

## TCM 3x0 - Circuit Application Examples

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### 1 RELATED DOCUMENTS

This document describes some typical application examples of TCM 3x0 modules. It is assumed that detailed information about following devices is well known.

- [TCM 300 / 320](#)
- [TCM 310](#)

In addition, we recommend following EnOcean documentation and application notes:

- [AN101: Power Supply Layout - Layout considerations for line-power supplies](#)
- [AN102: Antenna Basics - Antenna design considerations for EnOcean based products](#)
- EnOcean Serial Protocol 3 (ESP3): [EnOcean Serial Protocol 3](#)

Using TCM 3x0 transceivers it is easy for everyone to implement typical functions like e.g. serial interface, repeater, switch actuators or dimmer.

This document only shows some very simple circuit application examples like gateway, actuator or repeater, based on TCM 3x0 family. For more details, please consult the related documentation. Please also note that the following examples are basic concepts only.

#### Some specific TCM 3x0 features:

- Standard TCM 300 and TCM 320 devices provide a possibility to select between some predefined operating modes. Operating mode is defined at start-up of the device, via reading of the corresponding voltage level at the ADIO\_0 input. Please refer to the information regarding mode selection in the user manual. In addition, repeater functionality (1 or 2 level) can be independent activated and configured (at power-up).
- The TCM 310 has just one operating mode, as Gateway Controller. This firmware can be however directly implemented into both TCM 300 and TCM 320 HW modules too.

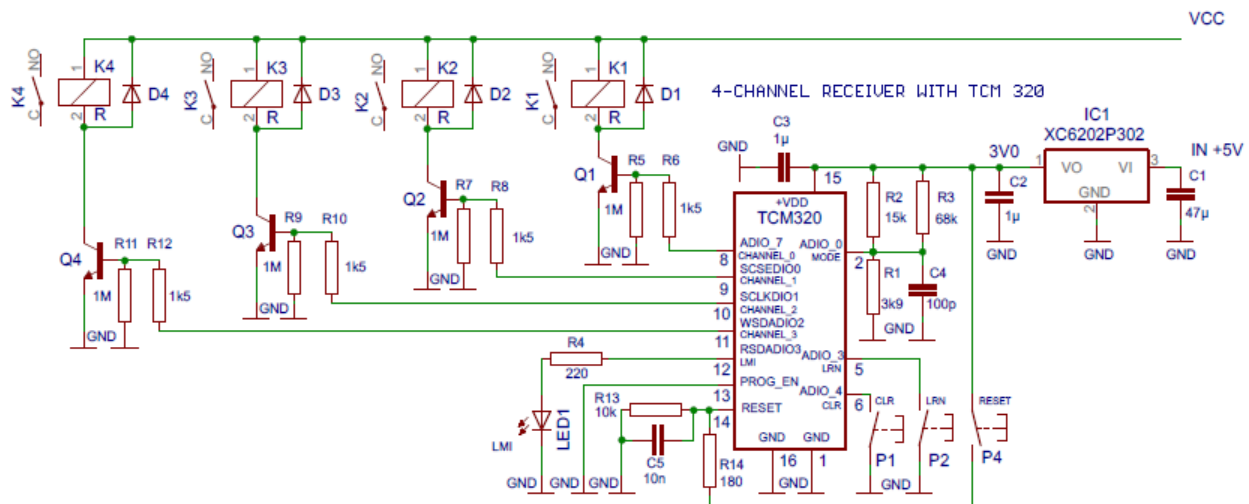
Due to its reduced pin count (only 16 pins) and similar form factor with predecessor products, TCM 320 offers the simplest way for implementation of standard functions as shown in the following examples. However due to its reduced number of pins, not all hardware features of the ASIC chip are accessible for the user. The most important TCM 320 HW limitations refer to reduced supply voltage range associated with considerably higher sleep current (IOVDD internally hard connected to VDD) and reduced number of available I/O's.

So if you use the TCM 300/310, please note the specific differences vs. TCM 320 platform. Do not forget to connect the IOVDD externally to the appropriate supply voltage (in TCM 320, IOVDD is already internally connected to VDD). Apart from that, implementation is similar to the TCM 320, pin names are the same.

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## 2 TYPICAL APPLICATION EXAMPLES

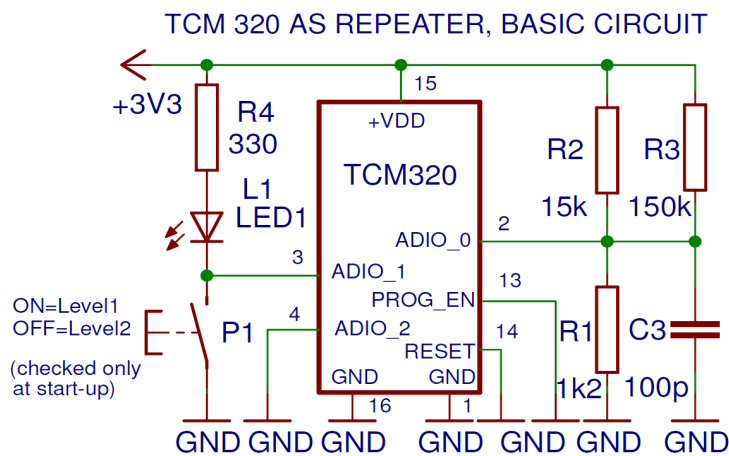
**a. Actuator:** TCM 3x0 have digital outputs. Due to its lower supply voltage i.e. 2.6 to 3.3 V for the TCM 320 and lower output current drive capability (max. 2 mA @ 3 V), external output drivers for actuators like relays may be required, as shown Fig. 1.



**Fig.1:** 4 channel actuator circuit diagram example (TCM320, Mode 3, switch actuator).

Using ADIO\_1 and ADIO\_2 inputs like illustrated in Fig.2, additional repeater functionality can be provided. Similar (using Mode 2 respectively Mode 4) one channel switch or one channel dimming receiver can be implemented.

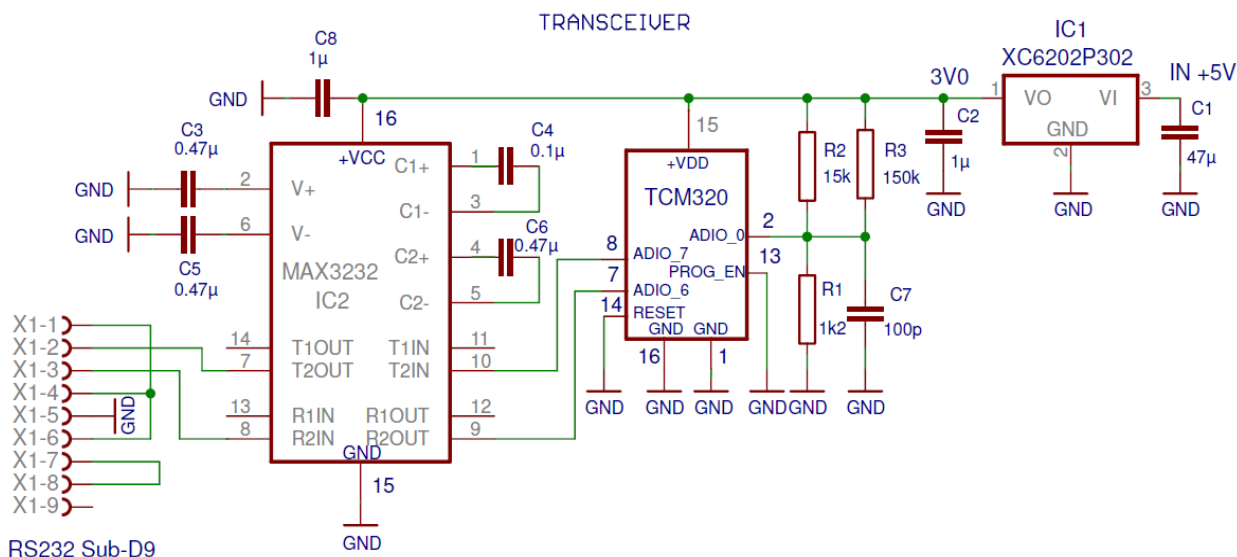
**b. Repeater:** the example shows a simple configurable repeater based on TCM 320:



**Fig.2:** Repeater with TCM320

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**c. Serial Interface:** one of the most common applications is the EnOcean Radio to Serial interface. If you use standard TCM 300 / 320 devices (ESP2) this can be easily implemented as shown in in Fig. 3, bidirectional serial interface (ESP2), Mode 1.



**Fig.3:** RS232 Interface example using TCM 320. Using ADIO\_1 and ADIO\_2 inputs like illustrated in Fig.2, additional repeater functionalities can be also implemented.

**NOTE:** The best way to realize gateways is to use TCM 310 Gateway Controller devices, or alternatively to flash the EnOcean Gateway Controller Firmware (see [Gateway Controller Firmware](#), [Gateway Controller User Manual](#)) in any TCM 300 / 320 standard module.

The TCM 310 Gateway Controller Firmware uses [EnOcean's Serial Protocol 3 \(ESP3\)](#). ESP3 is a bidirectional serial protocol between the TCM 310 module and an external host. It provides a transparent channel for radio messages and a serial interface to control the module from the host. Compared to the previous EnOcean Serial Protocol 2 (ESP2), which has been used in the past, ESP3 adds several new features, such as:

- Information about the received radio signal strength (RSSI) and number of the received sub-telegrams
- Improved data security and consistency by CRC8 data verification
- Higher serial data rate
- Support for longer special telegrams with more data for future requirements
- Support for EnOcean Equipment Profiles according to EEP
- Programmable Repeater functionality
- High flexibility for future requirements.

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