MAGNET CONTACT –
Using STM110 for Sliding Window/Door Applications

Magnet contact based on STM110 / 110C

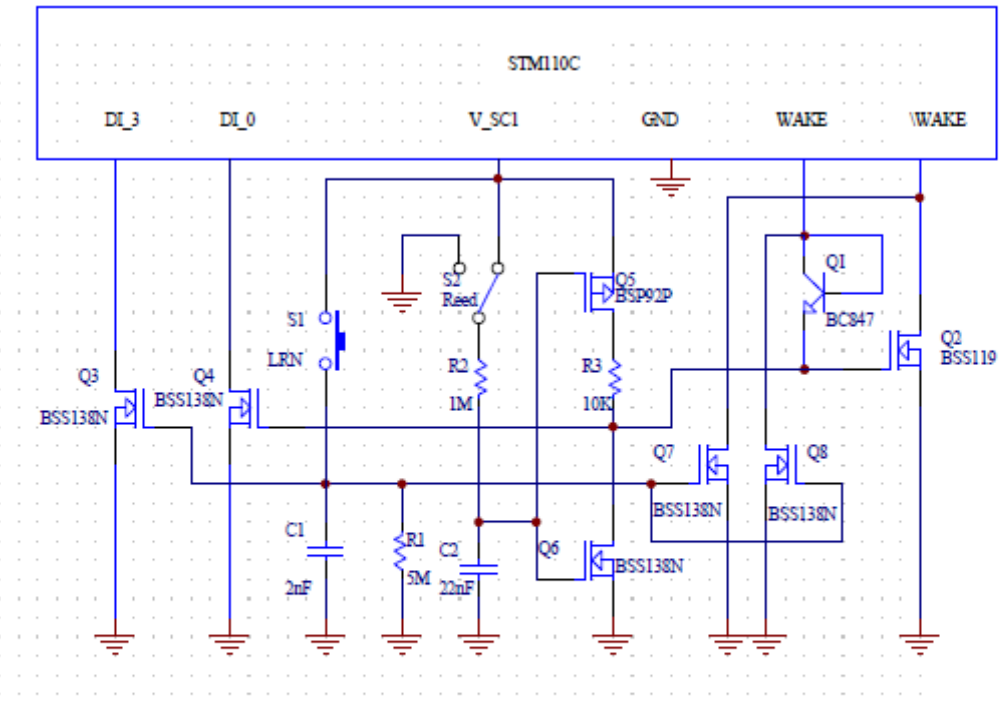
Wireless magnet contact sensors are essential to set up HVAC control in green buildings. EnOcean's wireless modules like the STM-family are optimized for self-powered sensor applications. You can find an overview of available STM sensor modules on the EnOcean website:

http://www.enocean.com/products-technology/

The magnet contact uses reed relay to wake up STM110/110C when the status of window/door change. It has been challenging when the magnet contact is installed on the sliding window/door. The reed relay may be switched on and off multiple times due to magnet polarity changes during the sliding process. The following note provides an example of magnet contact sensor that will work with sliding window/door.

1. CIRCUIT DIGRAM

The circuit diagram is shown in Fig. 1.



1. Telegram is sent when S1 is pressed and no telegram sent when it is released.
2. The circuit will work wiht sliding doors — Only one telegram is sent when the reed relay bounces back and forth multiple times in short time.
3. S2: SENSOR MAGNETIC SPDT-0/C SMT, Digikey part # 59160-030-ND
4. All FETs: The gate threshold of the FETs are critical. Please use those with gate threshold between +-0.8V to +-1.8V (max) to ensure the device will work in wide voltage supply range.
5. Q2, Q5, Q6, Q7 and Q8: Please use low leakage FETs. (Low IDSS and IGSS)
6. Q4: Use low IGSS FET

Fig. 1 Magnet Contact Sensor with STM110C

The STM110C can be waked up immediately from sleep mode by a logic falling edge on WAKE and/or \WAKE pins, and a radio telegram will be always transmitted after wake-up via these two pins. Periodic wake-up is also available with STM110C module by configuring the CW_0 and CW_1 pins.

2. LEARN SCHEME

When the learn button S1 is pressed, R1 and C1 provide a low pass filter to prevent de-bouncing effect on gate voltage of Q3, Q7 and Q8. Then the gate voltage will be driven high by V_SC1, thus waking up STM110C no matter which pin is low in previous state for WAKE or \WAKE. The STM110C will send the learn telegram by detecting DI_3=0.

When S1 is released, R1 and C1 still prevent the debouncing effect, and R1 works as a pull-down resistor to the gates. No telegram will be sent. The WAKE or \WAKE pins will restore to their previous state if the status of S2 has not changed.

3. REED SWITCH SCHEME

Due to the physics and manufacture tolerance of the reed switch and magnet, it is hard to align the reed and magnet in an optimal way to make sure only 1 status change of the reed switch when the window slides open or close. The design of Fig. 1 uses low pass filter formed by R2 and C2 to filter out the bouncing signals of the reed switch to the STM110C during the sliding process. Only the final position status matters if the window slides in a reasonable speed.

To validate the effectiveness of the design, 2 channels of an oscilloscope was connected to Q6 gate and Q6 drain. WinEtel is also used to monitor the data telegrams from the STM110C. The following figures (Fig.2–Fig.5) are captured for CH1 (Q6 gate voltage) and CH2 (Q6 drain voltage). It is obvious that CH2 only shows one abrupt change (1 change responds to 1 wake-up of STM110C) during the sliding process. The same conclusion is obtained by observing that only 1 telegram is received in the WinEtel side.

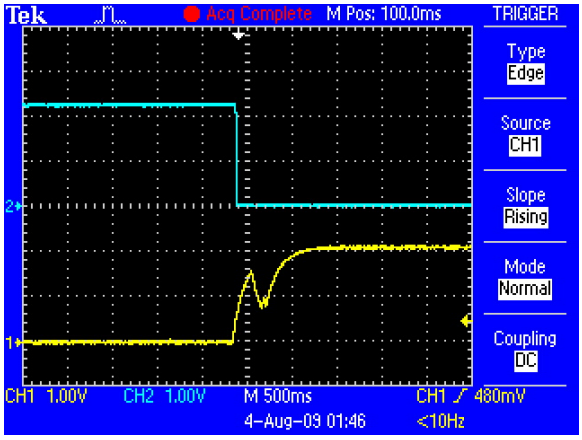


Fig. 2 Slide open with V_SC1=2.2V

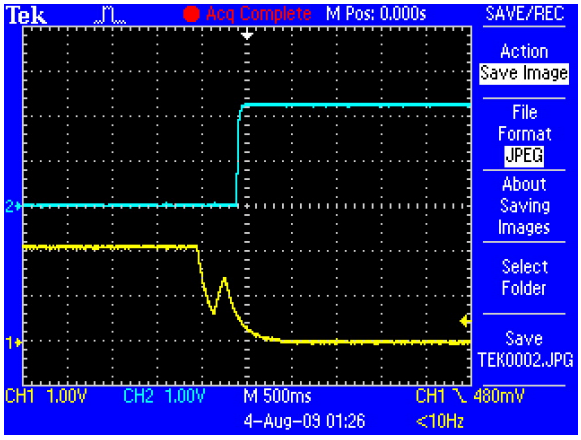


Fig. 3 Slide close with V_SC1=2.2V

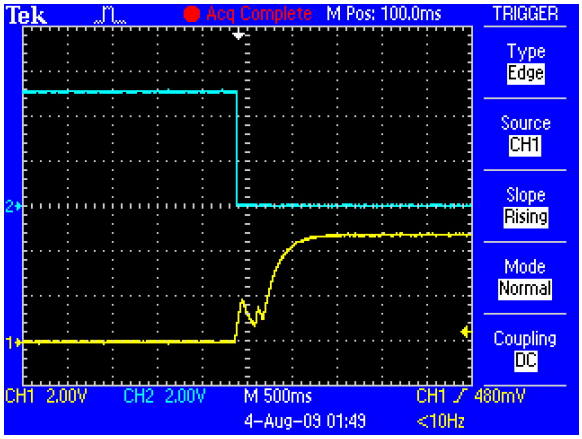


Fig. 4 Slide open with V_SC1=5.0V

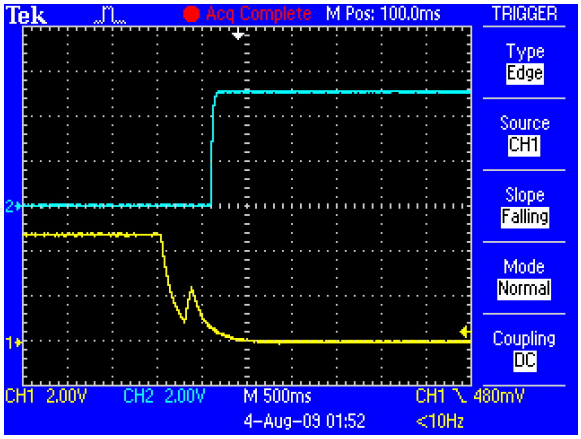


Fig. 5 Slide close with V_SC1=5.0V

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