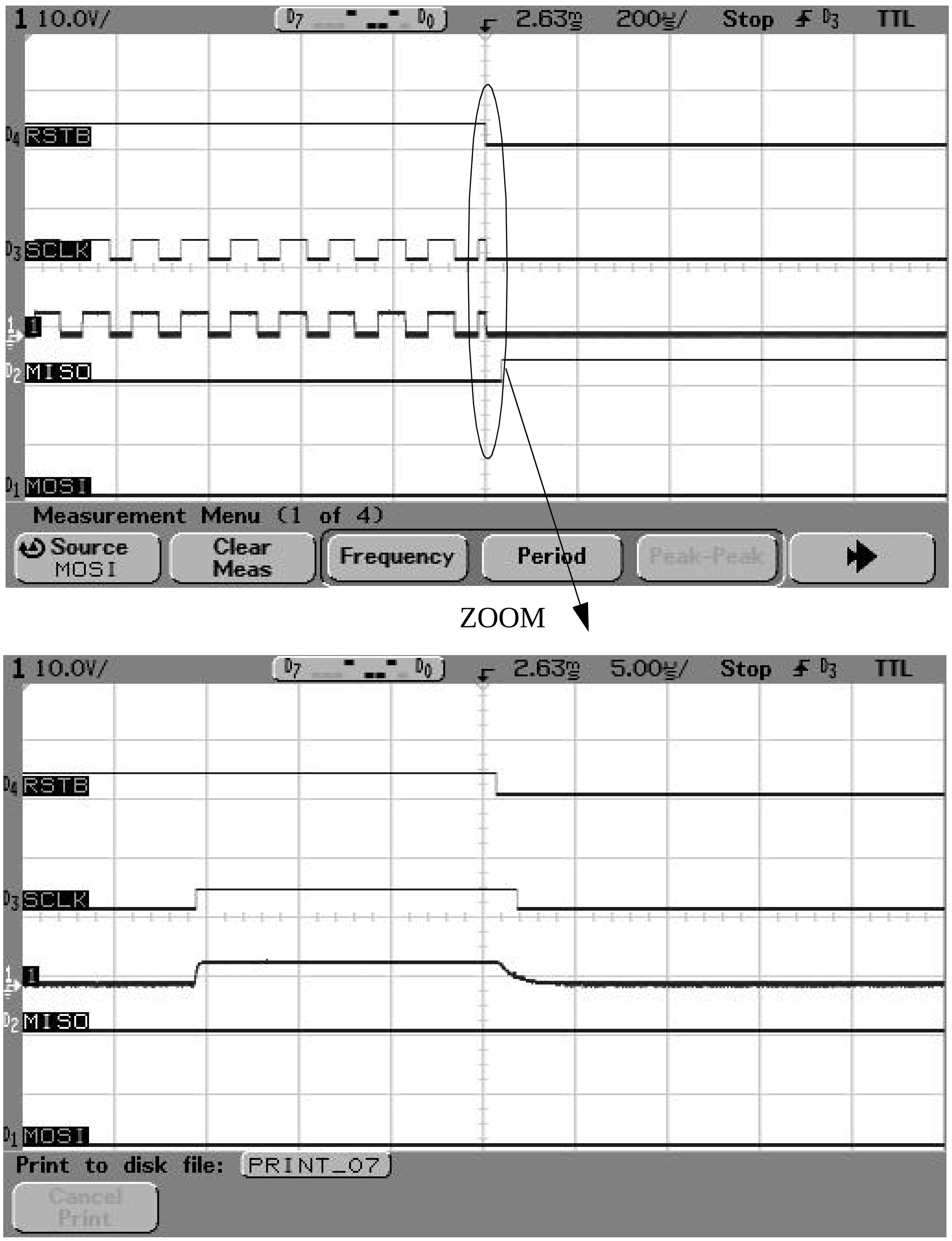


Figure 2

An unwanted SCLK edge occurs 1 µs after RSTb is pulled down. If it is understood as a clock pulse, the Romeo2 state machine is in trouble.

Solution 2

This solution involves monitoring the SCLK line. When the MCU detects a falling edge on SCLK, it pulls down RSTb. This solution is safe and secure. In fact, SCLK is noise free while the received signal is above the sensitivity level. The CPU must detect the falling edge on SCLK and force a low level on RSTb within a 50 µs time slot (when the data rate is 9600 bauds). This time slot is long enough for the CPU. This software solution has been implemented and extensively tested with success.

Solution 3

Solution 3 involves resetting the Romeo2 state machine with a short pulse on the RSTb pin. Then, the configuration is changed as shown below (see Figure 3).

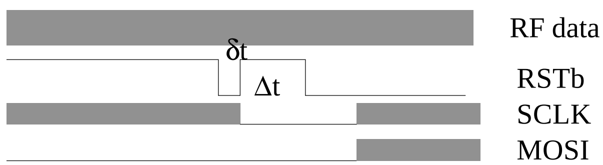


Figure 3

The first RSTb pulse is about 2 µs. This pulse width is long enough to be certain that the RSTb command is detected by the Romeo2 state machine. The pulse width is also short enough to be certain only one SCLK falling edge (in the worst case) is detected by the Romeo2 state machine. In slave mode, the first detected bit does not change Romeo2 configuration registers; it only sets the state machine either in write or read. Thus, this small RSTb pulse will reset the state machine into state 1 (see MC33591/2/3 data sheet). Then, since the strobe pin is high, the state machine will move to state 3 or state 7 (depending on the SOE bit). At this point, Romeo2 is waiting to receive a new ID byte. However, in these 2 states, SCLK is clean and low. Δt is shorter than the ID length so that the state machine does not move into state 5 or state 10 before the RSTb pin is pulled down; no SCLK pulse is shifted out. Also note that Δt must be longer than 4 µs. As a matter of fact, it has to be long enough so that the state machine moves to state 2 after the small RSTb pulse. A new Romeo2 configuration can then be downloaded safely.

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