

## Interfacing to the RX Pin of the 6511, 6513 and 6515

Due to unique circuitry on the RX input, its behavior is slightly different from the other digital inputs of the 651X family of metering ICs.

This application note explains what considerations apply when interfacing signals exceeding the 0 to 3.6V range to the RX pin. Applications with voltages at the RX in the 0 to 3.6V range do not require special precautions and are not affected by this application note.

### Rx Pin Summary

The Rx pin (serial port receive pin) of the 71M6511, 71M6513 and 71M6515 is internally clamped to the V3P3 supply as shown in Figure 1. This means, the voltage of signals applied to this pin will be clamped to  $V3P3D + 0.6V$ , i.e. nominally 3.9V. Note that this clamp voltage exceeds the 3.6V Absolute Maximum Rating of the RX input.

Inputs above 1.6V ( $V_{IL}$ ) are guaranteed to be recognized as logic 1. Inputs below 0.8V ( $V_{IL}$ ) are guaranteed to be recognized as logic 0. Input voltages between 0.8V and 1.6V must be avoided.

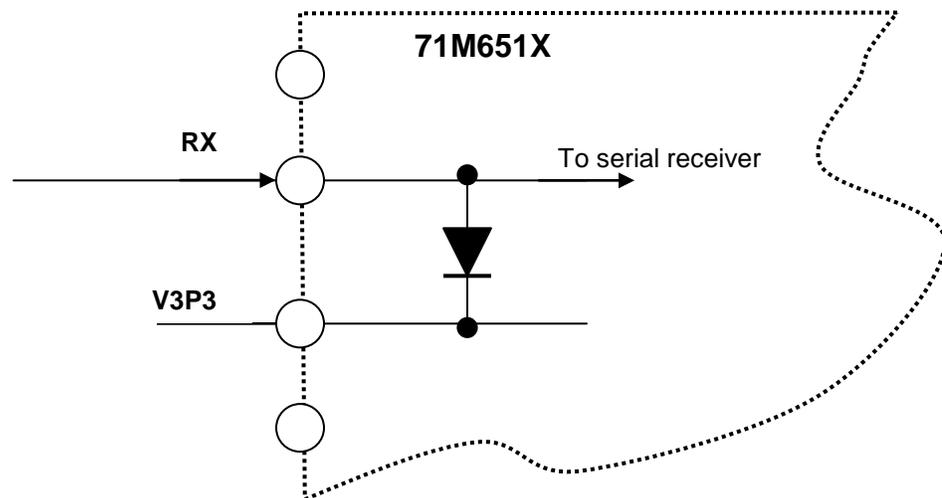
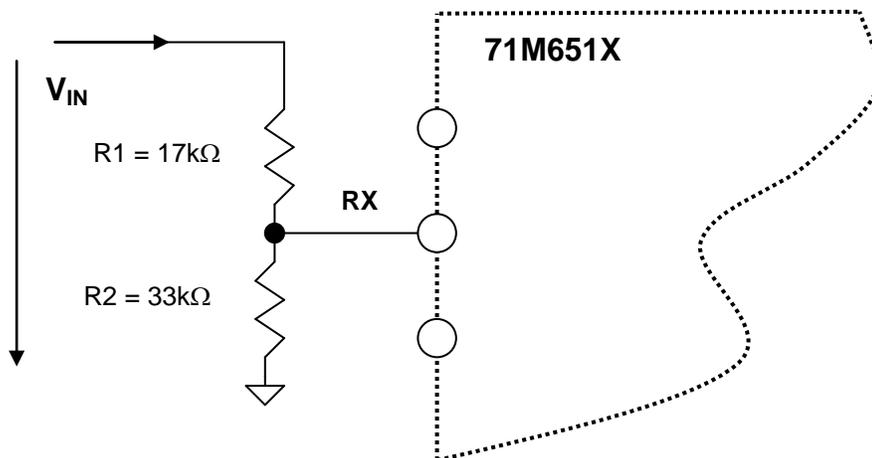


Figure 1: Internal Diode Clamp on the RX Pin

### Considerations when Connecting 5V-Based Circuitry to the RX Pin

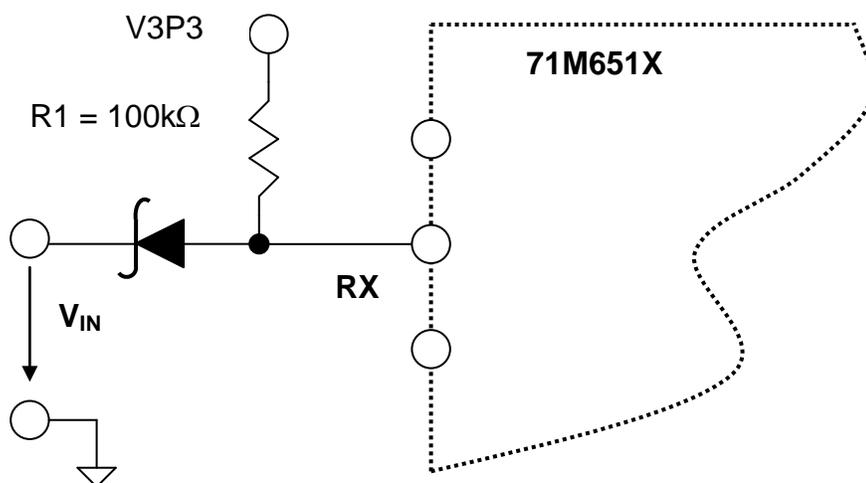
If inputs higher than 3.6V are expected at the RX pin, e.g. when interfacing to 5V-based driving circuitry such as RS-232 transceivers/receivers, TTL or CMOS logic, a resistor attenuator should be used in order to restrict the RX input voltage.

Figure 2 shows the recommended resistor network consisting of R1 (17k $\Omega$ ) and R2 (33k $\Omega$ ). This network scales the input voltage  $V_{IN}$  of 5.5V to 3.6V, and an input voltage of 2.5V will be scaled to 1.6V. For the low voltage level,  $V_{IN}$  voltages below 1.2V will be scaled to 0.8V. The maximum current at 5.5V input voltage is  $5.5V/(50k\Omega) + I_{IH} = 110\mu A + 1\mu A = 111\mu A$ .



**Figure 2: Resistor Network for RX**

An alternative circuit is shown in Figure 3. Here, a Schottky diode prevents higher voltages from the driving circuit to reach the RX pin, while a logic zero from the driving circuit pulls RX down. The pull-up resistor R1 ensures that the voltage at RX is driven to logic 1 when the driving circuit is not actively pulling RX down.



**Figure 3: Diode-Resistor Combination for RX**

Assuming a forward voltage drop at the Schottky diode of 0.4V, any voltage  $V_{IN} > 1.6V - 0.4V = 1.2V$  will guarantee a logic 1 at the RX pin. To generate a logic 0 at the RX pin,  $V_{IN}$  must be below  $0.8V - 0.4V = 0.4V$ . The maximum drive current at  $V_{IN} = 0V$  will be  $(3.3V - 0.4V) / 100k\Omega = 29\mu A$ .

If the driving circuitry offers an open-collector output, the RX pin should be connected to this open-collector output and a pull-up resistor equivalent to R1 in Figure 3 should be used.

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