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RF SILICON AND SUBSYSTEMS SOLUTIONS
FOR BROADBAND COMMUNICATIONS AND AUTOMOTIVE ELECTRONICS

# MT1393ETC FM/RDS TUNER MODULE

**PRODUCT BRIEF**

**The MT1393ETC is a highly integrated FM tuner module with an on-board data decoder for RDS (Europe) as well as RBDS (US).**




*MT1393ETC FM/RDS Tuner Module*

The MT1393ETC FM/RDS Tuner Module is specifically designed to meet the demanding performance targets of automotive customers, at an attractive price. This tuner module has been developed for both FM audio reception as well as RDS/RBDS data reception and includes both an integrated receiving condition analyzer and an integrated RDS/RBDS decoder. The high level of functionality makes this tuner module an ideal solution for use as a dedicated background tuner enabling data services offered via RDS/RBDS and monitoring alternate frequencies. Its excellent sensitivity and strong signal performance produce clear audio and reliable data reception, even under critical receiving situations.

The MT1393ETC is environmentally hardened to operate over an extended temperature range and under adverse climatic conditions and offers a very small form factor for space-critical applications. The tuner section of the module contains a double down-conversion system with a selective pre-filter circuit and image reject mixers. The dynamic selectivity function evaluates the current receiving situation continuously and automatically determines the optimum IF bandwidth. The audio path provides an MPX signal output for external stereo decoding.

The RDS/RBDS portion of the MT1393ETC contains, in addition to the demodulator and decoder, data processing functions including synchronization and error correction. An integrated RAM buffer for up to 24 RBS/RBDS blocks decreases the number of data pulls via the I2C bus. This serial bus is used to control frequency settings and multiple programmable functions of the MT1393ETC.

## APPLICATIONS

- Car radios (FM audio reception or background data reception)
- Dynamic navigation systems (Traffic data reception)

## FEATURES

### FM

- Double down-conversion
- Selective pre-filter circuit
- Image reject mixers
- Keyed AGC selectable, AGC-threshold programmable
- Highly sophisticated IF filter technology with dynamically controlled bandwidth
- FM demodulator with noise cancellation
- Receiving condition analyzer with detectors for “adjacent channel”, “multipath” and “fieldstrength”
- Stop signal output
- Adjustable softmute control
- Multiplex (MPX) audio output

### RDS

- Integrated demodulator and decoder
- Supports European RDS and US RBDS
- Automatic group- and block-synchronization
- Error detection and error correction
- RAM with a capacity of 24 blocks
- Programmable interrupt for readout of data via $I^2C$ bus

### GENERAL

- $I^2C$ bus-controlled
- On-board EEPROM supports digital alignment
- Very small form factor
- Design tool: Evaluation Kit MT1393ETC_EK available

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## OPERATING CHARACTERISTICS

| PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|
| 5V Power supply voltage | | | | |
| Current | | 35 | | mA |
| Voltage | 4.5 | 5 | 5.5 | V |
| 8.5V Power supply voltage | | | | |
| Current | | 100 | | mA |
| Voltage | 8 | 8.5 | 9 | V |
| Operating temperature | -40 | | +85 | °C |
| Storage temperature | -40 | | +95 | °C |

## INPUT/OUTPUT CHARACTERISTICS

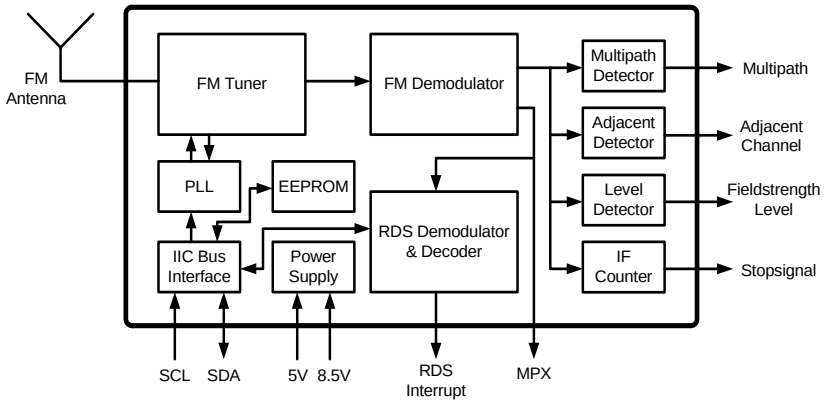
| PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|
| Antenna Input | | | | |
| Input impedance | | 50 | | Ω |
| VSWR | | | 4 | |
| Field-strength level detector output | | | | |
| Voltage | 0 | | 5 | V |
| Adjacent channel detector output | | | | |
| Voltage (open collector with pull up) | 0.1 | | 4.9 | V |
| SCL (IIC bus) | High and Low levels are according to the IIC bus specification with thresholds of 3.3V or 5V. | | | |
| SDA (IIC bus) | | | | |
| Stop signal output | | | | |
| Voltage | 0.2 | | 5 | V |
| Maximum sink current | | | 1 | mA |
| Multipath detector output | | | | |
| Voltage | 0.1 | | 4.9 | V |
| Output resistance | | 2.5 | | kΩ |
| MPX audio output | | | | |
| Load resistance | 20 | | | kΩ |
| Output resistance | | | 50 | Ω |
| Interrupt output | | | | |
| Low level voltage | | | 1.2 | V |
| High level voltage | 4 | | | V |
| Output resistance | | 10 | | kΩ |

## ELECTRICAL CHARACTERISTICS

| PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|
| Receiving frequency range | | | | |
| USA band | 87.9 | | 107.9 | MHz |
| Europe band | 87.5 | | 108 | MHz |
| Sensitivity for S/N=26 dB | | 2 | | µV |
| S/N at high RF input | | 60 | | dB |
| Image rejection | | 70 | | dB |
| AM supression | | 55 | | dB |
| THD+N | | 0.15 | | % |
| Adjacent channel selectivity (100 kHz) | | 10 | | dB |
| Alternate channel selectivity (200 kHz) | | 72 | | dB |
| Intermodulation rejection | | 70 | | dB |
| Frequency response | | -1 | | dB |
| MPX output voltage (deviation=75 kHz) | | 430 | | mV |
| Field-strength output voltage | | | | |
| RF input = 30 dBµV | | 1.8 | | V |
| RF input = 100 dBµV | | 4 | | V |
| RDS sensitivity for 50% correct received blocks | | 18 | | dBµV |
| Standard measurement conditions | Antenna dummy with loss=6dB, RF input = 60dBµV; deviation = 40kHz; audio frequency = 1kHz; de-emphasis = 50µs; CCIR weighted | | | |

## MECHANICAL CHARACTERISTICS

| PARAMETER | DIMENSION | UNIT |
|---|---|---|
| Vertical Housing (Product ID = 3x0923) | | |
| Length | 48 | mm |
| Width | 14 | mm |
| Height | 29.8 | mm |
| All inputs/outputs via pins; number of pins is 16; pin grid is 2.54mm | | |




*MT1393ETC FM/RDS Tuner Block Diagram*

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**Microtune, Inc., 2201 Tenth Street, Plano, TX 75074, USA**
**Tel: +1-972-673-1600, Fax: +1-972-673-1602, E-mail: sales@microtune.com, Web site: www.microtune.com**
**For a detailed list of design centers, sales offices, and sales representatives, visit our Web site at www.microtune.com.**

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