

RTM-6000 User Manual

Version 1.3
2008/10/30

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0. Revision History

| Rev | Release Date | Change Description | Editor |
|-----|--------------|-----------------------------------|------------|
| 1.0 | 2007/08/29 | Initial Draft | Amanda Lee |
| 1.1 | 2007/10/24 | Increasing 8. temperature profile | Amanda Lee |
| 1.2 | 2008/05/23 | Change schematic | Linda Fan |
| 1.3 | 2008/10/30 | Change RDS sensitivity | May Chen |

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1 Introduction

RoyalTek RTM-6000 is the RDS-TMC demodulator module using Silicon Lab Si4703 chip and Silicon Lab C8051F331 MCU. RTM-6000 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 C8051F331 (MCU) transmission CMOS level (+3.3V) to communicate with device. The smallest form factor and miniature design is the best choice to be embedded in a portable device like PDA, PND and navigation such as personal locators, speed camera detectors and vehicle locators. The module can be used on supporting navigation and traffic application.



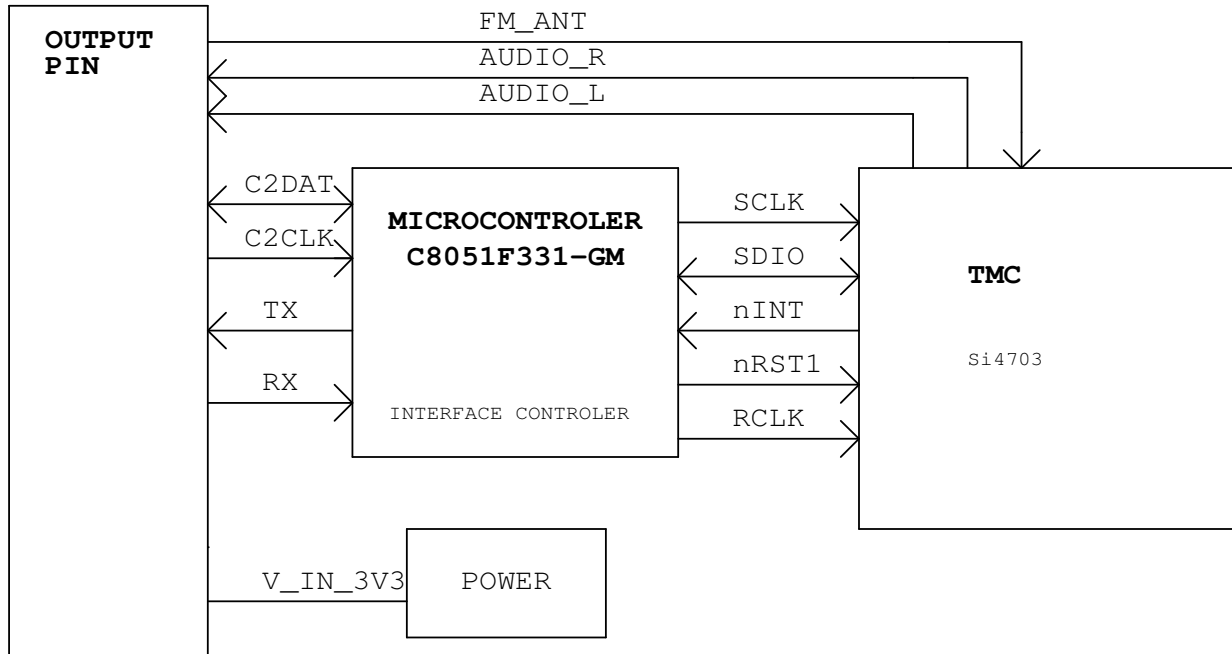
1.1 Product Features

- ✧ 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 (DC+2.9 ~ 3.6V)
- ✧ Serial TTL interface
- ✧ High quality stereo audio output
- ✧ Ultra compact size : (L) 10 (+-0.2) * (W) 9.3 (+-0.2) * (H) 2 (+0.25, -0.1)mm

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1.2 System Block Diagram

System block diagram,



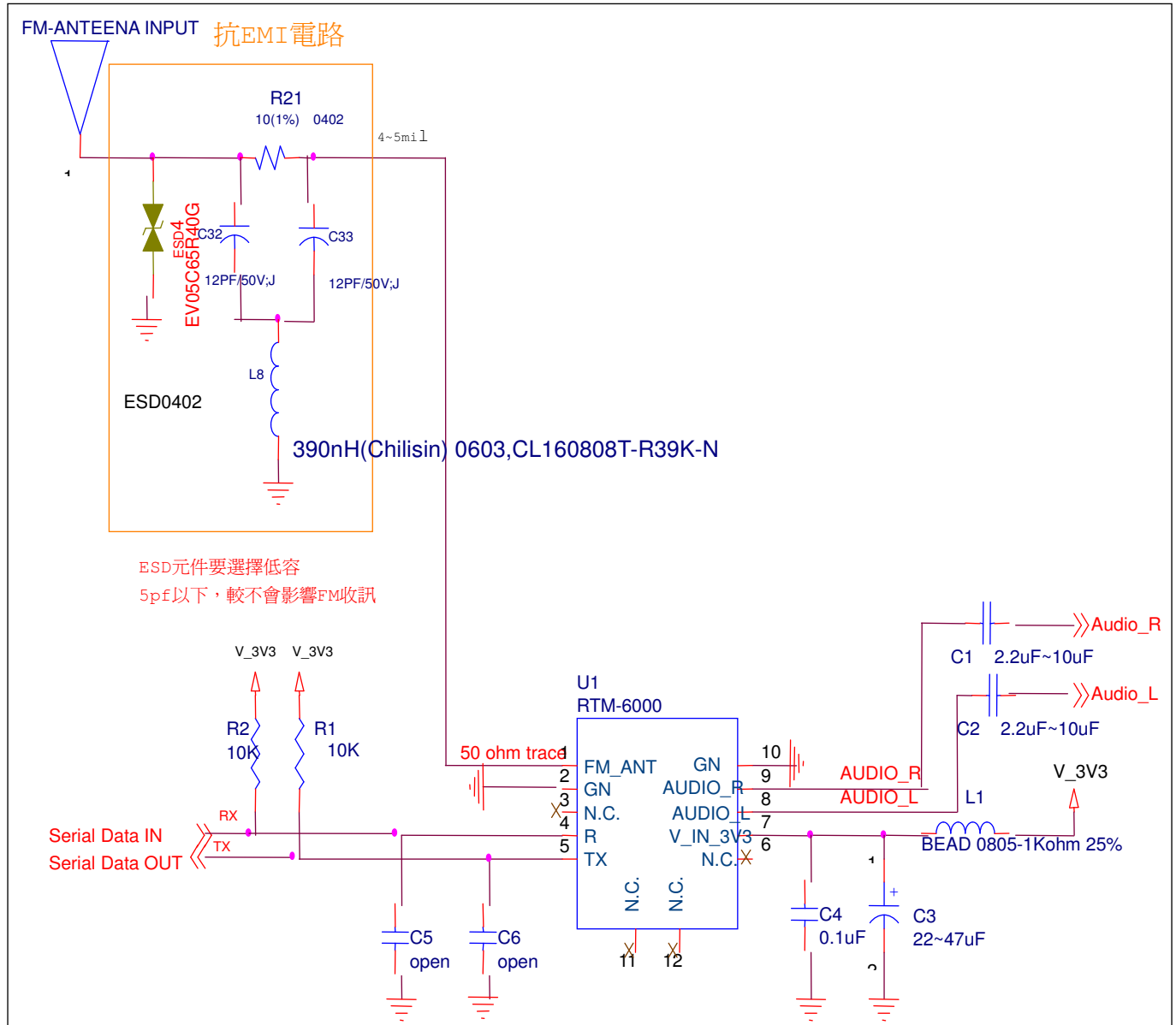
2 Specification

| No | Function | Specification | | | | |
|-------------------------|-------------------------|---|------|------|--------|---|
| Mechanical requirements | | | | | | |
| 13 | Weight | ≤ 0.43 g | | | | |
| 14 | Dimension | 10mm \pm 0.2mm(L) x 9.3mm \pm 0.2mm(W) x 2mm+0.25-0.10mm(H) | | | | |
| TMC/RDS receiver | | | | | | |
| 1 | Chipset | Silicon Lab Si4703-GM | | | | |
| 2 | Frequency | 87.5~108MHz. US/Europe | | | | |
| 3 | sensitivity | 2.5 μ VEMF typ. (S+N)/N=26dB FMOD = 1 kHz, 75 μ s de-emphasis MONO = 1, and L = R unless noted otherwise. $\Delta f = 22.5$ kHz. BAF = 300 Hz to 15 kHz, A-weighted. | | | | |
| | RDS sensitivity | 12 μVEMF min. $\Delta f = 2$ kHz, RDS BLER < 5% RDS PRF = 1 | | | | |
| Antenna Input | | | | | | |
| 4 | Matching | 50 ohm | | | | |
| Interface | | | | | | |
| 5 | Output | TTL +3.3V serial interface | | | | |
| 6 | Baud rate | 38400bps | | | | |
| 7 | I/O Pin | 12pin I/O pin | | | | |
| Power consumption | | | | | | |
| 8 | Vcc | DC +2.9~3.6V | | | | |
| 9 | Current | Current ≤ 35 mA Maximum @DC +3.3V | | | | |
| Audio Function | | Min. | Typ. | Max. | Unit. | Note. |
| 10 | Audio output voltage | 72 | 80 | 90 | mVRMS | |
| 11 | Audio output resistance | 10 | -- | -- | k ohms | |
| 12 | AF THD | -- | 0.1 | 0.5 | % | |
| 13 | Audio Mono S/N | 55 | 63 | -- | dB | FMOD = 1 kHz, 75 μ s de-emphasis MONO = 1, and L = R |

| | | | | | | |
|-------------|-----------------------|-----------------------------|----|----|----|--|
| | | | | | | unless noted otherwise. $\Delta f = 22.5 \text{ kHz}$. BAF = 300 Hz to 15 kHz, A-weighted. VEMF = 1 mV, fRF = 87.5 to 108 MHz. |
| 14 | Audio Stereo S/N | -- | 58 | -- | dB | $\Delta f = 22.5 \text{ kHz}$. |
| Environment | | | | | | |
| 10 | Environment | Building in Navigation Cube | | | | |
| 11 | Operating temperature | -20 °C to +85 °C | | | | |
| 12 | Storage Temperature | -40 °C to +100 °C | | | | |
| 13 | Humidity | $\leq 95\%$ | | | | |

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3 Reference schematic:



(1)GND

GND provides the ground for RTM-6000 Module.

(2)Power:

Connect V_IN_3V3 pin to DC 2.9~3.6V.The power supply must add Bead and bypassing capacitor(22~47uF).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 pin contains the Audio of the left/right channel directly out of the Si4703.

(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.

4 Hardware Interface:

Pin definition:

| NO. | Name | I/O | Descriptions | Characteristics |
|-----|---------|-----|--------------------|--|
| P1 | FM_ANT | I | FM antenna input | FM antenna input(50ohm trace) |
| P2 | GND | ~ | Ground | Common Ground |
| P3 | N.C. | ~ | Test Pin | None Connector |
| P4 | RX | I | Serial Data in | $2.0V \leq V_{IH} \leq 3.3V$ $0V \leq V_{IL} \leq 0.8V$ |
| P5 | TX | O | Serial Data out | $2.5V \leq V_{OH} \leq 3.3V$ $0V \leq V_{OL} \leq 0.6V$ |
| P6 | N.C. | ~ | Test Pin | None Connector |
| P7 | V_IN_3V | ~ | System power input | DC : 2.9~3.6V.Current $\leq 35mA$ typ.@+3.3V |
| P8 | AUDIO_L | O | Left audio output. | Left audio output |
| P9 | AUDIO_R | O | Right audio output | Right audio output |
| P10 | GND | ~ | Ground | Common Ground |
| P11 | N.C. | ~ | Test Pin | None Connector |
| P12 | N.C. | ~ | Test Pin | None Connector |

(1)GND

GND provides the ground for RTM-6000 Module.

(2)Power:

Connect V_IN_3V3 pin to DC 2.9~3.6V @3.3V TYP..The power supply must add Bead and bypassing capacitor (10~33uF).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 pin contain the Audio of the left/right channel directly out of the Si4703-GM

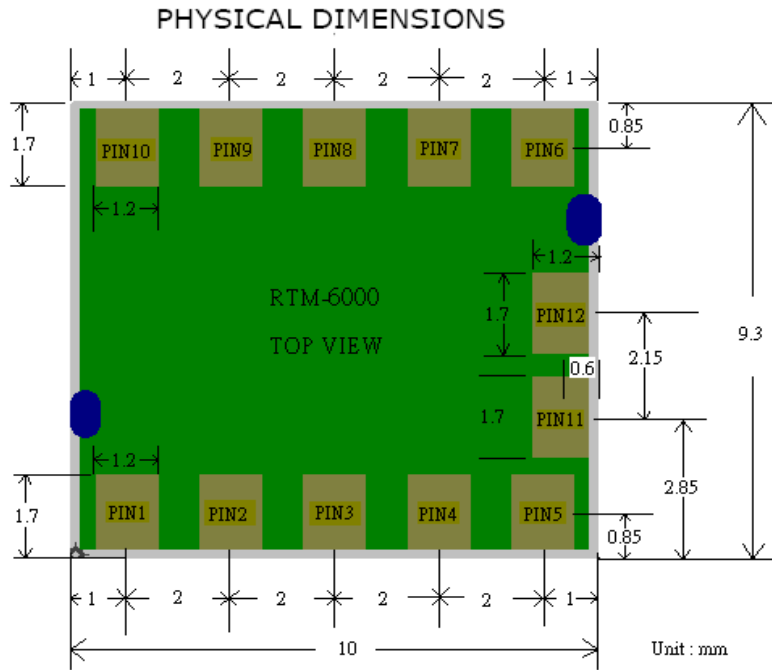
(6)FM_ANT

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

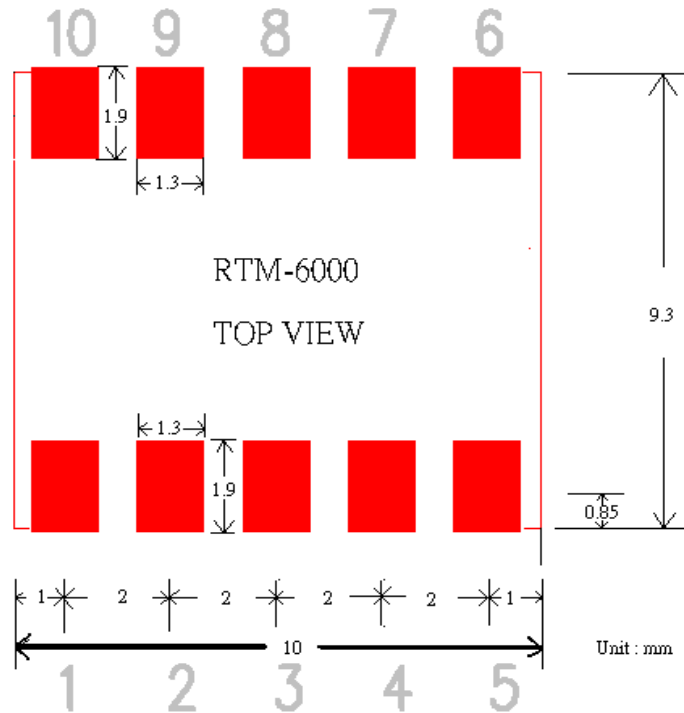
(7)No connection pin

These pin (C2CLK, C2DAT) are used for MCU (C8051F331) FIRMWARE UPDATE.

5 Recommend layout PAD:



RECOMMENDED LAYOUT PAD



6 Layout Note:

- (1) The trace connected to FM_IN should be 50 ohm.
- (2) It is recommended to add Bead and bypass capacitor above 10~33uF to reduce power noise.
- (3) The system's EMI or noise is recommended to reduce first which efficiently boost TMC performance.
- (4) Please refer to the recommend pad for connecting well.

7 Mechanical Drawing

