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

Content

1 Intruduction

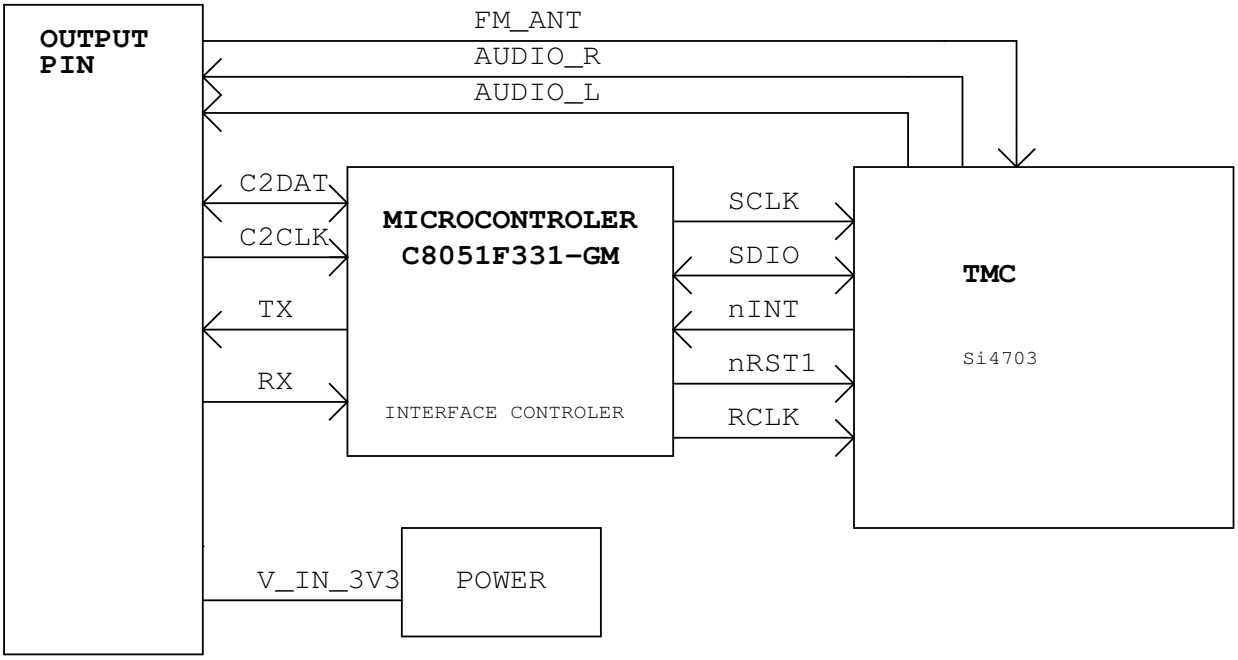
RoyalTek RTM-6000 is the RDS-TMC demodulator module using Silicon Lab Si4703 chip and Silicon Lab C8051F331 MCU. RTM-6000 has a low power consumption and can operate at a low supply voltage. The module demodulates the RDS-TMC in FM band from 87.5MHz to 108MHz. The block data and status information are 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

1.2 System Block Diagram

System block diagram,

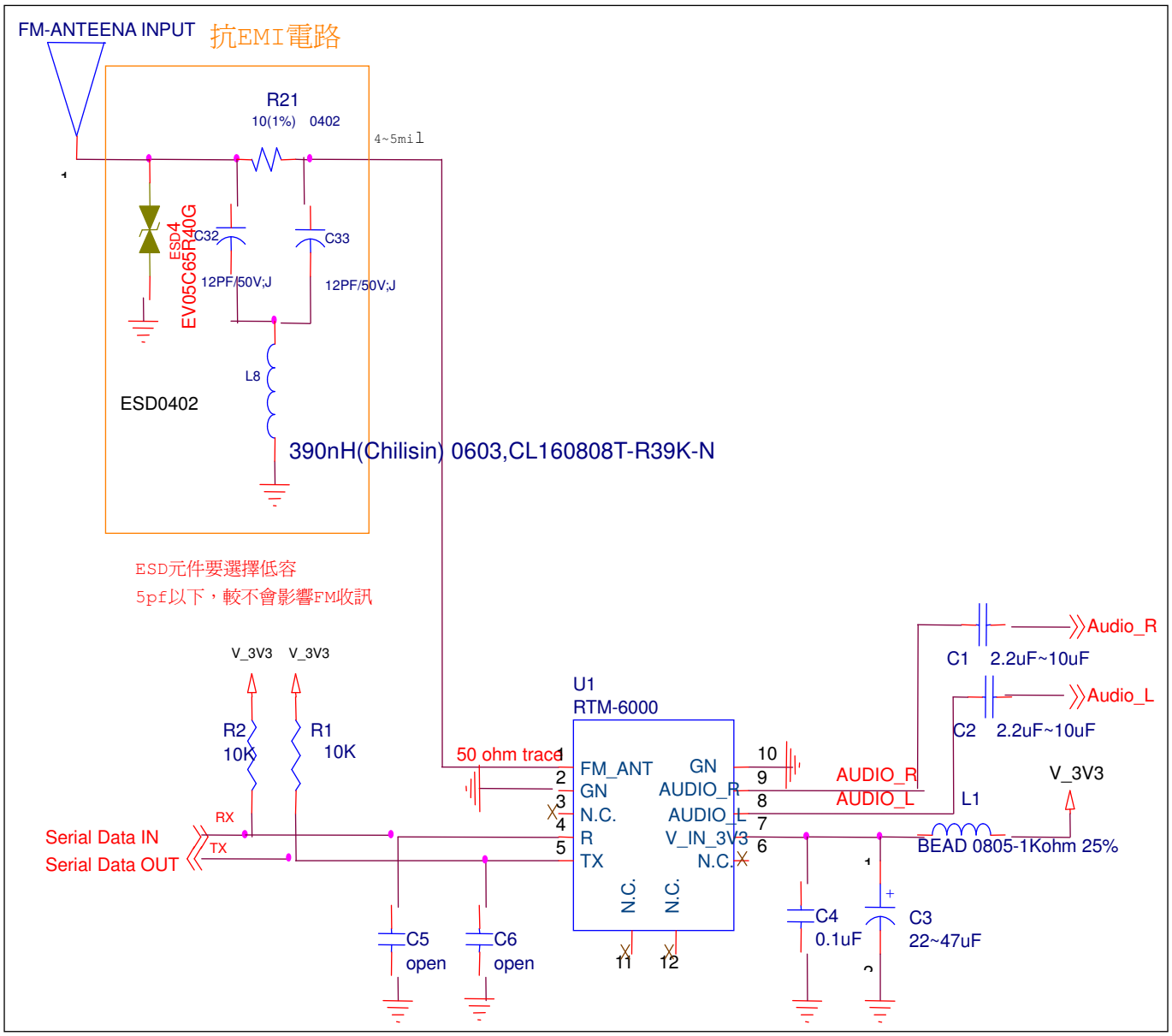


2 Specification

No	Function	Specification				
Mechanical requirements						
13	Weight	≦0.43 g				
14	Dimension	10mm±0.2mm(L) x 9.3mm±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 μVEMF typ. (S+N)/N=26dB FMOD = 1 kHz, 75 μs de-emphasis MONO = 1, and L = R unless noted otherwise. △f = 22.5 kHz. BAF = 300 Hz to 15 kHz, A-weighted.				
	RDS sensitivity	**12 μVEMF min.** △f = 2 kHz, RDS BLER < 5% RDSPRF = 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 ≦35mA 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 μs de-emphasis MONO = 1, and L = R

						unless noted otherwise. △f = 22.5 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	△f = 22.5 kHz.
Environment						
10	Environment	Building in Navigation Cube				
11	Operating temperature	-20 ℃ to +85 ℃				
12	Storage Temperature	-40 ℃ to +100℃				
13	Humidity	≦95%				

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.

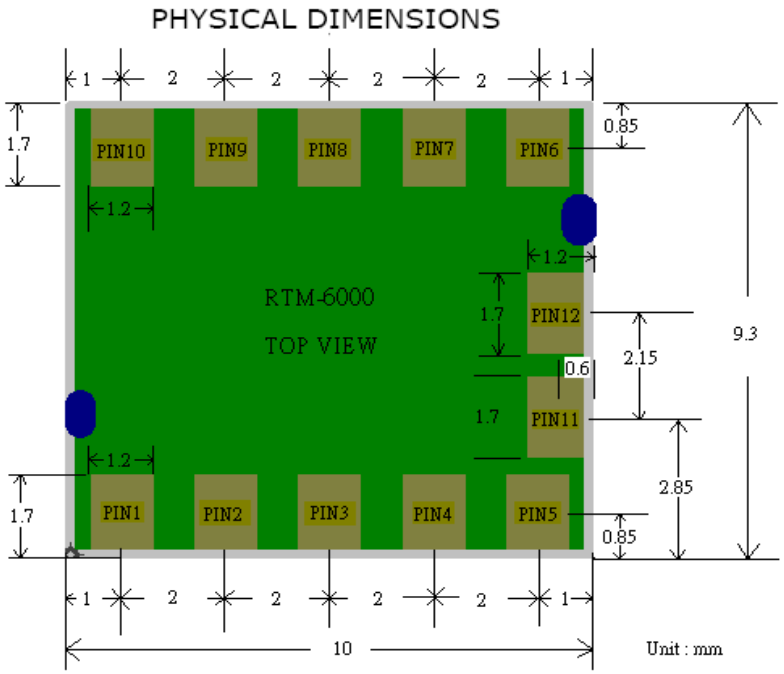
4 Hardware Interface:

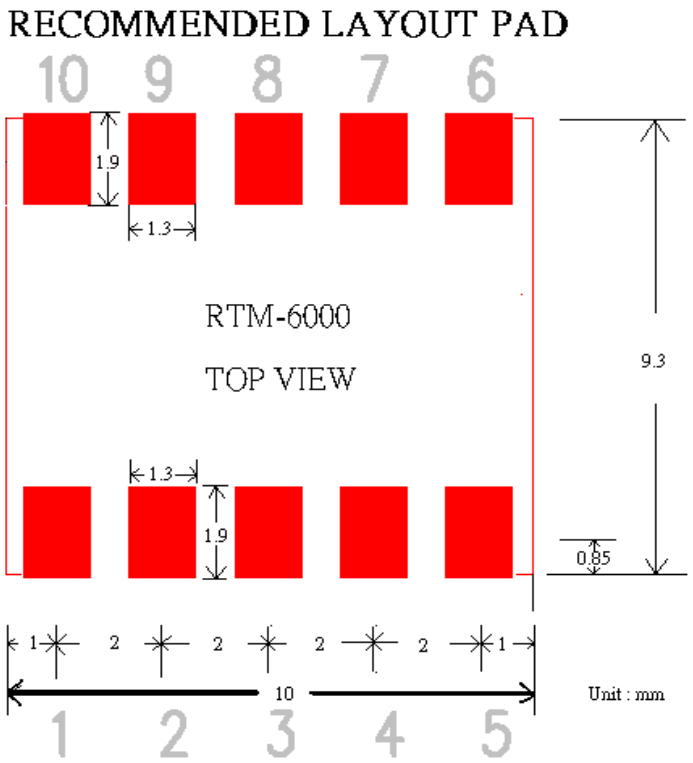
Pin definition:

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	$2.0V \leqq V_{IH} \leqq 3.3V$ $0V \leqq V_{IL} \leqq 0.8V$
P5	TX	O	Serial Data out	$2.5V \leqq V_{OH} \leqq 3.3V$ $0V \leqq V_{OL} \leqq 0.6V$
P6	N.C.	~	Test Pin	None Connector
P7	V_IN_3V	~	System power input	DC：2.9~3.6V.Current ≦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:

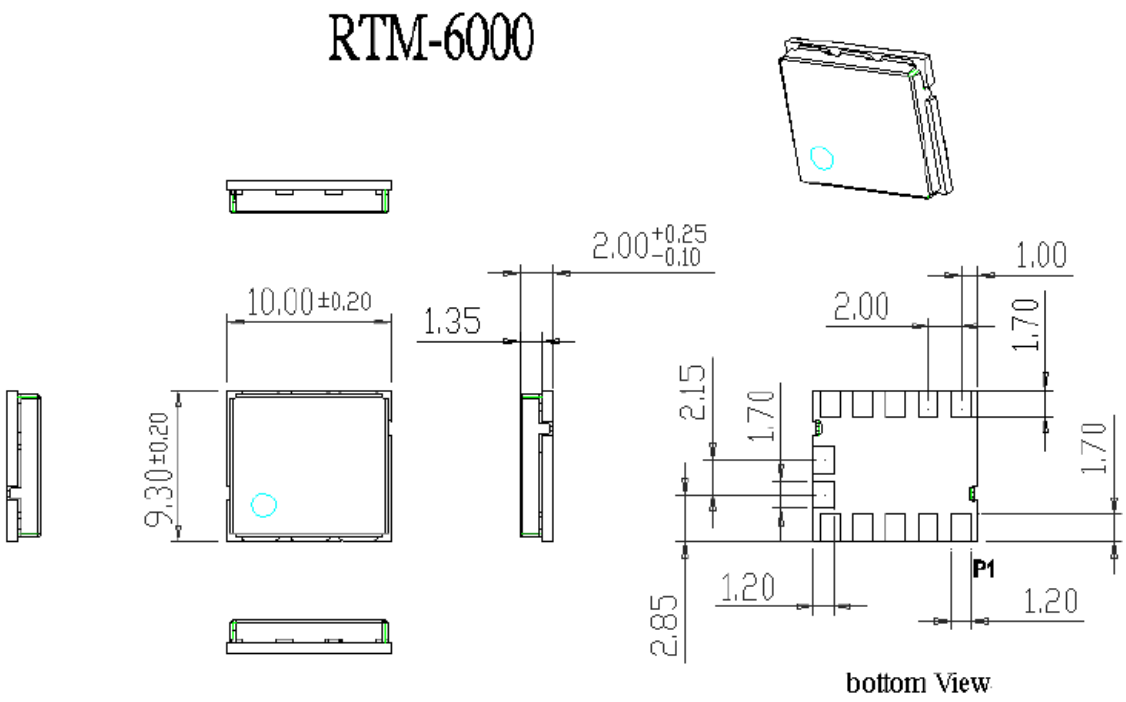




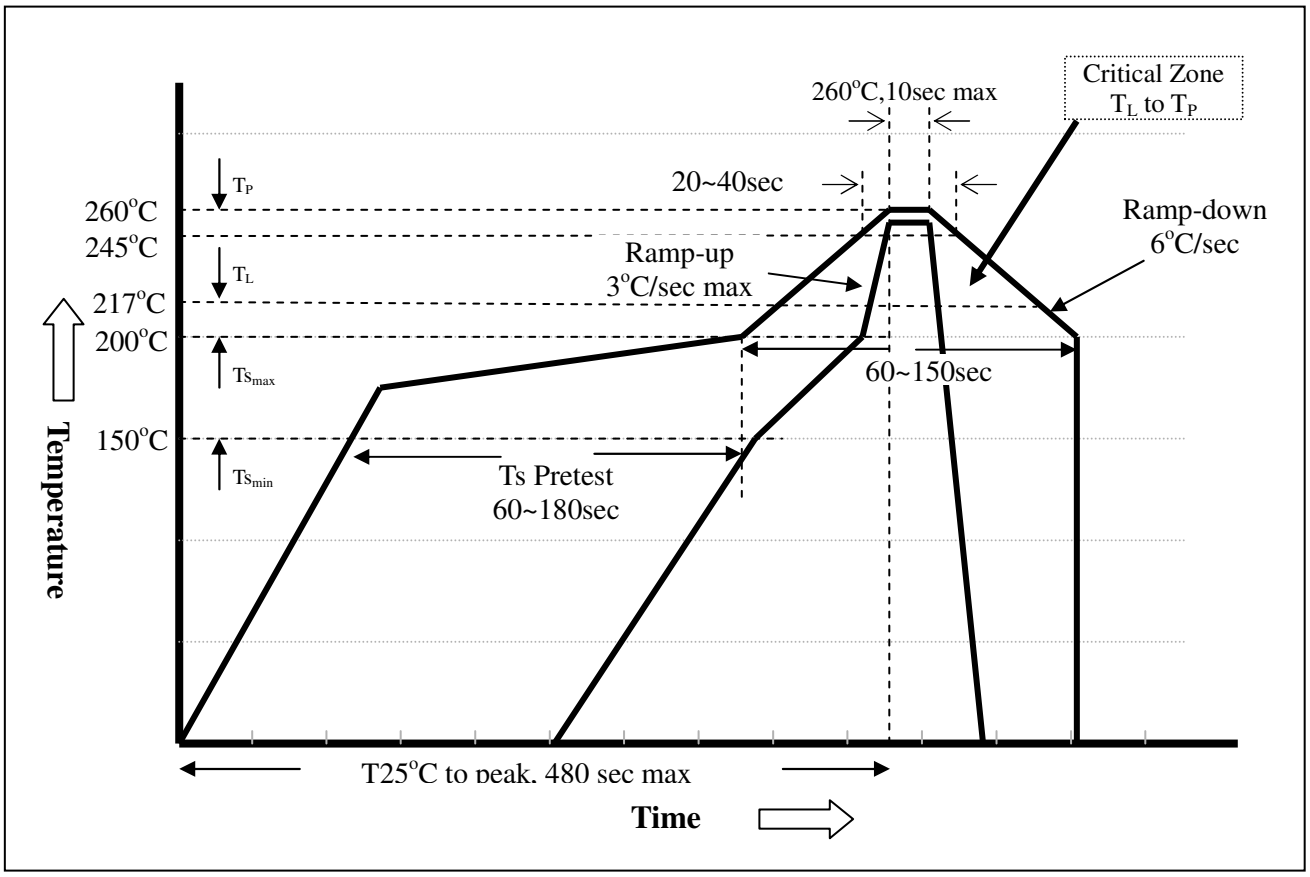
6 Layout Note:

(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



8 Temperature Profile



RTM-6000 Lead-Free Standard Reflow Profile

