# RADAR BASED MOTION DETECTOR MODULE

## Characteristic features

- Universal HF-module (K-Band Transceiver), without NF-Signal amplifier
- Innovative Radar operating principle: high sensitivity on slightest movement
- Ideal for motion alarm unit: invisible mounting, safe against vandalism
- Optimized PHEMT-Oscillator with low current consumption, mono (single channel) operation
- Separate sending and receiving antenna for maximum sensitivity
- Fulfils ETSI-standard, general CE-permission
- Very small outline dimensions

## Typical areas of application

- Level measurement, sanitary applications
- Distance and speed measurement
- Alarm and safety applications
- OEM applications in automotive

## Description

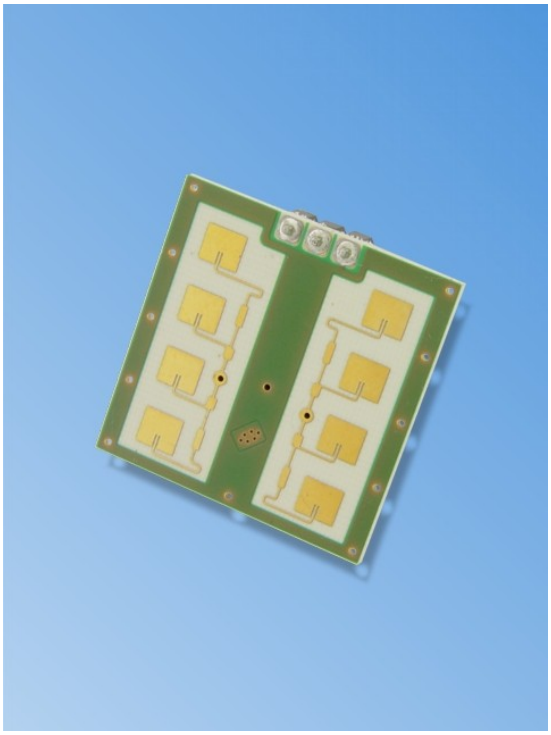
The Radar module has been developed to cater for majority of the requirements which are meant for door openers, alarm and safety systems, control of machines, sanitary rooms and up to games and sport devices. The module is suitable for a wide variety of applications, in which movement or presence has to be registered and based on this, the switching process is to be affected.

Unlike the passive infra-red motion alarm unit, which only registers object at a temperature difference with respect to the background, the radar module responds to all movements in the direction of the sensor. With this, the movement sensitivity is extremely high, even smallest movements nearly up to the stand still state is recognized, because of which the modules are also very well suitable for presence alarm units.

Radar module works through many materials, e.g. plastics, hence vandalism safe, hidden installation is possible.

The module supplies an unamplified mixer signal, which must treated in a subsequent amplifier, before it can be evaluated by means of a comparator or a micro-controller. The electronics module as HF-sub assembly is meant for assembling into customised projects.

Further application notes and circuit examples can be obtained on request.



## Technical data

| Motion alarm Module | RSM 1650 |
|---|---|
| Operating voltage $V_{CC}$ | 4.75 ... 5.25 V |
| Supply current | 30 ... 40 mA |
| Operating temperature | -20 ... +60 °C |
| Sending frequency | Standard:<br>24.000 ... 24.250 GHz<br>UK: 24.150 ... 24.250 GHz<br>F:24.075 ... 24.175 GHz |
| Output power | 16 dBm |
| Temperature Drift | -1 MHz/°C |
| Antenna characteristics | Horizontal 80 ° (azimuth)<br>Vertical 32 ° (elevation) |
| Side lobe suppression | Horizontal 13 dB (azimuth)<br>Vertical 13 dB (elevation) |
| IF output voltage (DC Offset) | -300 ... +300 mV |
| Signal level | category A (low):<br>263 ... 399 mV(P-P)<br>category B or E (medium):<br>400 ... 549 mV(P-P)<br>category C (high):<br>550 ... 8502 mV(P-P) |
| Dimensions | 25,0 x 25,0 x 12,7 mm |
| Ordering number | CON-RSM1650 |
| Rights reserved for change in technical data! | |

**For further information, please visit our website: www.deiwo.de**

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## Operation

The radar module comprises of a highly integrated radar sensor with sending and receiving part as well as a push-pull mixer. Careful circuit layout and selection of suitable components guarantees the fact that the module complies with the requirements of European ETSI standard and possesses a generally valid CE permission.

Radar based motion alarm units work as per the Doppler principle: the electromagnetic waves in the microwave range are reflected from the object and superimposed over a sending signal by a mixer in the module. Therefore, the frequency of signal originating at the mixer output is proportional to the speed: 44 Hz corresponding to a movement speed of approx. 1 km/h. The amplitude of the signal is an outcome of the size of the object and its distance to the sensor.

While PIR sensors react very insensitively to movements in straight direction, the radar sensor shows its highest sensitivity here. On the other hand, radar sensors are more insensitive to circular movements around the sensor, while the PIR sensors clearly possesses the highest sensitivity here. Therefore, in modern safety related applications, the PIR sensors and radar sensors are effectively combined.

The signal voltage at output of the mixer is still very low, in the maximum order of approx. 300 µV. Therefore, a subsequent amplifier is required with defined bandwidth (approx. 20 ... 900 Hz) which brings the signal to a useful level, which can be then further evaluated over a micro-controller. Application circuits for this are available on request, alternatively modules with integrated amplifiers are also available.

## Handling recommendations

The sensor is susceptible to ESD danger due to wrong handling. However, the regular precautions for CMOS circuits are sufficient during handling of the component. Touching the signal outputs should be avoided, before the module is assembled on the circuit board.

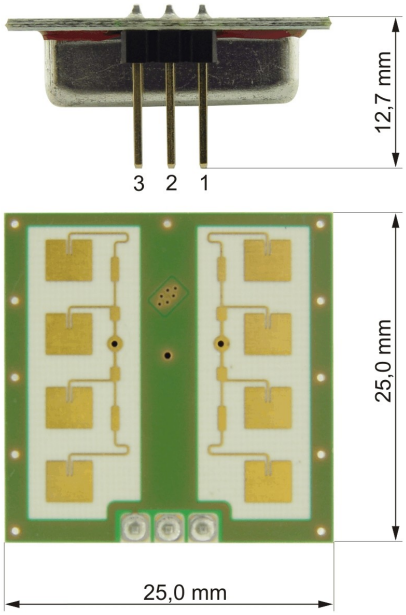
The use of a multimeter for resistance measurement between the connection pins can lead to damage of the module.

The proximity of fluorescent lamps can lead to incorrect triggering. Hence, the module should not be installed in direct proximity of fluorescent lamps. This effect can be suppressed by introducing a 100 Hz notch filter in the ensuing electronics.

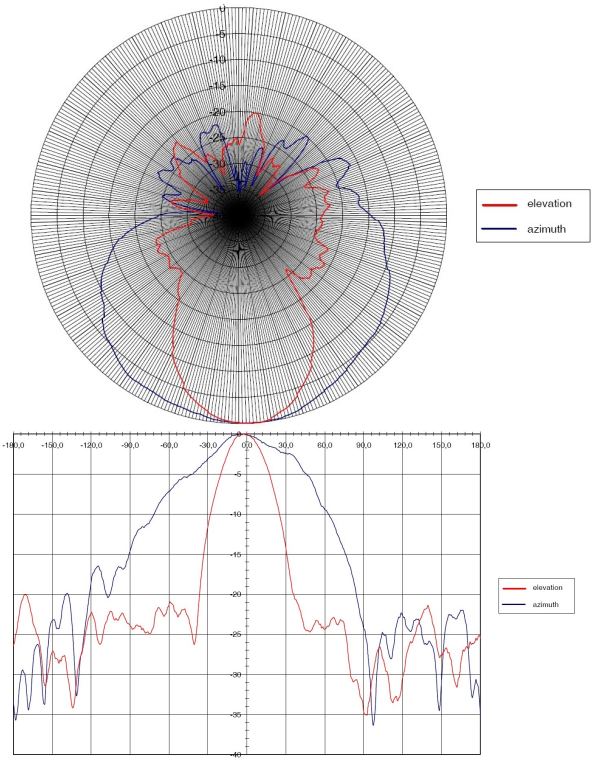
Because of its type of construction, the module is sensitive to sound impacts. Just mounting over the pins is not sufficient, the module should also be mechanically further secured.

## Connection

| Pin | Function |
|---|---|
| 1 | Operating voltage 4.75 ... 5.25 V |
| 2 | Signal output |
| 3 | Ground |




## Antenna diagram

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