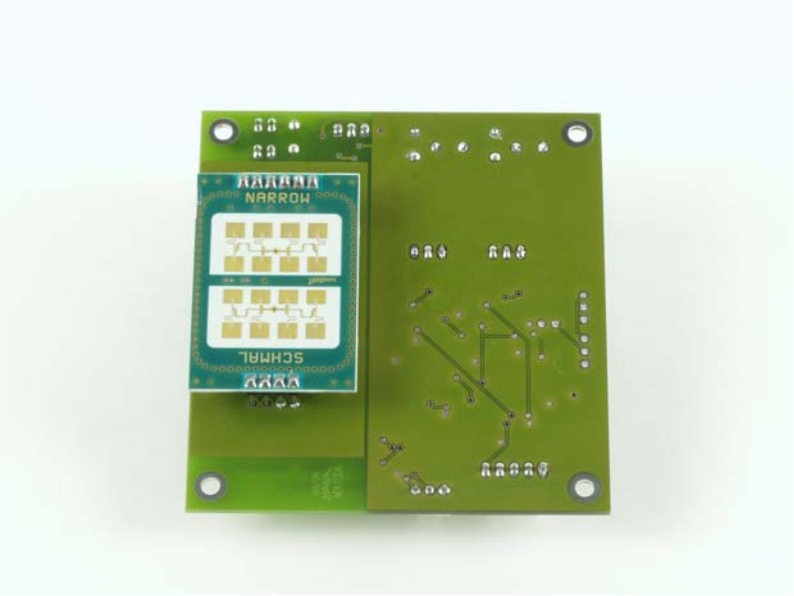
NEOBOTIX

Neobotix Radarboard 2/30

Technical Description



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Inhalt

1 Introductions

The RadarBoard 2/30 is based on a 24 GHz radar sensor with preamplifier and a controller board with amplifier, signal conditioning, dsPIC30F5011 microcontroller and communication interfaces.

It is designed to precisely measure position and speed of moving objects in large areas. The board is sensitive for objects containing metal or water. In contrast the radar sensor is able to look through objects made of plastic or wood for example.

Typically the radar sensor is used to detect moving persons or animals in non industrial applications and to measure position, speed or direction of motion of machines/ machine parts in industrial applications:
- Security/ Surveillance
- Automotive: true speed over ground,
  pre-crash, parking aid
- medical supervision

A wide variety of radar sensors can be mounted to the board, so sensitivity/ detection distance or field of view can be adapted to specific application requirements.

The radar sensor even works outdoor in nearly all weather conditions including light rain and snow.

2 Technical Data

- Powerful 16 bit DSP dsPIC30F5011
- Flash memory for in circuit software update
- Supply +5V, +12V or other
- Low power consumption (+150 mA @ 5V)
- Small outline package
- Optional IP 65/ IP67 package
- Binary (relay), RS-232 or CAN communication interface
- Measurement of object positions, velocities and direction of motion
- Detection sensitivity adjustable
- Small size 75mm x 82 mm
- Robust against vibration and shock
- Detection areas from 12° horizontal/ vertical to 70° horizontal/ vertical
- Detection of persons up to 30 m with wide viewing angle
- Detection of velocities from 0,01 to 250 km/h
- Low cost

3 Software

The software is running on a powerful 16 bit 20 MIPS/ 30 MIPS CPU of type dsPIC30F5011 from Microchip.

Radar sensor data are continuously acquired, amplified and evaluated by the microcontroller. So the user may request the current position and velocity data by CAN or RS-232 anytime.

Information transmitted are objects positions, velocities and directions of motion.

The current status of the radar sensor data is displayed by LEDs mounted on the board.

The software is running on a 16 bit/ 20 MHz CPU. It provides access to all board functionality.

The board may be used by RS-232 interface or CAN bus or both at the same time.

The baud rate values are predefined:

CAN	RS 232
500.000 Baud	19.200 Baud

If other baud rates are requested, please contact Neobotix.

The CAN standard receive identifier is 0x111, the standard send identifier is 0x110. If other identifiers are requested, please contact Neobotix.

4 CAN communication protocol

The CAN2.0B protocol with extended identifiers is used.

All CAN messages have data length of 8.

Commands to be executed by the board are transmitted in the first byte of a sent message. The command values in CAN messages are taken from an enumeration named CmdRadarBoard:

```
enum Cmd_RadarBoard
{
	CMD_RADARBOARD_CONNECT,
	CMD_RADARBOARD_DISCONNECT,
	CMD_RADARBOARD_GETDATA
};
```

To evaluate received messages the command is returned in byte 8 of the message left shift by two. The first two bits of byte 8 are used for returning if the command was executed successfully or not. The enumeration *MsgState* defines return codes as follows:

```
enum MsgState
{
	MSG_OK,
	MSG_ERROR,
	MSG_NOT_ACCEPT,
	MSG_NO_ACTION
};
```


4.1 CAN Message description

Command	**CMD_RADARBOARD_CONNECT**
Purpose	Connect to the microcontroller, switches the internal state machine to connected
Message format	(CMD_RADARBOARD_CONNECT, 0, 0, 0, 0, 0, 0, 0)
Answer	(0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, MSG_OK | (CMD_RADARBOARD_CONNECT << 2) - numbers in return message are for testing purposes only

Command	**CMD_RADARBOARD_DISCONNECT**
Purpose	Disconnect the microcontroller, switches the internal state machine to disconnected
Message format	(CMD_RADARBOARD_DISCONNECT, 0, 0, 0, 0, 0, 0, 0)
Answer	No answer

Command	**CMD_RADARBOARD_GETVELDATA**
Purpose	Return the current velocity value as signed integer (16 bit), the unit is [mm/s]. The sign contains information if the target is approaching (positive sign) or departing (negative sign).
Message format	(CMD_RADARBOARD_GETVELDATA, 0, 0, 0, 0, 0, 0, 0)
Answer	(velocity >> 8, velocity, 0, 0, 0, 0, 0, MSG_OK | (CMD_RADARBOARD_GETDATA << 2)) - velocity: current velocity value [mm/s]

Command	**CMD_RADARBOARD_GETPOSDATA**
Purpose	Return the current position value of the object next to the sensor as signed integer (16 bit), the unit is [mm].
Message format	(CMD_RADARBOARD_GETPOSDATA, 0, 0, 0, 0, 0, 0, 0)
Answer	(position >> 8, position, 0, 0, 0, 0, 0, MSG_OK | (CMD_RADARBOARD_GETDATA << 2)) - position: current position of object next to radar [mm]

5 RS-232 communication protocol

The RS-232 protocol is identical to the CAN protocol. Send and receive 8 byte formatted as described in chapter 4.1 without any delimiter like LF or CR.

6 RadarBoard States

The RadarBoard has two states

- *State Idle*
- *State Connected*

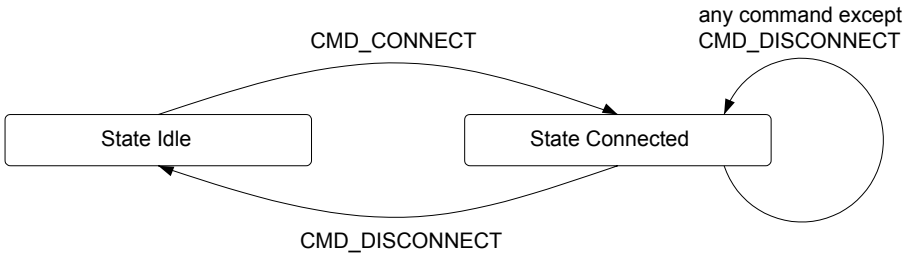

Figure 6-1: States of RadarBoard

Only in *State Connected* sensors can be activated/ deactivated or sensor values can be requested.

7 Picture of RadarBoard

Figure 7-1 Figure 6-2 show pictures of RadarBoard 2/30. For pin assignment, please see chapter 8.

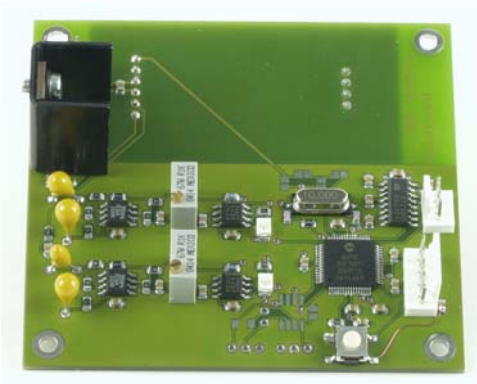

Figure 7-1: Top picture of RadarBoard

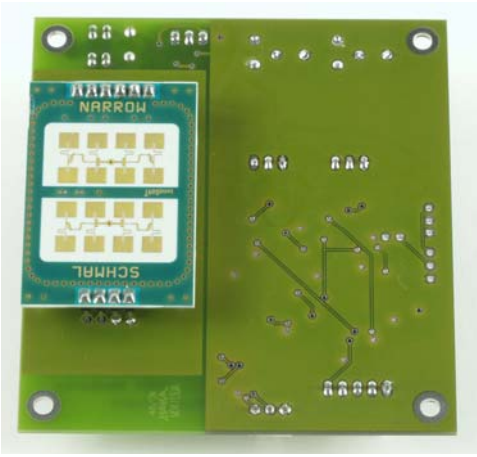

Figure 7-2: Bottom picture of RadarBoard

8 Connector assignment

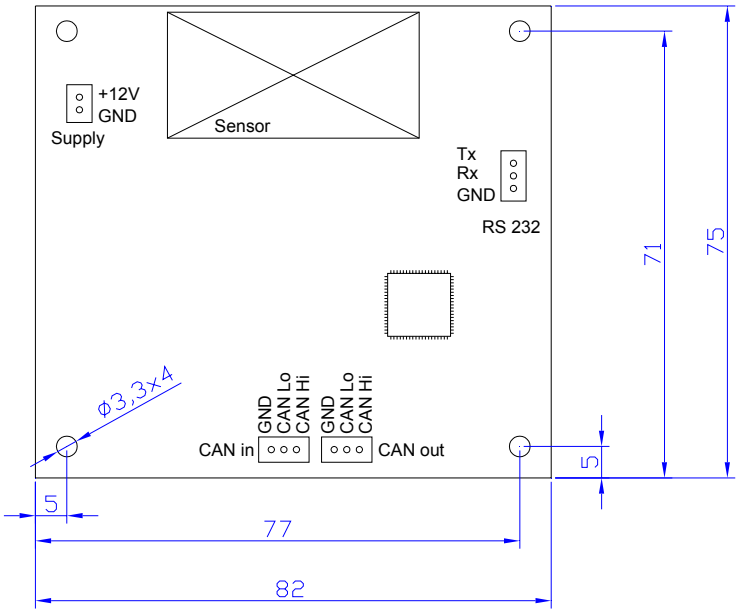

Figure 8-1: Connector assignment of RadarBoard 2/30

All connectors are of type Molex KK, 2.54 mm grid.

