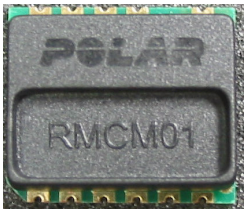


RMCM-01 Heart Rate Receiver Component

Product code #: 39025074

KEY FEATURES

High Filtering Unit
Designed to work well on constant noise fields

SMD component: To be installed as a standard component to end user circuit board.

Working solution with all Polar transmitter belts
There is a possibility that one software modification is required on training equipment

Differences on reception range depending the transmitter used

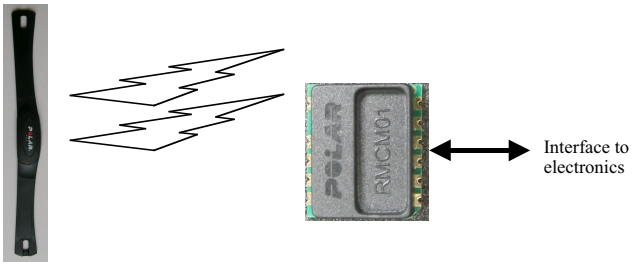
Receiver coil installation method improved. Better towards mechanical noise.

GENERAL DESCRIPTION

The Polar heart rate receiver component receiver wirelessly receives the heart rate signal from Polar transmitter belt. The complete heart rate measurement system consists of three different parts; transmitter, receiver and electronics and/or display device that is outputting the heart rate value.

The transmitter, worn around the chest, electrically detects the heart beat and starts transmitting a pulse corresponding to each heart beat. The receiver that is installed on end user equipment receives the signal and generates a corresponding digital pulse that is operated on by the end user equipment electronics.

Following picture illustrates the structure of measurement setup.



KEY BENEFITS

- Designed to be used in constant noise environment
- Small size, easy to find a place inside end user equipment
- Working with all Polar transmitter belts
- SMD component for Pick & Place machine
- Coded and noncoded receiver

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RMCM-01 RECEIVER COMPONENT - SPECIFICATIONS

Beat-to-Beat Output format

The receiver module has 2 different output pins, HR and FPLS.

The **HR** output generates a 1ms, 3V positive pulse after the receiver has locked onto a code from a coded transmitter. If no coded signal is detected, the receiver will determine that a non-coded transmitter signal is present and output the data on the HR pin.

FPLS always generates pulses in the same manner as Polar's standard OEM receiver modules. All detected pulses are outputted. For example, if a coded transmitter is being used, there will be two pulses (within 250ms) outputted. Nominal pulse width is 6ms, positive pulse, 3V.

The application where RMCM01 is connected should be able to calculate the time between incoming pulses and then use suitable averaging to ensure the best performance on outputted heart rate.

System Description

A complete heart rate measuring system consists of a Polar Transmitter worn around the chest and Polar RMCM-01 receiver built into the end user equipment. The Polar Transmitter detects every heartbeat through two electrodes with ECG accuracy and transmits the heart rate information wirelessly to Polar RMCM-01 receiver with the help of a low frequency electromagnetic field. The RMCM-01 receiver receives the transmission, and passes a digital pulse corresponding to each heartbeat to the end user equipment electronics. The coils in the Polar Transmitter and Polar RMCM-01 receiver must be aligned parallel in order to gain optimum performance.

The end user equipment contains a microprocessor that calculates current heart rate value based on the time interval between the pulses sent by the Polar RMCM-01 receiver to the microprocessor. This calculation contains certain amount of averaging, and other techniques, known as an algorithm, to ensure a reliable and stable heart rate reading.

The microprocessor of the end user equipment thus has the following functions:

1. Receiving of the electric heart beat pulse from the Polar Receiver
2. Calculating the times between the pulses
3. Performing the error checks
4. Calculating the heart rate
5. Sending the heart rate to the display

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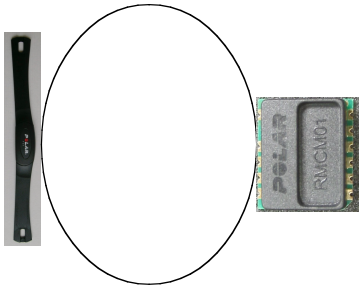
RMCM-01 RECEIVER COMPONENT – SPECIFICATIONS

Placement of the receiver component

The following rules and advice apply to the placement of the Polar receiver components. This verifying measurement should be performed before the release of final circuit board

- The distance from the transmitter to the receiver should not exceed 80 cm.
- The orientation of the receiver is very important. The coil axis of the receiving coil has to be parallel with the magnetic flow created by transmitter in order to get optimum gain for successful heart rate measuring. In normal cases this means that the axis of the transmitting and receiving coils must to be parallel. This is also illustrated in the following picture. Coil is placed on the edge of right hand side along the long side of the RMCM01



- Metal casing may form a Faraday case around the receiver thus attenuating the signal and shortening the reception range. There may also be an effect twisting the direction of the magnetic field, thus possibly changing the rule of parallel coil axis.
- Interference may be created by i.e. electric motors and their control circuitry, multiplexed display units, switching power supplies, monitors or TV equipment causing difficulties to heart rate measuring. Most disturbances are both directional and distance related. An optimum location for the receiver is where the heart rate signal is maximized and the disturbances are minimized.

The best cure is to maximize the distance between Polar receiver and the source of disturbance, and at the same time minimize the distance between Polar Receiver and the Polar Transmitter.

Practical solutions can be discussed with Polar engineering staff. Polar engineering also can, using special equipment, find out the nature of the disturbance, thus helping to cope with it.

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RMCM-01 RECEIVER COMPONENT – SPECIFICATIONS

Step by step procedure for defining an optimum location

1. Initially, without any heart rate transmission, place a Polar Heart Rate Monitor in possible and desired location for the receiver. These tests should be performed during operation of end user equipment with light and heavy loads. If the "♥" symbol in the wrist receiver is blinking it means that there are some occasional spikes possibly decreasing reliability of heart rate measuring. If heart symbol does not blink it means that in most cases there is no disturbances. In most cases only way to eliminate interference is to place receiver far enough from interfering components.
2. At the next stage, keep receiver still at the place defined in first step and turn Polar Pulse Simulator on. If the "♥" symbol in wrist receiver starts blinking regularly a good location for the PCBA receiver has been located. If heart symbol does not blink, the typical cause is that electromagnetic noise causes saturation of receiver circuit preventing successful heart rate measuring. (Note: Simulator should be located within approximately 2 feet from the receiver for the test.)
3. Once a good location is determined, place the RMCM-01receiver and connect it to end user equipment electronics and receive heart rate transmission from the Polar Heart Rate Simulator. If RMCM-01receiver does not generate corresponding pulses there may be some problems in interfacing the receiver to end user equipment electronics. System should work also with chest belt.
4. Test RMCM-01receiver with chest belt and check the reception range. The most reliable way to define maximum range is to take the Polar heart rate transmitter outside the reception range and move it closer to receiver. Maximum reception range is the distance at which receiver generates pulses regularly.

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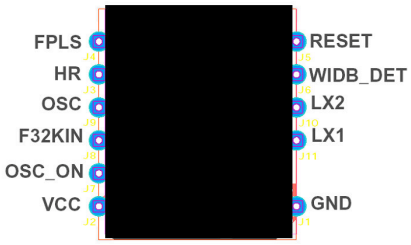
RMCM-01 RECEIVER COMPONENT – SPECIFICATIONS

Dimensions, Diagrams and Electrical Details



Dimensions	Value
Board Length	17.8 mm
Board Width	15.3 mm
Board Height	5.2 mm

Pin name	Description
HR	Heart beat information 3V positive pulse, 1ms.
Reset	Reset
OSC	Crystal terminal
F32KIN	Crystal terminal or DC isolated clock input
OSC_ON	Clock selection (input/output)
WIDB_DET	Settings. Connect to Vcc
FPLS	Pulse detector output 3V positive pulse, 6ms nominal width.
LX2	Antenna coil terminal
LX1	Antenna coil terminal
GND	Ground
VCC	Operating voltage

Parameter	min	typical	maximum	Unit
Reception range (T31 typ.)	80	92	100	cm
Operating voltage	2.5	3.0	3.4	V
Operating current @ 3.0V			60	µA
Output high voltage @ 3.0V	2.4			V
Output low voltage @ 3.0V			0.4	V
HR output width		1		ms
FPLS output width		6		ms
Reception frequency		5.5		kHz
Operating temperature	0	20	60	°C
Crystal input (sinusoidal) *	0.2		3.0	V
Crystal input (square) **		3.0		V
Crystal input frequency ***	32.736	32.768	32.800	kHz
Storage temperature	-30	20	70	°C

*) Peak-to-peak voltage value. Do not exceed the supply rails [0, Vcc] V.
**) Square wave input between 0V and Vcc. Do not exceed the supply rails [0, Vcc] V.
***) Tolerance for crystal is 1000ppm.
Note: Crystal duty cycle has to be between 40-60%

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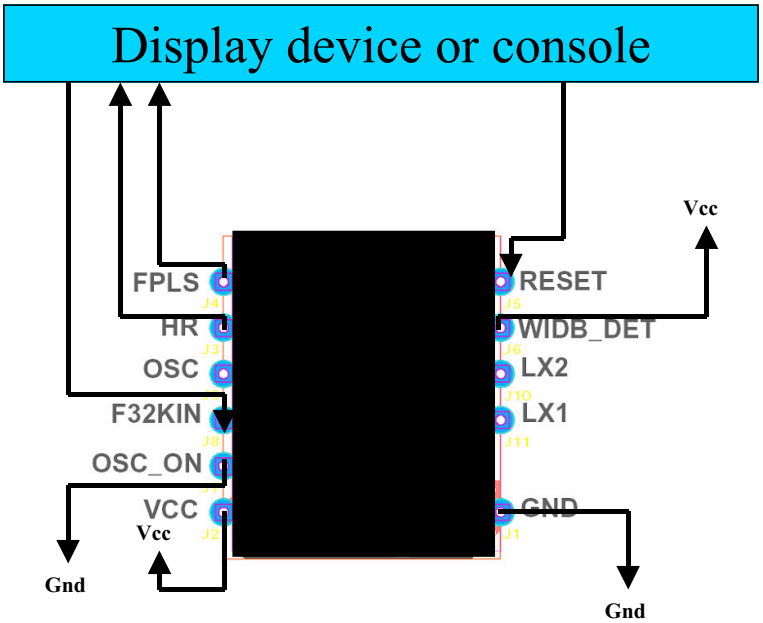
RMCM-01 RECEIVER COMPONENT – SPECIFICATIONS

Detailed pin descriptions

HR – Outputs heart rate value as positive pulse on each heart beat. Startup delay 5 seconds on coded signal, 15 seconds on non-coded signal
Reset – Pulling down this pin causes the heart rate receiver reset itself. Recommendable pull down resistor value is 1kΩ.
OSC – Crystal terminal. This pin is used if external 32kHz crystal is used.
F32KIN – Crystal terminal or clock input. If 32kHz clock is available on the end user board, the clock signal can be inputted on this pin. Note that signal has to be DC blocked.
OSC_ON – Connect pin to ground if external clock is used. Connect to Vcc if crystal is used.
WIDB_DET – This pin is connected to 3V.
FPLS – Detector output. On this pin all the detected pulses are shown. No startup delays on outputting.
LX2 – Antenna coil terminal. If range is too high, a resistor is connected between this pin and LX1 pin.
LX1 – Antenna coil terminal. If range is too high, a resistor is connected between this pin and LX2 pin.
GND – Power supply ground pin.
VCC – Power supply voltage pin.

Application note for typical connections



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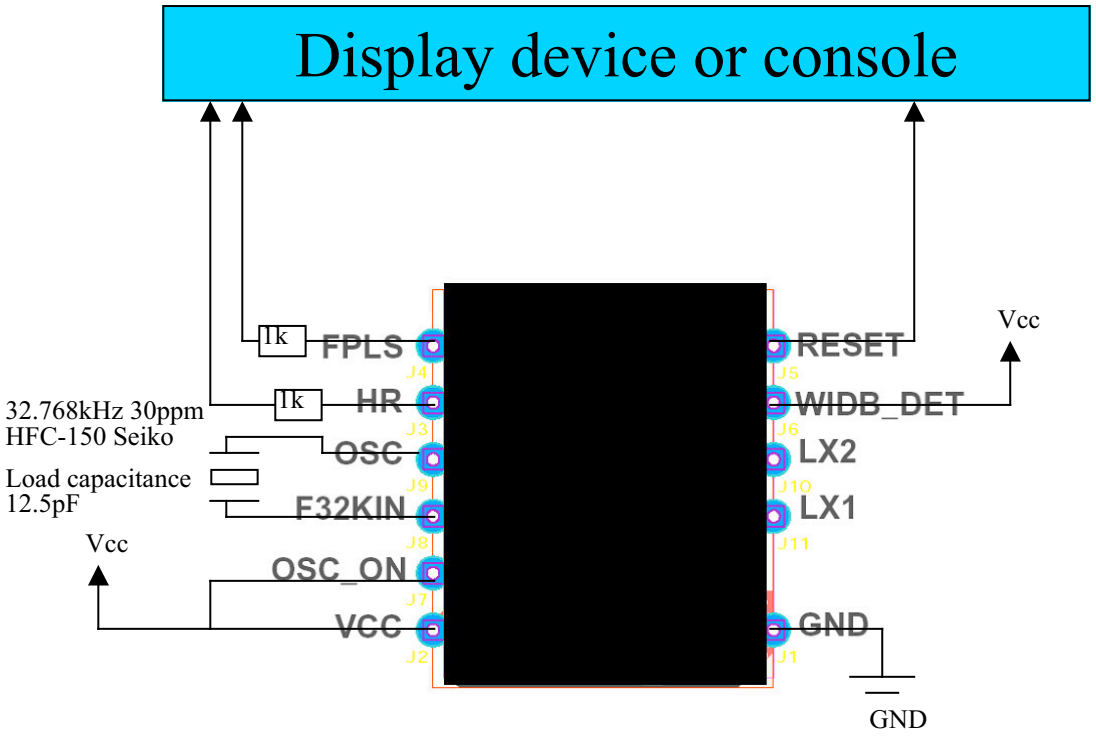

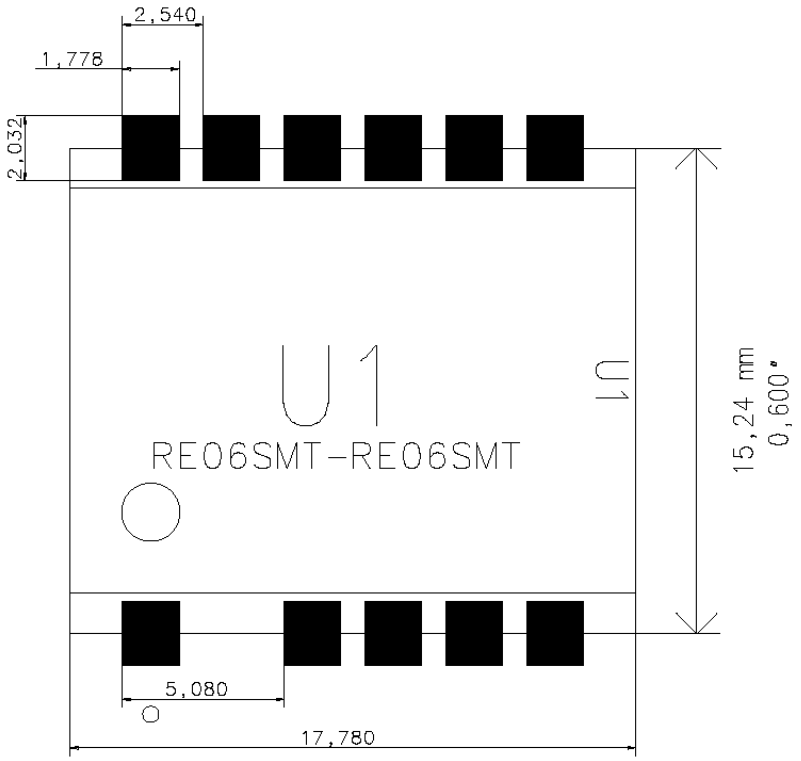

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RMCM-01 RECEIVER COMPONENT – SOLDERING PROFILE

SnAgCu Reflow Soldering Profile		
Parameter	**Ref**	**Specification**
Pre-heating		2 °C/sec
Soak time	t_{soak}	2…3 min
Time above 217°C	t_1	Max 60 sec
Time above 230	t_2	20…50 sec
Time above 250	t_3	Max 10 sec
Peak temperature	T_{peak}	245…255°C
Cooling		Max -6 °C/sec

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