

RTM-2000 User Manual

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RoyalTek TMC Module: RTM-2000 User Manual

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RoyalTek RDS-TMC Module: RTM-2000 User Manual

Introduction

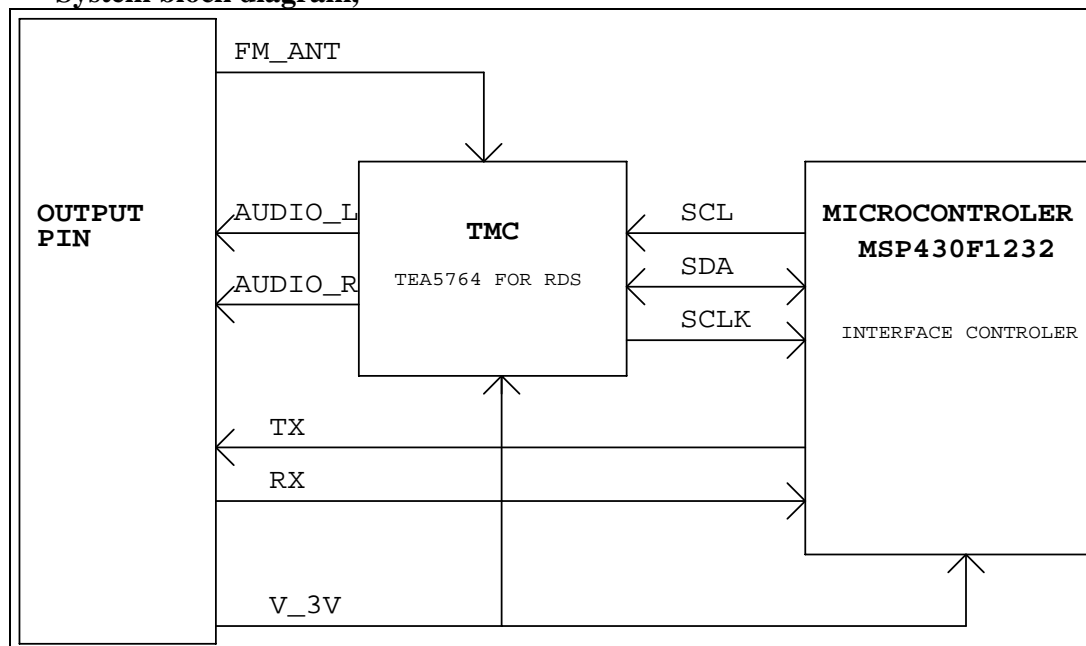
RoyalTek RTM-2000 is the RDS-TMC demodulator module using Philips TEA5764 chip and MSP430F1232 MCU. RTM-2000 has a low power consumption and can operate at a low supply voltage. The module demodulates the RDS-TMC in FM band from 87.5MHz to 108MHz. The block data and status information are available via I²C bus. Then pass through MSP430F1232 (MCU) transmission CMOS level(+3.0V) to communicate with device. The smallest form factor and miniature design is the best choice to be embedded in a portable device like PDA, personal position and navigation like personal locator, speed camera detector and vehicle locator. The module can be used with to support navigation and traffic application.

Product Features

- ✧ Complete FM/RDS receiver module
- ✧ FM mixer for conversion of the US/Europe (87.5MHz to 108MHz)
- ✧ Auto search tuning, raster 100kHz
- ✧ Only one single power supply (+3.0V)
- ✧ Serial TTL interface
- ✧ High quality stereo audio output
- ✧ Ultra small size (LXWXH): 25X18X2.8mm

System Block Diagram

System block diagram,



Specification

No	Function	Specification
System		
1	OS	TMC protocol: Royaltek RTM-2000 TMC Protocol 1.0
2	Microcontroler	MSP430F1232
3	Supported Software	DESTINATOR, GATE5, IGO, MAP&GUIDE, MAP FACTOR, NAVIGON, NAVMAN, PHAROS, ROUTE66 Further software adaptations are in preparation. For updating software list, please contact RoyalTek directly.
4	Output message	Royaltek RTM-2000 TMC protocol 1.0
TMC/RDS receiver		
5	Chipset	Philip TEA5764HN
6	Frequency	87.5~108MHz. US/Europe
7	RDS sensitivity	24.7uV type $\Delta f=22.5\text{kHz}$, $f_{AF} = 1\text{kHz}$, $L=R$, $f_{RDS}=1.2\text{kHz}$, deemphasis= 50us, Block Quality Rate $\geq 85\%$
Antenna Input		
8	Matching	50 ohm
Interface		
11	Output	TTL +3.0V serial interface
12	Baud rate	9600bps
13	I/O Pin	16pin I/O pin
Mechanical requirements		
14	Weight	$\leq 3\text{g}$
15	Dimension	The TMC Module dimensions: 25mm(Length) x 18mm(Width) x 2.8mm (Hight) ± 0.3
Power consumption		
16	Vcc	DC +3.0 $\pm 10\%$
17	Current	Current $\leq 20\text{mA}$ Maximum
Environment		
18	Environment	Building in Navigation Cube
19	Operating temperature	-40 °C to +85 °C
20	Storage Temperature	-45 °C to +85 °C

21	Humidity	$\leq 95\%$
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Hardware Interface:



Pin definition:

NO.	Name	I/O	Descriptions	Characteristics
P1	GND	~	Ground	Ground
P2	GND	~	Ground	Ground
P3	TCK	I	No connection	2.2V Vih 3.0V , Vil 0.6V
P4	TMS	I	No connection	2.2V Vih 3.0V , Vil 0.6V
P5	GND	~	Ground	Ground
P6	TDI	I	No connection	2.2V Vih 3.0V , Vil 0.6V
P7	TDO	O	No connection	2.75V Voh 3.0V , Vol 0.25V
P8	V_IN_3V	~	System power input.	DC : +3V±10%.Current ≤20mA@+3.0V
P9	TEST	I	No connection	2.2V Vih 3.0V , Vil 0.6V
P10	NRST	I	No connection	2.2V Vih 3.0V , Vil 0.6V
P11	TX	O	Navigation data output	2.75V Voh 3.0V , Vol 0.25V
P12	RX	I	Serial Data Input	2.2V Vih 3.0V , Vil 0.6V
P13	AUDIO_R	O	Right audio output	V_{AFR} output vol tage 66mV(TYP.) ~ 75mV(Max.) R_{AFR} output resistance 50ohm(Min.) ~ 100ohm(Max .)
P14	AUDIO_L	O	Left audio output	V_{AFL} output vol tage 66mV(TYP.) ~ 75mV(Max.) R_{AFL} output resistance 50ohm(Min.) ~ 100ohm(Max .)
P15	GND	~	Ground	Ground
P16	FM_ANT	I	FM antenna input	FM antenna input(50ohm trace)

(1)GND

GND provides the ground for RTM-2000 Module.

(2)Power:

Connect V_IN_3V pin to DC 3.0V±10%.The power supply must add Bead and bypassing capacitor(33uF).It can reduce the Noise from power supply and increase power stability.

(3)TX

This is the main transmitting channel and is used to output user application software.

(4) RX

This is the main receiver channel and is used to receive software commands to user application software.

(5)AUDIO_L/R

The two pins contain the Audio of the left/right channel directly out of the TEA5764.

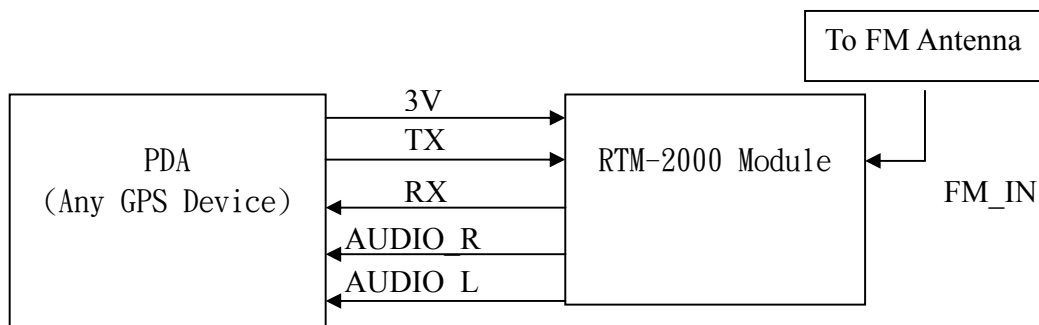
(6)FM_ANT

This pin is FM Antenna input pin. It is suggested to use 50 ohm trace from FM-ANT pin to FM antenna connector.

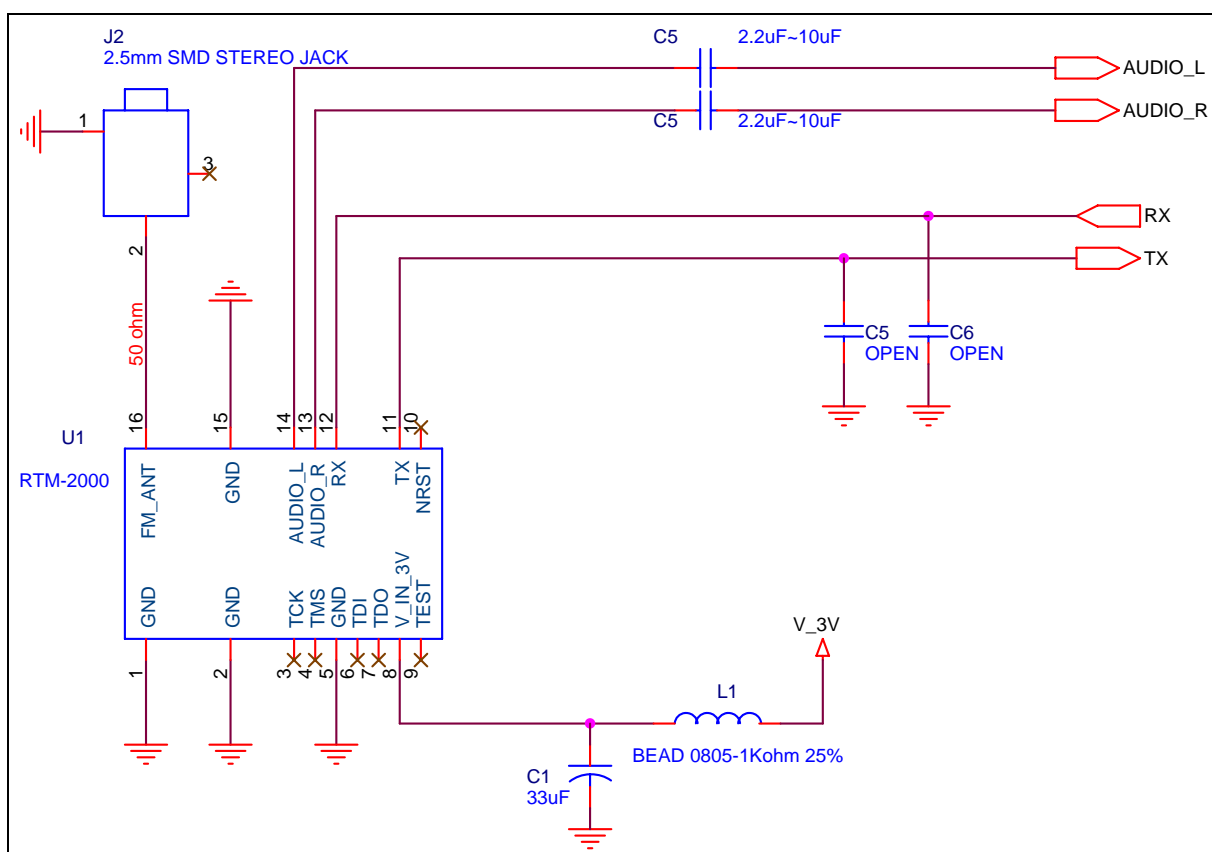
(7)No connection pin

These pins (TCK,TMS,TDI,TDO,TEST,NRST) are used for MCU(MSP430F1232) FIRMWARE UPDATE.

Application block diagram with Royaltek TMC module (RM-2000)

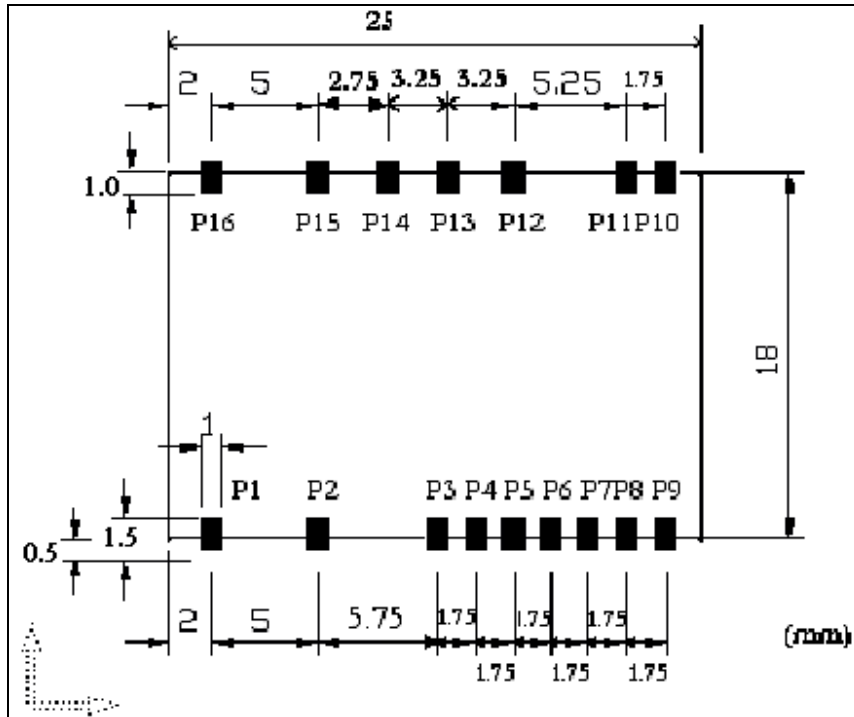


Application Circuit



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Recommended layout PAD

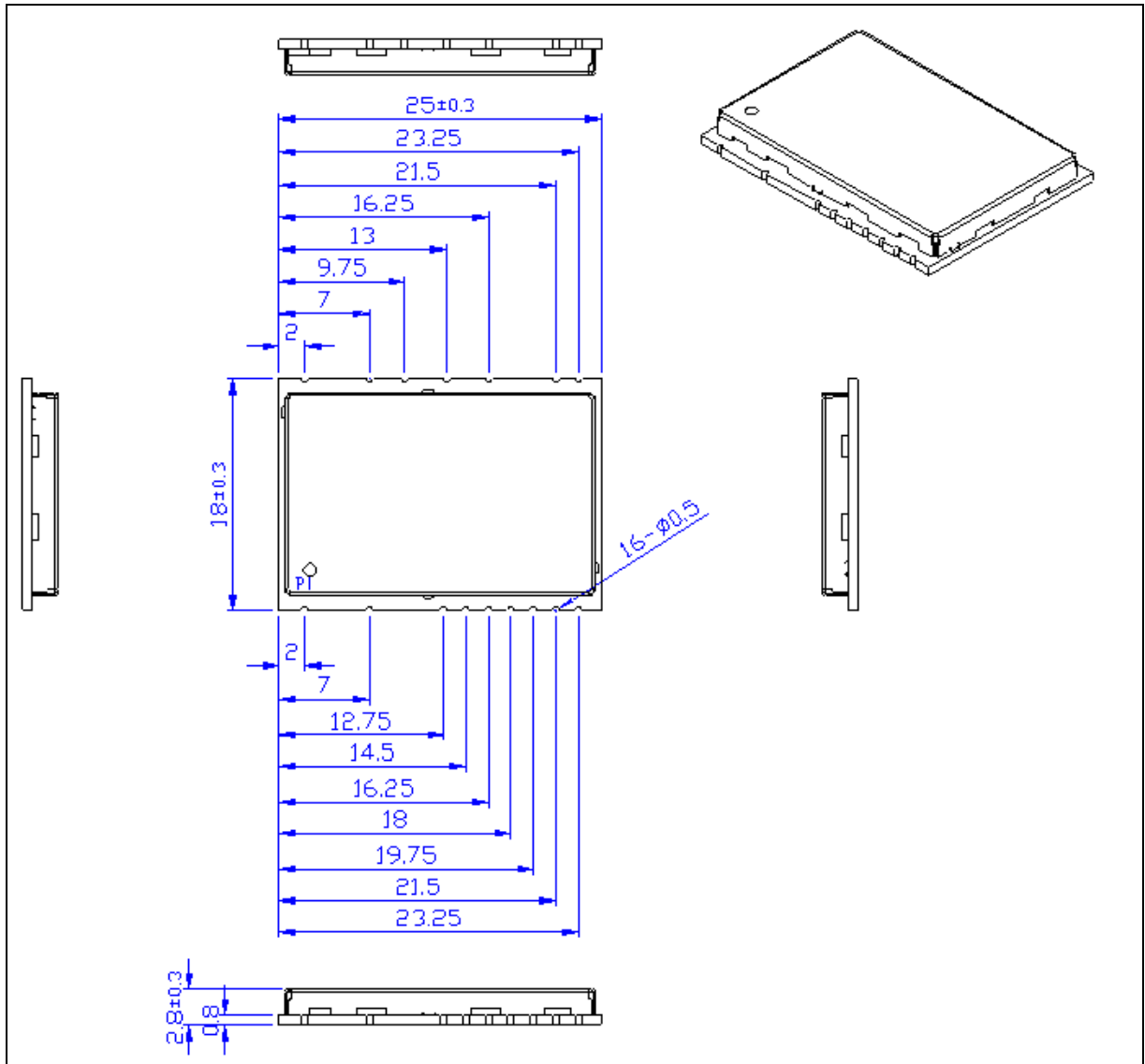


Layout Note:

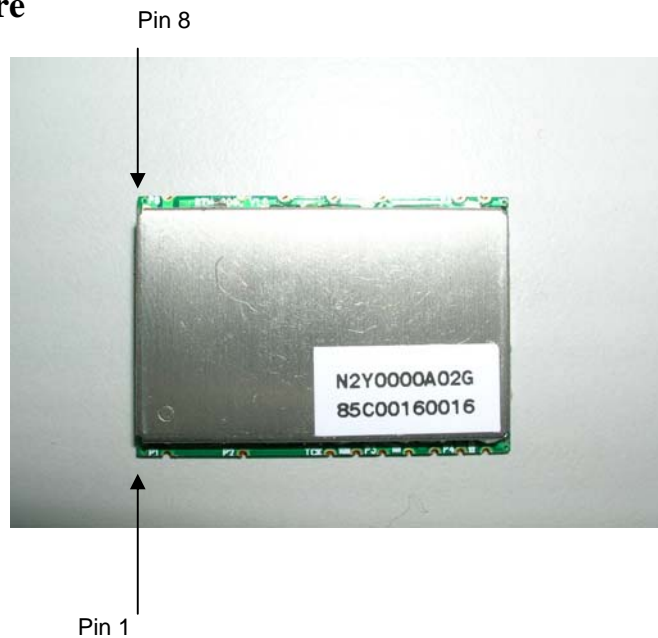
- The trace connected to FM_IN should be 50 ohm.
- The switching power and address bus should be away from the antenna trace.
- It is recommended to add Bead and bypass capacitor above 33uF to reduce power noise.

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Mechanocal Drawing,



Product Picture RTM-2000



RTM-2000 Interface Board

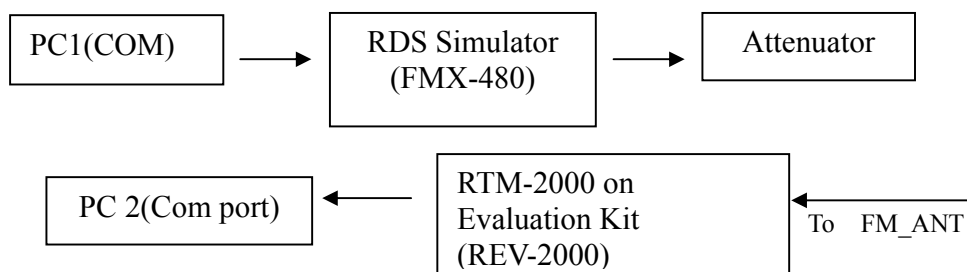


RoyalTek Evaluation Kit REV-2000 for RTM-2000

(Please refer to RoyalTek Evaluation Kit REV-2000 for RTM-2000 Operational Manual for more information)



Test Configuration :



Requirement list of Test:

1. RTM-2000 module (DUT)
2. REV-2000 test board
3. FMX-480 FM simulator
4. Attenuator
5. PC1 to control simulator
6. PC2 with test program to control test board

Test Procedure:

1. Setup FMX 480 simulator to the following parameter
 $\Delta f = 22.5\text{kHz}$, $f_{AF} = 1\text{kHz}$, $L=R$, $f_{RDS} = 1.2\text{kHz}$, $\text{deemphasis} = 50\mu\text{s}$,
2. Set frequency value, for example 98MHz.
3. To calibrate signal strength to -78dBm before FM_ANT
4. Run test program to read Block Ratio above 85%.